

# Gender Imbalance and Terrorism in Developing Countries

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Journal of Conflict Resolution  
2017, Vol. 61(3) 483-510

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DOI: 10.1177/0022002715603102

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## Abstract

This article investigates whether gender imbalance may be conducive to domestic terrorism in developing countries. A female-dominated society may not provide sufficient administration, law, or order to limit domestic terrorism, especially since societies in developing countries primarily turn to males for administration, policing, and paramilitary forces. Other economic considerations support female imbalance resulting in grievance-generated terrorism. Because male dominance may also be linked to terrorism, empirical tests are ultimately needed to support our prediction. Based on panel data for 128 developing countries for 1975 to 2011, we find that female gender imbalance results in more total and domestic terrorist attacks. This female gender imbalance does not affect transnational terrorism in developing countries or domestic and transnational terrorism in developed countries. Further tests show that gender imbalance affects terrorism only when bureaucratic institutions are weak. Many robustness tests support our results.

## Keywords

gender imbalance, domestic and transnational terrorism, developing countries

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In recent years, researchers have related demographic considerations to political violence. Notably, Urdal (2006) showed that a youth bulge—a proportionately large cohort of fifteen to twenty-four-year olds—may result in low-level violence, such as terrorism. This follows if this cohort resorts to violence to passionately pursue a political agenda. In an earlier influential study, Goldstone (2002) argued that rapid and large-scale demographic transformations can create grievances that may result in violent conflict. Berrebi and Ostwald (2015a) found that terrorism reduces fertility owing to stress-related factors. In a separate investigation, Berrebi and Ostwald (2016) empirically established that terrorist attacks reduced female labor participation rates, thereby increasing the female gender gap in the labor force. Unlike Urdal and Goldstone, the Berrebi and Ostwald articles showed how terrorism could affect demographic considerations.

The purpose of our article is to show empirically that male gender imbalance (henceforth, a higher ratio of men to women) ameliorates domestic terrorism in developing countries, which then means that female gender imbalance (a higher ratio of women to men) encourages more domestic terrorism. This same male dominance has no influence on terrorism in developed countries. At first sight, our finding is counterintuitive because one might expect that greater male imbalance may erupt in terrorism or violence, as the relative oversupply of men must find outlets for their energy and aggression (de Soysa 2002; Edlund et al. 2013; Goldstone 2002).<sup>1</sup> Generally, men are more prone to violence than women; however, a female gender imbalance may set in motion economic and institutional considerations that result in grievances or *opportunities* for terrorism by the male minority.

Despite some contrary arguments, we build a theoretical case, supported by evidence, that female gender imbalance may be conducive to domestic terrorism in developing countries. There are a number of theoretical constructs supporting our hypothesis. The most convincing one is based on opportunity, as a relative male shortage results in weak bureaucracies to maintain law and order and administer the country. In most developing countries, men staff police forces, military, and paramilitary units that maintain order. Male-poor societies are also prone to challenges in manufacturing, agriculture, and resource extraction, which can, in turn, limit economic growth, result in food shortages, and lead to stagnation that fuel grievances and terrorism. Developing countries abide by traditional gender roles more than developed countries, where women have made better progress in breaking down traditional gender roles.

We establish that this relationship between female gender imbalance and terrorism is particularly strong and robust in developing countries with weak bureaucratic institutions to maintain the rule of law and administrative tasks, in keeping with our link between female gender imbalance and an absence of control. Unlike developed countries, developing countries display a wide variety of gender ratios that range from a low of 83.3 males to every 100 females to a high of 165.7 males to every 100 females.<sup>2</sup> In fact, there are a fair number of sample countries with male gender ratios less than 100. Without consulting the data, one might generally expect males

to outnumber females owing to the aborting of female embryos in some developing countries. As shown in fourth section, the distribution of the gender ratio is generally bell shaped with a mean of 100 (i.e., 100 males for 100 females) for our sample of developing countries. During the 1975 to 2011 sample period, most of the gender ratio variation is between, rather than within, countries. In contrast, developed industrial countries do not display much between-country variation in their gender ratios. For twenty-five Organization of Economic Cooperation and Development (OECD) countries, this between-country variance is one-eighth that of our sample's developing countries' variance (see Tables B1 and B2 in the online appendix). We control for influences that might give rise to this female gender imbalance, such as civil wars and net migration. Past civil wars may decimate the male population in battlefield deaths, resulting in more women to men. This same imbalance may stem from refugees arriving from neighboring countries that are embroiled in conflict. A larger share of women is likely to migrate, as men stay behind to fight and die. Poor countries that are dependent on remittances are likely to have more women as men go abroad to earn money to send home. Even though we control for the youth bulge, civil conflict, natural disasters, and infant mortality, the hypothesized relationship between gender imbalance and terrorism holds. Our regressions also control for the standard determinants of terrorism—for example, population density, political and civil freedoms, real gross domestic product (GDP) per capita, and education attainment.

Our study is the first that makes a case that female gender imbalance is a potential inducer of terrorism in developing countries. The novel argument and findings contained herein are bolstered by rigorous empirical tests that display robustness and that point to some underlying theoretical grounds for this relationship. We do not, however, argue that female gender imbalance is the primary cause of domestic terrorism; rather, we demonstrate that this imbalance is a significant contributor to terrorism in developing countries when standard determinants are held constant. We acknowledge that both types of gender imbalance may fuel terrorism in developing countries because social order thrives on balance. Ultimately, the direction of the impact of gender imbalance, if any, is an empirical question. By controlling for factors that create female imbalance, we intend to make a convincing case for our finding that developing countries with more women than men are plagued with more terrorism owing to opportunities (i.e., control problems) and grievances created by this imbalance. We do not anticipate such a relationship in developed countries because gender ratios display very little variation among countries, domestic terrorism is generally not a concern, and institutions are strong.

## **Preliminaries**

Terrorism is the premeditated use or threat to use violence by individuals or subnational groups to obtain a political or social objective through intimidation of a large audience beyond that of the immediate noncombatant victims (Enders and Sandler 2012; Hoffman 2006; Sandler 2015). There are a number of things to highlight in

this definition. First, the definition agrees with those that are employed in the two terrorism event data sets—Global Terrorism Database (GTD) and International Terrorism: Attributes of Terrorist Events (ITERATE)—from which we draw our terrorism data. Second, the definition stresses that violent acts of intimidation must possess a political or social motive if they are to qualify as terrorist incidents. Third, the perpetrators must be individuals or subnational agents, which rules out state-imposed terror. The definition does not, however, rule out state sponsorship, where a country's government surreptitiously aids a terrorist group through logistical support, intelligence, funding, training, or other means. Fourth, the victims are noncombatants, so that attacks against an occupying army are not terrorist events, but attacks against peacekeepers are terrorist incidents. Fifth, the presence of an audience is essential because terrorists want their acts to threaten the general public so that they feel sufficiently imperiled to pressure the government to concede to the political demands of the terrorists.

An important distinction for this and other studies is between domestic and transnational terrorism (Enders, Sandler, and Gaibullov 2011). Domestic terrorist incidents involve perpetrators and victims from the venue country, hosting the attack. As such, domestic terrorism is home-directed and homegrown and represents the most common form of terrorism. Many bombings of public buildings in developing countries are acts of domestic terrorism, intended to extort political concessions from a besieged government. Transnational terrorism involves two or more countries. If, say, an armed attack in India kills foreign tourists at a hotel or train station, then the incident is one of transnational terrorism. When one or more victims or perpetrators are not citizens of the venue country, then the terrorist attack is transnational.

The two forms of terrorism may have different implications. For instance, Enders, Sandler, and Gaibullov (2011) showed that domestic terrorism leads to transnational terrorism, but not the reverse. This follows because domestic terrorists resort to transnational terrorist attacks in order to generate more visibility and publicity for their cause. Thus, Palestinian terrorism spilled over to European capitals in the 1970s and 1980s in order to capture more media attention and make the world more aware of their struggle for statehood (Hoffman 2006). Piazza (2011) showed that economic discrimination resulted in domestic, but not in transnational, terrorism given that discrimination grievance is by its nature domestic. Moreover, transnational terrorism impacted foreign direct investment, tourism, and international trade (Sandler 2014). In the current study, female gender imbalance is shown to affect domestic, but not transnational, terrorism. Because numerous transnational terrorist attacks involve perpetrators from abroad, gender imbalance in the venue country is not so germane since the attack is coming from abroad where the gender ratio may be balanced. Female gender imbalance-related grievances, given in the next section, primarily involve domestic concerns regarding a venue country's institutions, growth, and well-being. Of course, the opportunity argument applies for either type of terrorism, so if transnational terrorism is not influenced by female gender

imbalance, one must conclude that the absence of venue grievance is more important than opportunity for such terrorism.

### *Terrorist Event Data Sets*

Using print, televised, and digital media accounts, two key event data sets have recorded myriad variables associated with terrorist attacks. Since the 1970s, ITERATE has coded incident date, country location, attack type, casualties, perpetrators' nationalities, victims' nationalities, logistical outcome (i.e., success or failure), and other variables. Currently, ITERATE's coverage is 1968 to 2013 (Mickolus et al. 2014). Only transnational terrorist incidents are recorded in ITERATE.

GTD records domestic and transnational terrorist incidents and indicates key variables (National Consortium for the Study of Terrorism and Responses to Terrorism 2014). Unlike, ITERATE, GTD does not record the nationalities of the perpetrators. Currently, GTD covers incidents during 1970 to 2012.<sup>3</sup> We rely on a partitioning of GTD terrorist incidents into domestic, transnational, and ambiguous events, devised by Enders, Sandler, and Gaibulloev (2011), based on observations on victims' nationalities, target entities (e.g., attacks on embassies), attacks on US interests, and other variables to engineer the split. Their split is much more complete than the one later devised by GTD in 2013. Enders, Sandler, and Gaibulloev's division of incidents has about 12 percent of incidents that could not be deemed domestic or transnational owing to missing information on nationalities. When we later measure total terrorism in our estimation, we account for domestic, transnational, and ambiguous incidents in GTD.

### *Past Studies of Demographics and Political Violence*

The current study is not the first to link demographic considerations with political violence. Under some scenarios, Goldstone (2002) argued that population growth can lead to political violence in the form of civil conflict or terrorism. When population growth causes increased demands for farmland, which is usurped by elites, civil conflict may ensue. If the growing number of young people has no employment opportunities, then conflict may follow owing to unfulfilled aspirations. Goldstone tied violent conflict to the interface among the population, the elites, and the state. States that lack the capacity to control their population or that possess weak institutions are more prone to violence from population-induced stresses. Migration, rapid urbanization, and ethnic considerations can increase the likelihood of civil conflict.

A number of studies have related measures of population to terrorism (e.g., Gassebner and Luechinger 2011; Krueger and Malečková 2003; Piazza 2008).<sup>4</sup> Population level can positively affect terrorism through multiple channels: inducing more demands on farmland, allowing for a greater supply of terrorists; giving terrorists a means to hide in plain sight; and providing more targets and victims. In other studies, population density was deemed a cause of terrorism owing to internal tensions and

stresses that may arise from such density (e.g., Bandyopadhyay and Younas 2011; Burgoon 2006; de Soysa 2002). The presence of a youth bulge has been associated with more terrorism insofar as young people may have lower opportunity costs for engaging in violence (Goldstone 2002; Urdal 2006). This is particularly true if there are meager employment opportunities for the young. Young persons are also more inclined than older people to engage in risky activities; hence, there is less to dissuade the young from low-level violence.

## Theoretical Considerations

A strong rationale for female gender imbalance resulting in terrorism is tied to police, security, and other institutions, charged with maintaining law and order, primarily relying on male staff in most developing countries. A relative shortage of men to women may tax these institutions' capabilities, thereby providing terrorists with an opportunity to intimidate society to concede to their demands. As mentioned earlier, this concern is more germane for domestic terrorism, perpetrated by citizens within the male-challenged country. Goldstone (2002) indicated that when states lack the capacity to maintain control, there is more terrorism. Developing countries with both a female gender imbalance and weak bureaucracies to administer and foster the rules of law should be particularly vulnerable to terrorism.

Also, a female gender imbalance may result in less employment in the manufacturing sector in developing countries where traditional gender roles are maintained. If manufacturing is not a vibrant sector, then GDP per capita may be low, resulting in grievances and terrorism. A large female imbalance may mean less labor in agriculture, which may lead to food shortages, high food prices, and famine. Piazza (2013) showed that rising food prices may cause domestic, but not transnational, terrorism. Large numbers of females relative to males may limit resource extraction, thereby creating economic challenges and potential grievances. Researchers argued that male gender imbalance results in more investment to attract the limited females (de Soysa 2002; Sharygin, Ebenstein, and Das Gupta 2013). Thus, female gender imbalance may mean low investment, low savings, and small economic growth, which can fuel grievances. Since female gender imbalance may reduce GDP per capita, it is important to control this economic variable, which is done in our estimations.

In Table 1, we present the sample countries wherein their male/female ratio is less than 100 and their index of bureaucratic quality is *below the sample median*. We also note that there are many more female-dominated countries whose bureaucratic quality is below the sample median, consistent with our priors.<sup>5</sup> The table presents the samples' averages for investment and savings rates (both as percentage of GDP) and the index of rule of law. We see that female-dominated societies with poor bureaucratic quality generally have below the median investment rates, savings rates, and rule of law, consistent with our priors (boldfacing indicates greater than median values). A robustness test later shows that female gender imbalance is a significant

**Table 1.** Countries for Which Male/Female Ratio Is Less than 100 and the Bureaucratic Quality Index Is Less than Its Median in Our Sample.

Country	Male/female ratio (<100)	Bureaucratic quality (<M = 2.0)	Investment (percentage of GDP) M = 20.9	Savings (percentage of GDP) M = 15.5	Rule of law M = 3.1
Angola	97.4	1.5	12.5	<b>34.2</b>	3.0
Armenia	95.1	1.0	<b>28.4</b>	6.6	3.0
Azerbaijan	96.3	1.0	<b>23.4</b>	<b>33.0</b>	3.7
Bolivia	98.8	1.2	15.0	14.7	2.3
Burkina Faso	96.6	1.3	19.6	7.5	<b>3.5</b>
Congo, DR	98.0	1.0	12.4	9.9	2.1
El Salvador	93.2	1.2	15.6	0.1	2.0
Ethiopia	99.6	0.7	18.4	7.3	<b>4.0</b>
Gambia	99.3	1.8	15.4	3.1	<b>4.1</b>
Guatemala	98.3	1.2	14.6	7.6	1.7
Guinea-Bissau	98.3	1.1	<b>24.7</b>	-4.9	1.7
Guyana	99.5	1.8	<b>27.5</b>	9.2	2.3
Haiti	97.5	0.0		-3.2	1.8
Lebanon	99.9	1.3	<b>26.3</b>	-14.8	3.0
Liberia	99.9	0.0	15.7	-19.8	1.8
Madagascar	99.5	1.3	14.3	4.4	2.9
Malawi	97.9	1.6	17.5	5.8	3.0
Mali	99.4	0.0	<b>21.7</b>	5.5	2.7
Moldova	90.9	1.3	19.5	2.3	<b>4.8</b>
Mozambique	93.3	1.3	20.7	1.8	2.8
Myanmar	95.5	0.7	13.9	12.2	3.0
Nicaragua	99.1	1.0	<b>22.5</b>	7.7	<b>3.3</b>
Niger	98.9	1.8	16.5	4.5	2.5
Romania	96.1	0.8	<b>21.4</b>	<b>17.1</b>	<b>3.7</b>
Russia	87.0	1.3	<b>21.1</b>	<b>32.4</b>	<b>3.5</b>
Senegal	97.7	1.5	<b>22.8</b>	8.6	2.6
Sierra Leone	97.6	0.7	10.8	1.1	<b>3.2</b>
Somalia	98.4	0.2	<b>21.0</b>	2.2	1.6
Tanzania	98.8	0.7	<b>23.6</b>	10.2	<b>4.4</b>
Togo	96.6	0.5	17.5	5.9	2.7
Uganda	99.7	1.2	17.1	7.4	2.9
Ukraine	86.1	1.0	<b>21.4</b>	<b>23.0</b>	<b>4.0</b>
Uruguay	94.0	1.5	14.2	<b>16.7</b>	2.8
Vietnam	97.0	1.7	<b>30.4</b>	<b>21.7</b>	<b>4.0</b>
Zambia	99.0	1.0	15.9	<b>17.1</b>	<b>3.2</b>

Note: M stands for median value. Boldfaced entries are above the median. Data for each country are averaged over the sample period.

determinant of domestic terrorism only when bureaucratic quality is below the sample's median.

Poor health care infrastructure in developing countries may result in more male baby deaths, which may exacerbate female imbalance. Males are more prone than females to death in infancy (Perls and Fretts 1998). Such losses may lead to frustrations and grievances; hence, we control for infant mortality. Since female gender imbalance may stem from past civil wars and/or migration, both variables are also controlled in most of our estimations.

Our opportunity and grievance grounds for hypothesizing a positive relationship between female gender imbalance and terrorism must be weighed against some opposing arguments that male gender imbalance may also induce domestic terrorism. For instance, an oversupply of men relative to women may result in asocial behavior which may include terrorism and crime (Edlund et al. 2013). Since terrorist groups in developing countries generally draw their members from the male population, a relative abundance of males assists recruitment. These opposing arguments mean that an empirical test must ascertain which set of gender imbalance predictions holds sway. In the results section, female gender imbalance is found to be a strong and robust positive contributor to domestic terrorism in our sample developing countries.

## **Data**

### *Variables of Interest*

This study examines the effect of gender imbalance on the number of terrorist incidents for 128 developing countries during 1975 to 2011.<sup>6</sup> GTD is our main data source for different types of terrorist incidents, while we also utilize ITERATE's data on transnational terrorism to see if our results are sensitive to using information from an alternative source. Domestic terrorism is more volatile than transnational terrorism, where the annual sample average for the former is 1073.2 incidents and for the latter it is 189.2 incidents (see online appendix figure). This suggests that on average a developing country experiences 5.7 times more domestic than transnational terrorist incidents.

To measure gender imbalance, we utilize data on the number of males per 100 females (male/female ratio) from the (United Nations Population Division [UNPD] 2013). These data are based on countrywide estimates and projections prepared by UNPD. In the online appendix, the second figure shows an approximately bell-shaped distribution of the male/female ratio in our sample, with some observations skewed to the right. These observations represent a few Middle Eastern (ME) countries, where males far outnumber females. The main reason for this relatively large gender imbalance is the presence of disproportionately more male expatriate labor force in these countries. In Appendix A, we report the average values of male/female ratio for each country over the sample period. There are a total of eighty-one countries where the



male/female ratio is less than one with the lower bound value of 85.5 for Ukraine. In forty-seven countries, this ratio is more than one with the upper bound value of 140 for Bahrain.

One misperception that may arise is that countries with extreme gender imbalance may experience more terrorism; however, the data do not support this view. Table B3 of the online appendix reports the twelve countries with largest and smallest male/female ratios along with the number of terrorist incidents. Of the twelve smallest male/female ratio countries, five experienced more than two incidents of terrorism on average per year, with the highest count of 129.1 for El Salvador. Of the twelve largest male/female ratio countries, two experienced more than two incidents of terrorism on average per year, with the highest count of 132.6 for Pakistan.

### *Control Variables*

We account for myriad controls and present results with different model specifications to avoid detecting only spurious correlation between gender imbalance and terrorism. While drawing these controls, we take guidelines from the existing literature.<sup>7</sup>

A sense of economic deprivation coupled with the frustration of not finding employment may fuel terrorism. Terrorist groups have an easier time to recruit members whose opportunity cost of time is low. Past studies, however, displayed divergent results in this regard. For example, Abadie (2006), Gassebner and Luechinger (2011), and Krueger and Malečková (2003) found no evidence that higher income per capita reduces terrorism and concluded that terrorism is instead rooted in political repression. Improving on the previous model's specifications, some studies argued that the relationship between terrorism and income per capita is an inverted U-shape (e.g., Enders, Hoover, and Sandler 2016). These studies showed that terrorism rises until an intermediate income per capita level is reached, and thereafter terrorism falls with greater income per capita. At low income per capita, individuals must focus on subsistence, while at high income per capita, terrorism has a high opportunity cost. Moreover, governments in rich countries are able to address terrorism. Greater openness and investment in an economy may increase the opportunity cost of terrorism, as participation in the labor markets becomes attractive (e.g., Li and Schaub 2004; Younas 2015). Freytag et al. (2011) argued that policies promoting investment yield dividends in terms of a reduction in terrorism, while Kis-Katos, Liebert, and Schulze (2011) uncovered support that openness reduces terrorism. Thus, our model includes GDP per capita (constant at 2005 USD) and its square, trade openness (exports plus imports) and investment, both as a share of GDP. The data are taken from the Penn World Table, 7.0, of Heston, Summers, and Aten (2011).

To capture the effect of the overall institutional environment, we employ data on "political rights and civil liberties" from Freedom House (2012). The indices of political rights and civil liberties are measured on a scale of one to seven, where a

higher value means poor institutional quality. We construct a combined freedom index by adding the two indices, so that the resulting index ranges from two to fourteen. We then reverse this index allowing a higher value to indicate democratically better institutions. Theoretically, better institutions, ingrained in a democratic structure, may have different impacts on terrorism. On one hand, democracies provide avenues for nonviolent resolution of conflicts through peaceful interaction of dissident elements and the government. On the other hand, increased movements, freedom of association, and the permissiveness of the democratic system reduce the costs of engaging in terrorism. Past studies, however, have found that the relationship between terrorism and political freedom is non-monotonic (e.g., Abadie 2006; Bandyopadhyay and Younas 2011), implying that countries characterized by anocracy or else in transition from autocracy to democracy experience more terrorism. Thus, we also include the square term of political rights and civil liberties.

Regarding the relationship between education and terrorism, there are two factors at work—higher opportunity costs of engaging in terrorism and better capabilities of executing such acts. Therefore, the existing literature is at odds on how education may influence terrorism. Abadie (2006) and Krueger and Malečková (2003) uncovered no association between education and terrorism at the cross-country level; however, the latter study argued that many terrorists are well-educated. Using micro-level data, Benmelech and Berrebi (2007) found that more-educated terrorists are engaged in suicide attacks in Israel. Some studies showed that education decreases terrorism (e.g., Enders, Hoover, and Sandler 2016). To capture the effect of education, we use secondary school attainment data from Barro and Lee (2013).

Another factor that may influence terrorism is the presence of a large share of youth in the total population. Given their low skill accumulation and a highly volatile job market, the opportunity costs of would-be young terrorists are generally low. Urdal (2006) indicated that youth bulges provide greater opportunities for political violence through the abundant supply of youth and found strong empirical support for his conjecture. Similarly, Goldstone (2002) also argued that a youth bulge can instigate political violence in a country. Thus, we also control for youth bulge, which represents the percentage of the population over fifteen years of age that are between ages fifteen and twenty-four. These data are taken from UNPD (2013).

Kis-Katos, Liebert, and Schulze (2011) argued that experience and propagation of violent dissent make present terror activity dependent on the past level of terrorism. Moreover, civil conflicts in a country are found to increase terrorism (e.g., Findley and Young 2012; Gassebner and Luechinger 2011; Piazza 2008). Also, past studies displayed evidence of a positive link between population density and terrorism (e.g., Bandyopadhyay and Younas 2011; Burgoon 2006). These studies argued that internal tensions can be a serious issue in densely populated countries, which may make them subject to more terrorism. Analyzing whether natural disasters spur terrorism, Berrebi and Ostwald (2011) showed that the occurrence of natural disasters has a strong positive effect on subsequent incidents of terrorism. Therefore, besides accounting for the past level of terrorism, we include the variables of internal

civil conflicts, population density, and the number of natural disasters.<sup>8</sup> These data are taken from Marshall and Cole (2011), the World Bank (2013), and the Center for Research on the Epidemiology of Disasters (CRED 2013), respectively.

The indices of ethnic, linguistic, and religious fractionalization come from Alesina et al. (2003), reflecting the probability that two randomly selected individuals from a given country will not belong to the same ethnic, linguistic, or religious group. Each of these indices ranges between zero and one, with a higher value reflecting greater fractionalization. Although most past studies uncovered mixed results in terms of the sign and significance of these factors, Sambanis (2008) found that ethnic fractionalization is a positive inducer of terrorism. In addition, we account for the share of Muslim and Catholic population in the total population, and whether a country is landlocked.<sup>9</sup> Data for Muslim and Catholic population are drawn from La Porta et al. (1999), while the information about landlocked countries is extracted from the *World Factbook* of the Central Intelligence Agency (2014).

The data for the gender ratios especially at different age-groups and other demographic variables are only available on five-year intervals from the UNPD (2013). Thus, all independent variables are taken on five-year intervals starting in 1975. The data for all dependent variables (total, domestic, and transnational terrorist incidents) are averaged over the next five-year period, except for 2011, which is the last year in our sample.<sup>10</sup> The next section illustrates the reason for implementing this strategy on our data. Descriptive statistics are presented in Table 2.

## Empirical Methodology

There is no plausible reason why an increase in terrorist incidents will lead to a reduction in the male/female ratio. Terrorism generally constitutes indiscriminate attacks in public places against people at large, so that men and women are equally likely to fall victim. Moreover, terrorism kills relatively few people so that a gender imbalance cannot result even if one sex was targeted more often. Only twenty-three people were killed annually by domestic terrorism for an average sample country. We nevertheless examine whether reverse causation can be an issue by running a series of ordinary least squares (OLS) regressions of the male/female ratio on past terrorist incidents, while controlling for some other covariates as well as country and time effects. However, we find no evidence that terrorism influences the male/female ratio (results are available upon request). In our model, using lagged values of explanatory variables ought to eliminate any contemporaneous correlation between them and the dependent variable, thereby also avoiding concerns about endogeneity. This also reflects that any changes in time-variant factors may affect terrorism only after some time. Recruitment of terrorists, their training, and the execution of a plan takes time. Moreover, socioeconomic conditions slowly push a frustrated individual and a would-be terrorist to pick up arms.

Because frequencies of terrorist events are discrete and take non-negative integer values, the Poisson regression technique is the logical choice for modeling such data.

**Table 2.** Descriptive Statistics.

Variable	Observation	Mean	SD	Minimum	Maximum
Total terrorist incidents	1,024	11.28	40.16	0	479.6
Domestic terrorist incidents	1,024	8.82	33.55	0	410
Transnational terrorist incidents	1,024	1.42	4.37	0	44.8
Transnational terrorist incidents (ITERATE)	896	1.41	3.94	0	63.60
Males per 100 females	1,024	99.80	7.06	83.3	165.70
Log real GDP per capita	943	7.93	1.11	5.08	10.80
Political rights and civil liberties	908	7.50	3.46	2	14
Trade openness (percentage of GDP)	943	71.34	41.17	1.48	232.63
Investment (percentage of GDP)	943	22.40	11.30	1.30	80.78
Log population density	1,024	3.81	1.39	0.10	7.41
Civil conflicts	898	0.84	1.78	0	9
Secondary school attainment	832	14.84	12.41	0.03	69.75
Youth bulge	1,024	31.49	5.85	13.31	41.76
Number of natural disasters	1,024	1.20	2.48	0	29
Landlocked	1,024	0.24	0.43	0	1
Linguistic fractionalization	928	0.44	0.29	0.01	0.92
Ethnic fractionalization	960	0.50	0.25	0	0.93
Religious fractionalization	968	0.44	0.24	0	0.86
Muslim population (percentage of total population)	1,024	28.18	37.18	0	99.9
Catholic population (percentage of total population)	1,024	27.99	33.99	0	97.3
Log child mortality rate	999	3.79	0.85	0.83	5.19
Net immigration rate	1,024	-1.46	8.37	-66	64

Note: Youth bulge is the percentage of population between the ages of fifteen and twenty-four to total population above age fifteen.

However, the Poisson distribution assumes equality of the mean and the variance of the dependent variable. The Negative Binomial (NB) model handles data that exhibit overdispersion (the variance being greater than the mean) by allowing for the random variation in the Poisson conditional mean. Thus, we apply the NB model, which is a standard econometric method used in the study of the determinants of terrorism (e.g., Gassebner and Luechinger 2011; Piazza 2008).

Table 3 reports the overall between-country and within-country variances in the male/female ratio in our study. These statistics show that within-country variance accounts for only 10.1 percent of the overall variance in this ratio, while between-country variance explains 90.5 percent of the overall variance. They highlight the fact that countries with different factors can have different sex ratios, such as differences in natural and environmental causes, gender selective abortions and infanticides, war casualties, and migrations, among others. The low within-country variation in the male/female ratio suggests that these factors

**Table 3.** Variation in the Male/Female Ratio.

Variable	Type of variation	Standard deviation	Variance	Percentage of overall variance
Males per 100 females	Overall	7.06	49.89	
	Between	6.72	45.15	90.51
	Within	2.25	5.04	10.11

Note: Number of countries = 128; number of observations = 1,024.

change very slowly in a country. Given that the within-country variation of our variable of interest is minimal, using country dummies in a fixed-effects (FE) model to account for all kinds of time-invariant heterogeneity will be infeasible. First, the FE model does not allow the estimation of time-invariant variables because it uses only the within variance and disregards the between variance. Second, the FE model is inefficient in estimating the effect of variables that have very low within variance, as it leads to highly unreliable point estimates (see, e.g., Plümper and Troeger 2007).

Beck (2001, 289) also mentions that “And although we can estimate [a model] with slowly changing independent variables, the fixed effects will soak up most of the explanatory power of those slowly changing variables.”

We implement actions to ensure that our findings regarding the impact of gender imbalance on terrorism are not spurious. First, in all regressions, we use country-clustered robust standard errors to account for heteroscedasticity and serial correlation in the residuals, as their presence can influence our statistical inference. Second, all regressions include a full set of regional and transition economies’ dummies, as well as year dummies to factor in time and trending effects. Third, we estimate our baseline model with our main variable of interest and then sequentially add a host of covariates to examine whether our results are robust. Thus, we report the test of Bayesian Information Criterion (BIC) to determine the best-fitting model among a finite set of models. Fourth, we carry out a number of other sensitivity checks on the data. Finally, the Vuong test largely favors the NB model over the zero-inflated NB model; however, the results for the latter are similar and are available from the authors upon request.

Our estimating model takes the following relationship:

$$(\text{Terrorism\_incidents})_{it} = \alpha + \beta(M/F)_{it-1} + \sum_{j=1}^k \theta_j Z_{jit-1} + \tau_t + \gamma_{ir} + \mu_{it}, \quad (1)$$

where  $i$  refers to countries;  $t$  to time;  $\tau_t$  indicates time effects;  $\gamma_{ir}$  represents regional (and transition economies) dummies,  $r$ , where country  $i$  is located; and  $\mu_{it}$  is the error term.  $M/F$  stands for the male/female ratio, and  $Z$  is the vector of all control variables  $j$ , for a country  $i$ .

## Estimation Results

### *Total Terrorism*

Table 4 displays the results for total terrorism, where column (1) includes only the male/female ratio. All models include a full set of dummies for regions and transition economies, as well as for each time period. For each regression, we also report the marginal effects of the male/female ratio with their statistical significance, evaluated at the mean of all explanatory variables. Total terrorist incidents decrease as the male/female ratio increases, possibly reflecting that a relative increase in the male population bolsters staffing institutions that limit terrorism and fosters economic opportunities.

Adding some control variables in column (2) does not affect the sign and statistical significance of the male/female ratio. According to its marginal effect, an increase in the male/female ratio by one percentage point, which means one more male per 100 females, reduces total terrorism by 0.126 events. Generally, our results for the control variables agree with the findings in the literature. Even though the square term of log GDP per capita is not statistically significant, its signs suggest that the opportunity cost of engaging in terrorism is low at a low level of income and that terrorism reaches a peak at some intermediate level of GDP per capita, consistent with Enders, Hoover, and Sandler (2016). The coefficients of the variables of political rights and civil liberties and its squared term, trade openness, investment/GDP, log population density, civil conflicts, and past level of total terrorism incidents are all statistically significant at the 1 percent level. The relationship between political rights and civil liberties and terrorism is non-monotonic, implying that countries with poor institutions due to weak democracies experience more terrorism, consistent with Abadie (2006) and Bandyopadhyay and Younas (2011). Greater economic openness and higher investment reduce terrorism by providing employment in the regular labor markets, thereby limiting incentives for engaging in violence (e.g., Freytag et al. 2011). In contrast, population density, civil conflicts, and the past level of total terrorist incidents are positively associated with terrorism, as found in the literature (e.g., Burgoon 2006; Findley and Young 2012; Piazza 2008).

In column (3), we add control variables of secondary school attainment, youth bulge, the number of natural disasters, landlocked, indices of linguistics, ethnic, and religious fractionalization, and the proportion of Muslim and Catholic population. The coefficient of the male/female ratio remains negative and significant at the 10 percent level when we exclude ME countries from our sample in column (4). Its marginal effect suggests that one more male per 100 females reduces total terrorism by 0.172 events. We also distinguish terror events based on the intensity of their impact. Column (5) includes events in which at least one person was physically harmed ( $Cas > 0$ ), while column (6) includes events in which no one was killed or injured. Splitting up the terror events into severe and less-severe incidents may allow us to draw some conclusions on the effectiveness of having more males in controlling terrorism.

**Table 4.** Negative Binomial Regressions with Total Terrorist Incidents as the Dependent Variable.

Independent variables	(1)	(2)	(3)	(4) Excluding ME	(5) If Cas > 0	(6) If Cas = 0
Male/female, $t - 1$	-0.062*** [-0.389***]	-0.039** [-0.126**]	-0.045** [-0.144**]	-0.059* (0.035) [-0.172*]	-0.044** (0.018) [-0.369**]	-0.026 (0.021) [-0.001]
[Marginal effect]		2.560** (1.258)	1.397 (1.504)	1.272 (1.739)	1.888 (1.018)	-0.575 (1.802)
Log GDP per capita, $t - 1$		-0.124 (0.079)	-0.043 (0.097)	-0.032 (0.116)	-0.078 (0.071)	0.043 (0.106)
(Log GDP per capita square, $t - 1$ ) <sup>2</sup>		0.505*** (0.121)	0.398*** (0.135)	0.407*** (0.146)	0.245** (0.113)	0.085 (0.217)
Political rights and civil liberties, $t - 1$		-0.033*** (0.008)	-0.029*** (0.008)	-0.030*** (0.009)	-0.019*** (0.007)	-0.016 (0.013)
(Political rights and civil liberties, $t - 1$ ) <sup>2</sup>		-0.011*** (0.002)	-0.008*** (0.003)	-0.009*** (0.003)	-0.005** (0.002)	0.004 (0.004)
Trade openness, $t - 1$		-0.031*** (0.009)	-0.028*** (0.010)	-0.029*** (0.011)	-0.026*** (0.009)	-0.022 (0.015)
Investment/GDP, $t - 1$		0.210*** (0.079)	0.059 (0.096)	0.032 (0.104)	0.017 (0.087)	-0.185 (0.123)
Log population density, $t - 1$		0.353*** (0.047)	0.269*** (0.060)	0.277*** (0.059)	0.163*** (0.056)	0.398*** (0.153)
Civil conflicts, $t - 1$		0.014*** (0.004)	0.013*** (0.004)	0.012*** (0.004)	0.010*** (0.002)	0.099 (0.124)
Total terrorism incidents, $t - 1$						
Secondary school, $t - 1$			-0.019 (0.013)	-0.022 (0.014)	0.001 (0.011)	0.027* (0.015)
Youth bulge, $t - 1$			0.007 (0.032)	0.015 (0.036)	-0.010 (0.030)	-0.072* (0.041)
Number of natural disasters, $t - 1$			0.091** (0.037)	0.104** (0.041)	0.042 (0.027)	0.159*** (0.042)
Landlocked			-0.132 (0.276)	-0.136 (0.281)	-0.350 (0.226)	0.473 (0.378)
Linguistic fractionalization			0.791 (0.735)	0.644 (0.852)	0.223 (0.560)	0.345 (0.763)
Ethnic fractionalization			-0.067 (0.798)	0.078 (0.899)	0.205 (0.629)	-0.683 (0.831)
Religious fractionalization			-1.034 (0.653)	-1.147* (0.677)	-1.086** (0.529)	0.009 (1.056)
Muslim population			-0.004 (0.005)	-0.002 (0.005)	-0.006* (0.003)	-0.001 (0.009)
Catholic population			0.012** (0.006)	0.013** (0.006)	0.016*** (0.005)	-0.007 (0.008)

(continued)

Table 4. (continued)

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
				Excluding ME	If Cas > 0	If Cas = 0
Regional dummies included	Yes	Yes	Yes	Yes	Yes	Yes
Transitional dummy included	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies included	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1024	832	665	578	409	256
Wald test (Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000
Bayesian information criterion (BIC)	5,059.5	4,080.5	3,401.3	2,910.9	2,852.3	353.1

Note: Robust standard errors are clustered by countries. All regressions include regional dummies for Latin America, Middle East and North Africa, sub-Saharan Africa, South Asia, East Asia and Pacific, Europe as well as a dummy for Transitional Economies. Time effects are also included in each regression. Vuong test generally favors negative binomial regressions (NBR). The results of zero-inflated NBR are qualitatively and quantitatively the same. ME = Middle East; Cas = casualties. \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10 percent levels, respectively.



The sign and significance of the marginal effect of the male/female ratio show that adding one more male per 100 females reduces total terrorism by 0.369 events, which is significantly larger than the marginal effect of any other regression in Table 4. This effect is statistically insignificant and small for events with no casualties in column (6).

While some control variables show mixed results, the variables of political rights and civil liberties, trade openness, investment, civil conflicts, and past total terrorism incidents are mostly statistically significant in Table 4, with signs that agree with the findings in the literature. Log GDP per capita and its square term are not jointly significant across all regressions at conventional levels, which is in line with the studies that find weak or no evidence of the impact of income on terrorism.

### *Domestic versus Transnational Terrorism*

In terms of statistical significance, we do not find a robust effect of the male/female ratio on total terrorism. This may be because total terrorism contains information about two distinct types of terrorism; thus, an inference based on its regressions may not be conclusive. Therefore, we run separate regressions for the numbers of domestic and transnational terrorist incidents, and report their results in Table 5 and Table B4 (in online appendix), respectively. We follow the same estimation strategy as above.

In Table 5, the effect of the male/female ratio is negative and significant at the 1 percent level for our baseline and fully specified models (columns 1 to 3), as well as the model for casualties events in column (5). This negative effect is significant at the 5 percent level for the models that exclude ME countries in column (4) and for no-casualties events in column (6). Their marginal effects are also significant at the same levels and their magnitudes range between  $-0.003$  for no-casualties events and  $-0.478$  for casualties events. For the latter, one more male per 100 female reduces domestic terrorism by 0.478 events. While the coefficients of some control variables lose significance and, at times, also change signs across the different models, the result of our main variable remains robust. In the online appendix, Table B4 shows that the effect of the male/female ratio on the number of transnational terrorist incidents is not significant in any of the model specifications. A reasonably large share of transnational terrorism is done abroad where the perpetrators' home country male/female ratio is not germane, since the institutions maintaining control in the venue country matters. These findings suggest that having more males only ameliorates domestic terrorism in developing countries.

### *Marginal Effects at Different Levels of the Male/Female Ratio*

The above findings for domestic terrorism are in line with our theoretical predictions that a relative increase in the supply of males may bolster institutions that maintain order and preserve rights in developing countries. Despite progress in female labor

**Table 5.** Negative Binomial Regressions with Domestic Terrorist Incidents as the Dependent Variable.

Independent variables	(1)	(2)	(3)	(4) Excluding ME	(5) If Cas > 0	(6) If Cas = 0
Male/female, $t - 1$	-0.073*** [-0.342***]	-0.051*** [-0.118***]	-0.065*** [-0.147***]	-0.082*** [-0.172***]	-0.063*** [-0.478***]	-0.071*** [-0.003***]
[Marginal effect]						
Log GDP per capita, $t - 1$	2.951*** (1.306)	2.951*** (1.306)	1.706 (1.544)	1.581 (1.811)	2.459*** (1.010)	1.512 (2.687)
(Log GDP per capita square, $t - 1$ ) <sup>2</sup>	-0.145* (0.082)	-0.145* (0.082)	-0.059 (0.100)	-0.05 (0.122)	-0.119* (0.067)	-0.081 (0.161)
Political rights and civil liberties, $t - 1$	0.512*** (0.132)	0.512*** (0.132)	0.410*** (0.148)	0.409*** (0.157)	0.179* (0.102)	-0.151 (0.180)
(Political rights and civil liberties, $t - 1$ ) <sup>2</sup>	-0.034*** (0.009)	-0.034*** (0.009)	-0.030*** (0.009)	-0.030*** (0.010)	-0.015*** (0.007)	-0.002 (0.011)
Trade openness, $t - 1$	-0.011*** (0.003)	-0.011*** (0.003)	-0.008*** (0.003)	-0.009*** (0.003)	-0.007** (0.003)	0.007* (0.004)
Investment/GDP, $t - 1$	-0.032*** (0.010)	-0.032*** (0.010)	-0.029*** (0.011)	-0.027** (0.011)	-0.013 (0.010)	-0.019 (0.014)
log Population density, $t - 1$	0.240*** (0.081)	0.240*** (0.081)	0.093 (0.100)	0.071 (0.106)	0.03 (0.085)	-0.089 (0.126)
Civil conflicts, $t - 1$	0.351*** (0.051)	0.351*** (0.051)	0.255*** (0.061)	0.263*** (0.061)	0.131*** (0.059)	0.213 (0.144)
Domestic terrorism incidents, $t - 1$	0.018*** (0.005)	0.018*** (0.005)	0.017*** (0.005)	0.017*** (0.005)	0.012*** (0.003)	0.407*** (0.117)
Secondary school, $t - 1$			-0.016 (0.013)	-0.016 (0.014)	-0.008 (0.011)	0.022 (0.014)
Youth bulge, $t - 1$			0.007 (0.034)	0.021 (0.037)	-0.031 (0.032)	-0.012 (0.049)
Number of natural disasters, $t - 1$			0.101** (0.040)	0.113** (0.044)	0.027 (0.028)	0.173*** (0.057)
Landlocked			-0.102 (0.285)	-0.138 (0.283)	-0.339 (0.226)	0.615* (0.369)
Linguistic fractionalization			0.900 (0.767)	0.691 (0.857)	0.406 (0.549)	0.744 (0.672)
Ethnic fractionalization			-0.119 (0.833)	0.137 (0.903)	0.028 (0.618)	-0.163 (0.869)
Religious fractionalization			-0.856 (0.683)	-1.027 (0.696)	-0.657 (0.539)	-0.022 (0.988)
Muslim population			-0.004 (0.005)	-0.002 (0.005)	-0.004 (0.003)	-0.001 (0.008)
Catholic population			0.014** (0.007)	0.015** (0.007)	0.018*** (0.005)	-0.005 (0.007)

(continued)

**Table 5.** (continued)

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
				Excluding ME	If Cas > 0	If Cas = 0
Regional dummies included	Yes	Yes	Yes	Yes	Yes	Yes
Transitional dummy included	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies included	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,024	832	665	578	358	307
Wald test (Prob > $\chi^2$ )	0.000	0.000	0.000	0.000	0.000	0.000
Bayesian information criterion (BIC)	4,487.0	3,642.3	3,051.7	2,626.9	2,465.7	357.1

Note: Robust standard errors clustered by countries. Other notes are same as for Table 4.

**Table 6.** Marginal Effects of the Male/Female Ratio on Domestic Terrorism at the Different Levels of This Ratio.

Percentile Male per 100 female	Values		Marginal effect	z-value
	Male per 100 female			
Fifth	91.3		-0.265**	(1.94)
Tenth	94.0		-0.222**	(2.16)
Twenty-fifth	96.8		-0.185**	(2.45)
Fiftieth	99.1		-0.159***	(2.77)
Seventy-fifth	101.7		-0.135***	(3.23)
Ninetieth	105.7		-0.104***	(4.30)
Ninety-fifth	108.4		-0.087***	(5.46)

Note: Absolute z-values in parentheses.

force participation, developing countries are more pervasive in assigning only traditional roles to females in the job market, making them less of a substitute for males, especially in law enforcement agencies. The bias against female employment and their roles also exists in manufacturing, agriculture, and resource extraction sectors. Intuitively, this line of argument suggests that the marginal effect of adding one more male on domestic terrorism should be highest when the male/female ratio is lowest. Therefore, we evaluate this marginal effect at the fifth, tenth, twenty-fifth, fiftieth, seventy-fifth, ninetieth, and ninety-fifth percentile levels of the male/female ratio in our sample, which correspond to 91.3, 94.0, 96.8, 99.1, 101.7, 105.7, and 108.4 males per 100 females, respectively. While calculating these marginal effects, we fix all other explanatory variables at their means. As reported in Table 6, all of these marginal effects are negative and statistically significant at conventional levels. When the male/female ratio is 91.3, adding one more male reduces domestic terrorism by 0.265 events, and when the male/female ratio is 108.4, adding one more male reduces domestic terrorism by just 0.087 events. This agrees with our priors that the effectiveness of males in reducing domestic terrorism is high when the male/female ratio is low. In the online appendix, a graph shows the diminishing marginal effect of the male/female ratio on the number of domestic terrorist incidents.

### *Marginal Effects at Different Levels of Political Right and Civil Liberties*

The political and institutional environment may be important for strong and effective checks on terrorism. Our results show that the relationship between political rights and civil liberties and domestic terrorism is an inverted U shape. This implies that terrorism is high when institutional quality is at some intermediate level, so that terrorism falls only when the quality of institutions passes some threshold. For our fully specified model in column (3) of Table 5, this threshold level of political rights and civil liberties (PR&CL) is 6.83 [ $0.410 - 2 \times 0.03 \times \text{PR\&CL} = 0$ ], which lies below the mean (7.50) and the median (7.0) levels in our sample.<sup>11</sup> The natural

**Table 7.** Negative Binomial Regressions Accounting for Administrative/State Capacity.

Independent variables	Domestic terrorism If BQ < 2	Transnational terrorism If BQ < 2	Domestic terrorism If BQ > 2	Transnational terrorism If BQ > 2
Male/female, $t - 1$ [Marginal effect]	-0.201*** (0.052) [-0.220***]	-0.030 (0.070)	-0.026 (0.025)	-0.015 (0.019)
Control variables included	Yes	Yes	Yes	Yes
Regional dummies included	Yes	Yes	Yes	Yes
Year dummies included	Yes	Yes	Yes	Yes
Number of observations	150	150	334	334
Wald test (Prob > $\chi^2$ )	0.000	0.000	0.000	0.000
Bayesian information criterion (BIC)	677.6	454.6	1584.7	958.6

Note: Robust standard errors clustered by countries. BQ = bureaucratic quality.

question that arises is whether it is the fewer number of males relative to females or the weak institutions that constrain an effective enforcement against domestic terrorism.

In Table 7, we run separate regressions when the index of bureaucratic quality is below (columns 1 and 2) and above (columns 3 and 4) the sample's median level. These results further reveal that the male/female ratio reduces domestic terrorism only when the state's administrative capacity is weak, while it has no significant effect when bureaucratic quality is above its median level. Moreover, it has no significant effect on transnational terrorism. Thus, gender imbalance is most conducive to domestic terrorism when it is coupled with substandard administrative capacity.

### Further Robustness checks

We conduct a number of additional robustness checks on the data. To save space, we only report the results of our main variable of interest along with their marginal effects.

In the online appendix, Table B6 shows that the male/female ratio has no significant effect on the incidents of transnational terrorism even when we draw transnational terrorism data from ITERATE. China and Russia may also be other potential outliers in our sample. The former has a high male/female ratio and may have very little reported terrorism, likely because of media censorship. Russia is more terrorism-prone after 1991 and has a low male/female ratio. In the online appendix, Table B7 shows that the results are robust when we exclude China and Russia from our sample. Urdal (2005) used child mortality rate as a proxy for development in his

**Table 8.** Negative Binomial Regressions Replacing GDP Per Capita with Child Mortality.

Independent variables	Domestic terrorism	Transnational terrorism (GTD)	Transnational terrorism (ITERATE)
Male/female, $t - 1$ [Marginal effect]	-0.053*** (0.018) [-0.130***]	-0.006 (0.014)	0.001 (0.007)
Log child mortality rate	-0.437* (0.247)	-0.262 (0.197)	-0.300 (0.160)
Control variables included	Yes	Yes	Yes
Regional dummies included	Yes	Yes	Yes
Transitional dummy included	Yes	Yes	Yes
Year dummies included	Yes	Yes	Yes
Number of observations	662	662	610
Wald test (Prob > $\chi^2$ )	0.000	0.000	0.000
Bayesian information criterion (BIC)	3,064.6	1,791.2	1,505.8

Note: Robust standard errors clustered by countries.

**Table 9.** Negative Binomial Regressions Including Net Immigration Rate.

Independent variables	Domestic terrorism	Transnational terrorism (GTD)	Transnational terrorism (ITERATE)
Male/female, $t - 1$ [Marginal effect]	-0.061*** (0.020) [-0.143***]	-0.015 (0.014)	-0.001 (0.009)
Net immigration rate	0.006 (0.013)	0.015 (0.010)	0.005 (0.007)
Control variables included	Yes	Yes	Yes
Regional dummies included	Yes	Yes	Yes
Year dummies included	Yes	Yes	Yes
Number of observations	666	666	614
Wald test (Prob > $\chi^2$ )	0.000	0.000	0.000
Bayesian information criterion (BIC)	3,066.2	1,806.9	1,527.2

Note: Robust standard errors clustered by countries.

analysis of population pressure and armed conflicts. In Table 8, we replaced GDP per capita with child mortality rate. These findings further confirm that an increase in the male/female ratio reduces domestic terrorism, while it has no significant effect on transnational terrorism.

Immigration can affect the sex ratio in a country. The presence of foreign workers, who are usually male, may increase the male/female ratio. In contrast, as refugees leave a nearby conflict country, this will decrease the male/female ratio in the receiving country as males stay behind and women and children flee to the nearby country. Table 9 shows that our findings for the male/female ratio remain intact even when we control for the net immigration rate.<sup>12</sup>

Finally, we redo our analysis of the effect of gender imbalance for different age-groups. The mean values of the male/female ratios for the population age between zero to fourteen, fifteen to twenty-four, twenty-five to forty-nine, and twenty to sixty-four stand at 103.3, 101.9, 100.4, and 99.5 male per 100 females, respectively. In the online appendix, Table B8 shows that the domestic terror-ameliorating effect of the male/female ratio is statistically significant at the 1 percent level for the age-groups of twenty-five to forty-nine and twenty to sixty-four, while there is no significant effect for the age-groups of zero to fourteen and 15-24. The youngest cohort is not involved in control-maintaining institutions, while the 15-24 cohort is underrepresented in these institutions. As found above, the male/female ratio has no significant effect on transnational terrorism for any age-group.

## Concluding Remarks

This article uncovers a robust negative relationship wherein higher male/female ratios are associated with less domestic terrorism in developing countries. This same relationship does not characterize transnational terrorism, nor does it characterize developed industrial countries. For 128 developing countries for 1975 to 2011, the relationship between domestic terrorism and the male/female ratio is robust to the inclusion of lagged civil conflict, net migration, and/or child mortality, which could lead to gender imbalance. Since such imbalance may have opposing influences on domestic terrorism, this imbalance's ultimate effect on domestic terrorism must be found through careful empirical analysis that holds the standard determinants of terrorism constant, as done here. We tie our findings to traditional roles that men assume in institutions, charged with maintaining control in developing countries. A relative shortage of men may challenge the capabilities of these institutions to keep domestic terrorism in check. Our empirical analysis uncovers a link between female gender imbalance and domestic terrorism owing to poor administrative institutions, which dovetails with our hypothesized relationship between a male shortage and a more permissive environment for domestic terrorism.

## Appendix A

### *Country Averages of the Male/Female Ratio in Our Sample of 128 Developing Countries*

Ukraine	85.5	Botswana	97.5	Ecuador	100.8
Russia	86.5	Chile	97.7	Tunisia	100.8
Belarus	87.4	Uzbekistan	98.1	Belize	100.9
Georgia	89.5	Colombia	98.1	Egypt	100.9
Moldova	90.4	Eritrea	98.2	Peru	100.9

(continued)

**Appendix A** (continued)

Swaziland	92.3	Somalia	98.2	Malaysia	101.0
Lesotho	92.7	Thailand	98.3	Djibouti	101.0
Croatia	93.0	Mauritius	98.3	Sri Lanka	101.2
Kazakhstan	93.0	Bolivia	98.4	Macedonia, FYR	101.5
Cambodia	93.6	Guinea-Bissau	98.4	Nepal	101.5
Mozambique	93.9	Tanzania	98.4	Dominican Rep.	101.6
El Salvador	94.2	Guinea	98.4	Cuba	101.6
Czech Rep	94.7	Brazil	98.4	Venezuela	101.7
Uruguay	94.8	Niger	98.5	Philippines	101.8
Slovenia	95.0	Morocco	98.5	Algeria	101.9
Benin	95.0	Senegal	98.6	Ghana	102.0
Barbados	95.1	Zimbabwe	98.6	Suriname	102.0
Armenia	95.1	Chad	98.6	Paraguay	102.0
Slovakia	95.5	Israel	98.7	Cyprus	102.0
Myanmar	95.5	Trinidad and Tobago	98.7	Nigeria	102.2
Rwanda	95.7	Cameroon	98.8	Panama	102.5
Namibia	95.8	Zambia	98.9	Albania	103.0
Kyrgyz Rep.	95.9	Laos	99.0	Fiji	103.2
Burundi	96.0	Yemen	99.2	Costa Rica	103.4
Azerbaijan	96.1	Guyana	99.2	Syria	103.7
Romania	96.4	Guatemala	99.3	Iran	104.5
Mexico	96.4	Kenya	99.3	Papua New Guinea	104.9
Grenada	96.5	Congo, Rep.	99.4	Solomon Islands	105.7
Central African Rep.	96.5	Mali	99.4	Bangladesh	106.6
Burkina Faso	96.6	Nicaragua	99.4	China	106.8
Gabon	96.7	Tajikistan	99.5	Samoa	107.0
Argentina	96.7	Gambia	99.5	Maldives	107.0
Vietnam	96.8	Uganda	99.5	Vanuatu	107.0
Togo	96.8	Ethiopia	99.5	Cote d'Ivoire	107.7
Malawi	96.9	Liberia	99.8	India	107.7
Jamaica	97.1	Madagascar	99.8	Pakistan	107.8
South Africa	97.2	Lebanon	99.9	Jordan	108.5
Angola	97.2	Mauritania	99.9	Bhutan	109.1
Sierra Leone	97.3	South Korea	100.1	Libya	109.1
Malta	97.3	Indonesia	100.2	Saudi Arabia	121.5
Congo, Dem. Rep.	97.4	Honduras	100.3	Kuwait	135.5
Turkey	97.4	Comoros	100.3	Bahrain	140.0
Haiti	97.4	Sudan	100.8		

Note: The average of the number of males per 100 females for each country is calculated over the entire sample period.

**Authors' Note**

Supplemental material and files to reproduce are available at <http://journals.sagepub.com/home/jcr>.



## Acknowledgments

The authors thank two anonymous reviewers and Khusrav Gaibulloev for helpful comments on earlier drafts.

## Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Sandler received financial support from the Vibhooti Shukla Foundation at the University of Texas at Dallas.

## Supplemental Material

The supplemental materials are available at <http://journals.sagepub.com/doi/suppl/10.1177/0022002715603102>.

## Notes

1. Some researchers argued that a surplus of never-married men may result in more crime and other forms of violence (Edlund et al. 2013; Sharygin, Ebenstein, and Das Gupta 2013), which is contrary to our findings.
2. High male gender imbalance characterizes countries with a large foreign labor force (e.g., Bahrain, Kuwait, and Saudi Arabia), who remit their wages to their home country. We exclude Qatar and United Arab Emirates from our analysis as their data for gender imbalance are highly skewed to their male population.
3. The coverage for 1993 is incomplete because the box with that year's data fell off a truck in an office move and was never recovered.
4. Population is also positively associated with civil wars—see, for example, Collier and Hoeffler (2004) and Sambanis (2008).
5. Data for bureaucratic quality and rule of law are taken from the International Country Risk Guide (2010), while data for investment and savings rates come from the World Bank (2013). In Table B5 of the online appendix, we present similar averages for countries where male/female ratio is less than 100, but the index of bureaucratic quality lies above the median level.
6. Because data for political rights and civil liberties are only available from 1972, and data for the male/female ratio, especially by different age-groups, are only available on five-year intervals, we start our analysis from 1975. Data on education attainment are also only available on five-year intervals. The criteria of choosing developing countries can be debatable. We form our sample by excluding the twenty-five most industrialized OECD countries (see Table B2 of the online appendix for the list of these countries).
7. We justify the inclusion of every control in the light of past literature, most of which were found to be robust determinants of terrorism (e.g., Bandyopadhyay and Younas 2011; Gassebner and Luechinger 2011).

8. Past studies have utilized different measures of civil conflicts. Our measure of internal civil conflict from Marshall and Cole (2011) is a composite index containing information on a number of indices representing the acts of civil violence, civil war, ethnic violence, and ethnic war in a country. Higher value of the index reflects more civil unrest. Population density is measured as the number of people per square kilometer. The number of natural disasters is the sum of the numbers of floods, droughts, storms, and earthquakes in a country over a year.
9. Freytag et al. (2011) did not find that a higher share of Muslim population affects terrorism. Gaibulloev and Sandler (2013) indicated that terrorist groups in landlocked countries are more likely to fail.
10. Using contemporaneous or one-year lagged values of explanatory variables does not change our findings.
11. Note that the range of the variable of political rights and civil liberties lies between 2 and 14, with higher values denoting more rights in our rescaling. Regression results for twenty-five industrialized economies are presented in Table B9 of the online appendix.
12. Data for the child mortality rate are taken from the World Bank (2013), while data for net immigration rate and the male/female ratios at different age-groups come from the UNPD (2013).

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