Wilfried-Guth-Stiftungsprofessur für Ordnungs- und Wettbewerbspolitik

Diskussionsbeiträge / Discussion Paper Series

No. 2015-04

Does Income Inequality Lead to Terrorism? Evidence from the Post-9/11 Era

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Juni 2015

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Abstract

We study the influence of income inequality on terrorism. Using cross-national data for 79 countries for the 2002-2012 period, we show that endogeneity matters to the inequality-terrorism relationship, e.g., because of the distributional effects of terrorism. Once endogeneity is properly accounted for by means of an instrumental-variable approach, higher levels of income inequality result in more terrorist activity. This finding is robust to different definitions of the dependent variable, different estimation techniques and different instruments for income inequality. Our finding that inequality fuels terrorism is consistent with relative deprivation theory which argues that conflict results from frustration over the actual distribution of economic resources within a society.

JEL Classification: C36, D74

Keywords: income inequality; terrorism; Gini coefficient; instrumental-variable approach

Word Count: 8,097

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1. Introduction

Influential voices have repeatedly related income inequality to the emergence of political violence. For instance, in 2013 Pope Francis stated that "until exclusion and inequality in society and between peoples are reversed, it will be impossible to eliminate violence […] [and] without equal opportunities […] conflict will find a fertile terrain for growth and eventually explode".[1]

In light of this discussion, we study the *effect of income inequality on terrorism*. Intuitively, income inequality ought to make terrorism more likely. That is, inequality is expected to create grievances among the economically disenfranchised who may then use terrorist violence to voice their discontent over and challenge the economic status quo. Empirically, however, the relationship between inequality and terrorism is less clear-cut. As we show below in more detail, neither is there persuasive evidence that inequality breeds political violence in general (e.g., civil wars, revolutions) nor does the empirical evidence clearly indicate that inequality matters to terrorism in particular. Rather, a majority of empirical analyses on the causes of conflict and terrorism do not conclude that more inequality results in more violence.

Our empirical analysis of the inequality-terrorism nexus aims at clarifying this inconsistent evidence. We contribute to the existing literature on the nexus between inequality and terrorism—discussed below in more detail—in three ways. First, previous empirical analyses studying the political and economic consequences of inequality have been criticized on grounds of using inequality data of poor quality (e.g., Easterly, 2007). To overcome this issue, we use *more consistent income inequality data* drawn from a recently published income inequality dataset developed by Solt (2009), the *Standardized World Income Inequality Database*. Second, we *focus on the post-9/11 era* (i.e., the 2002-2012 period) when we study the inequality-terrorism nexus. In recent years—beginning with the end of the Cold War—there have been geographical and ideological shifts in the patterns of terrorism, where terrorist activity has surged in Africa and Asia (while declining in Europe and Latin America) and has become increasingly motivated by religious (Islamist) rather than left-wing agendas (e.g., Enders and Sandler, 2012). By focusing on the post-9/11 we can account for these changes in the nature of terrorism, adding to the policy relevance of our contribution. Third, and most importantly, we consider the *role of endogeneity in the inequality-terrorism nexus*.

[1] See http://tinyurl.com/qclzcn6.

Endogeneity in this nexus may stem from multiple sources such as measurement error or simultaneity due to the distributional consequences of terrorism. Although endogeneity bias may thus be a serious issue in any econometric analyses of the inequality-terrorism relationship, to the best of our knowledge this issue has been neglected in related empirical studies. Consequently, the role of inequality in terrorism may have so far been severely underestimated. To preview our empirical findings for a sample of 79 countries for the 2002-2012 period, we indeed show that higher levels of income inequality lead to more terrorist activity once endogeneity is considered, where this finding is robust to different definitions of the dependent variable, different estimation methods and different instruments for income inequality. We also provide evidence that this effect may be due to an exacerbating effect of inequality on a variety of social conditions (e.g., ethno-religious tensions, socio-economic underdevelopment) which in turn are conducive to terrorism. Our empirical results suggest that policymakers ought to take seriously the inflammatory effects of inequality.

The remainder of this paper is organized as follows. In Section 2 we discuss the theoretical and empirical literature on the effect of inequality on terrorism. In Section 3 we introduce the data and econometric methods to empirically study the inequality-terrorism nexus. The empirical results and further robustness analyses are reported in Section 4. Section 5 concludes.

2. Inequality and Terrorism: Theory and Evidence

A direct theoretical link between inequality and political violence is the *relative deprivation theory* developed by Gurr (1970). This theory "is grounded in the assumption that people who engage in rebellious political behavior are motivated principally by anger resulting from […] relative deprivation" (Muller and Weede, 1994: 40), where relative deprivation refers to a situation in which "individuals' expectations of economic or political goods exceed the actual distribution of those goods" (Piazza, 2006: 162). In other words, political violence (aggression) is a direct consequence of discontent (frustration) over the actual distribution of economic resources. This frustration-aggression mechanism also ought to matter to the nexus between inequality and terrorism. That is, terrorism—just as any other form of political violence—may be used to voice frustration due to relative deprivation. Furthermore, terrorism may be used by the "have-nots" to violently challenge the distribution of economic resources. Indeed, the prospects of a redistribution of wealth and the capture and exploitation of rents may offer strong incentives to engage in terrorist activity (e.g., Kirk, 1983). What is more, the

occurrence of terrorism—or threat thereof—may induce politico-economic reforms to counter inequality. For instance, Acemoglu and Robinson (2000) and Aidt and Franck (2015) suggest that democratization and redistributive policies in Western countries in the 19th century were a consequence of the elite's fear of social unrest and revolution.

Furthermore, income inequality may be indirectly related to the emergence of terrorism. That is, inequality may contribute to unfavorable economic and politico-institutional outcomes which in turn incite terrorist activity. First, inequality may result in unequal means of *politico-economic participation* (i.e., in reduced politico-economic institutional quality). For instance, Acemoglu et al. (2005) argue that the political power of societal factions to shape institutions in their favor depends on the distribution of resources within a society and the access of the various factions to these resources. Arguably, a rich elite (through, e.g., corruption, lobbying, media influence or other political maneuvers) may then have sufficient means available to create politico-economic institutions that benefit them or to perpetuate institutions that further their interest. This in turn may incite violence on behalf of the "have-nots" to violently overthrow the existing institutional status quo penalizing them. Indeed, there is evidence that terrorism becomes more likely when the means of economic participation are constrained, e.g., when property rights are not secure (e.g., Basuchoudhary and Shughart, 2010; Gassebner and Luechinger, 2011).

Second, inequality may lead to poorer socio-economic outcomes. Thorbecke and Charumilind (2002) find that income inequality is associated with less *education* and poorer *health* on the society-level. For instance, inequality may constrain the poor's investment decisions in education and health, leading to unfavorable outcomes (Thorbecke and Charumilind, 2002). Because of this inferior human capital accumulation (in terms of education and health), *economic growth* may also suffer. Ultimately, by depressing socio-economic development and economic growth, inequality may foster terrorist activity. Indeed, some empirical studies suggest that terrorism becomes more likely when socio-economic conditions are unfavorable (Burgoon, 2006; Caruso and Schneider, 2011; Gries et al., 2011; Freytag et al., 2011; Brockhoff et al., forthcoming).

In sum, inequality may—directly—lead to more terrorist activity by fueling frustration due to relative deprivation, where terrorism serves as a means to voice discontent over and eventually change the economic (distributional) status quo. Furthermore, inequality may—rather indirectly—fuel terrorism by aggravating social conditions (e.g., by limiting politico-

economic participation and impairing socio-economic development) which in turn may incite terrorism. Still, while there are several theoretical pathways from income inequality to terrorism, the empirical evidence on the inequality-conflict nexus does not provide a consistent picture. First, the evidence on the relationship between inequality and civil conflict (civil war) is mixed at best (e.g., Muller and Weede, 1994). As put by Østby (2008: 143): "Over the past few years, prominent large-N studies of civil war seem to have reached a consensus that inequality does not increase the risk of civil war". Still, some more recent studies allot some importance to the role of inequality in civil conflict, finding that societies that are more unequal are indeed more likely to see civil war (e.g., Cederman et al., 2011; Baten and Mumme, 2013). Second, with respect to the inequality-terrorism relationship, the empirical evidence is likewise mixed. While some studies find that inequality is indeed associated with more terrorism (e.g., Piazza, 2011), a majority of studies (e.g., Li, 2005; Abadie, 2006; Kurrild-Klitgaard et al., 2006; Piazza, 2006) find that income inequality does not matter.[2]

In the following, we want to empirically study in more detail a potentially very important reason for the mixed evidence on the inequality-terrorism nexus, the prevalence of *endogeneity*. Endogeneity may have multiple sources. For instance, it may be due to *measurement error* and give rise to attenuation bias. As noted by, e.g., Easterly (2007), international inequality datasets are typically of poor quality. We shall reduce this problem by using an improved income inequality dataset described in the following section. Furthermore, endogeneity may be due to *simultaneity*. That is, income inequality may not only affect terrorism, but terrorism may also have distributional consequences. First, terrorism may distort the patterns of public spending, with spending on the military and security usually being prioritized in times of a terrorist threat over public expenditures for education, health and other public services (Gupta et al., 2004). Such effects may feed through to the economy's income distribution, e.g., as social welfare programs designed to reduce inequality are cut in favor of security spending. Second, terrorism may reduce a country's tax base (e.g., by reducing economic activity through increased insecurity) and decrease the efficiency of its

[2] What is more, many empirical analyses on the determinants of terrorism do not study the role of inequality at all. For instance, in their review of 43 empirical studies Gassebner and Luechinger (2011) find that only eight of them control for the effect of inequality on terrorism, where no study provides robust evidence that inequality indeed incites terrorism.

tax administration (Gupta et al., 2004). Both effects ought to constrain the amount of resources available to the government for public spending on (inequality-reducing) welfare programs. Third, terrorism may benefit some industrial sectors, while damaging others. For instance, Berrebi and Klor (2010) show that terrorism has positively contributed to the economic success of defence-related industries in Israel (e.g., by creating demand for security products), but has hurt non-defence-related industries. Again, such effects may have distributional consequences. Wages in defence-related industries are likely to increase, while wages in other industries may suffer. Here, terrorism may negatively affect industries linked to, e.g., trade and tourism.[3] Crain and Crain (2006) indeed show that terrorism has a negative effect on a number of macroeconomic variables such trade and tourism flows by, e.g., creating insecurity and increasing transaction costs. Such negative effects are likely to have distributional effects not only by depressing wages but also by contributing to more unemployment and less trade union activity.

3. Data and methodology

To examine the relationship between inequality and terrorism, we collect data for 79 countries for the 2002-2012 period.[4] The summary statistics are reported in Table 1. All variables are averaged over the observation period to allow for the use of time-invariant instrumental variables for income inequality.[5]

—Table 1 here—

3.1 Dependent Variables

[3] Considering that wage levels in some services industries affected by terrorism (such as tourism) tend to be low in the first place, while wage levels in defence-related industries should be higher, the distributional consequences of terrorism may be even more pronounced.

[4] As discussed in the introduction, we focus on this time period to make our analysis more relevant to today's "war on terror". In addition to this, some control variables we employ (e.g., measuring unemployment) are not available for earlier time periods.

[5] An additional reason why we use a cross-sectional approach is that some data series (particularly the data on income inequality) exhibit gaps that make a panel approach not feasible.

We use two variables to indicate a country's level of terrorist activity. Both variables are constructed using raw data from the *Global Terrorism Database* (*GTD*).[6]

Our first dependent variable is the (logged) *terrorism score*. This score has been developed by Hyslop and Morgan (2014). The terrorism score accounts for the number of terrorist incidents in a country (as reported by the *GTD*), the total number of fatalities and injuries caused by terrorism (as reported by the *GTD*) and the property damage due to terrorism (also per information provided by the *GTD*). A higher terrorism score coincides with stronger (i.e., more lethal, destructive and costly) terrorist activity (Hyslop and Morgan, 2014). Here, the individual components of the terrorism score are weighted so that fatalities contribute more to the score than incidents and injuries, while large economic damages due to terrorism matter more strongly to the score than low-impact incidents.

Our second dependent variable is a *terrorism index*, defined as the (logged) s*um of terrorist incidents and terrorism victims* (i.e., the number of individuals injured or killed in a terrorist incidents). Again, the underlying information on terrorist activity comes from the *GTD*. The index captures two dimensions of terrorism, its frequency (the number of terrorist incidents) and its ferocity (the number of terrorism victims). The use of the terrorism index—similar to the aforementioned terrorism score—thus ought to make it more likely to adequately reflect the level of terrorist activity in a country. Indeed, similar terrorism indices have been previously used in the empirical literature, e.g., in Gries et al. (2011) (for on overview of other studies using such indices, see Enders and Sandler, 2012: 203-223). Also, using two distinct terrorism measures ought to add to the robustness of our empirical analysis.[7]

3.2 Inequality Measures

3.2.1 Inequality Data

Income inequality is measured by the *Gini coefficient*. The Gini coefficient measures the extent to which the income distribution among individuals within an economy deviates from a

[6] The *GTD* data is available at http://tinyurl.com/m4bfw6. The *GTD* defines terrorism as "the threatened or actual use of illegal force and violence by non-state actors to attain a political, economic, religious, or social goal through fear, coercion, or intimidation" (Hyslop and Morgan, 2014: 103).

[7] As discussed below in more detail, we furthermore use count-data variables as additional dependent variables as part of our robustness analysis.

perfectly equal distribution. As shown by Yitzhaki (1979), the Gini coefficient can be interpreted as a quantification of relative deprivation theory. That is, higher values of the Gini coefficient coincide with higher relative deprivation in a society.

The data for the Gini coefficient come from the *Standardized World Income Inequality Database* (*SWIID*) (Solt, 2009). While the *SWIID* draws on existing inequality datasets (e.g., the *Luxembourg Income Study*), by means of computational procedures the *SWIID* aims at improving the comparability of income inequality statistics to allow for more consistent cross-national research (Solt, 2009). As discussed above, problems of data inconsistencies and incomparability of income inequality data may have plagued earlier studies on the inequality-terrorism nexus and may have contributed to endogeneity concerns. Using more consistent inequality data consequently ought to help to overcome these concerns.

Figure 1 provides a first impression of our sample and main variables of interest. Our sample includes countries that saw little terrorism during the observation period (e.g., Hungary, Japan), but also countries with a strong terrorist activity (e.g., India, Colombia) between 2002 and 2012. Similarly, in our sample there are countries in which income inequality was rather low (e.g., Denmark, Norway) but also countries with comparatively unequal income distributions (e.g., Honduras, South Africa). Plotting the country-level data on income inequality against the country-level (logged) terrorism score, Figure 1 very tentatively indicates that higher levels of inequality (measured by the Gini coefficient) are associated with higher levels of terrorist activity (measured by the logged terrorism score).

—Figure 1 here—

3.2.2 Instrument for Income Inequality

As argued above, endogeneity may plague the inequality-terrorism nexus because of measurement error and simultaneity/reverse causation. Using an instrumental-variable approach may help overcome endogeneity issues. As a consequence, we therefore instrument income inequality by the *wheat-sugar ratio,* defined as the (logged) share of arable land suitable for wheat to the share of land suitable for sugarcane. The data are drawn from Easterly (2007).

Easterly (2007) proposed this instrument when studying the relationship between income inequality and underdevelopment. Easterly (2007) argues that agricultural endowments may predict (structural) inequality. In particular, land endowments that favor the production of

sugarcane have historically contributed to inequality, e.g., due to the use of slave or low-wage labor by (small) plantation elites (Easterly, 2007). Conversely, land endowments that favor wheat have been associated with a more equal income distribution. Easterly (2007) argues that the production of wheat on family farms provided the basis for middle-class growth. Following these notions, we expect our instrument for income inequality (the wheat-sugar ratio) to be a negative predictor of income inequality. Using the instrument in our analysis, the implicit identification assumption is that agricultural endowments affect terrorism only through their exogenous impact on income inequality.

3.3 Control Variables

We choose a set of control variables according to the literature reviews of Gassebner and Luechinger (2011) and Krieger and Meierrieks (2011). The summary statistics, operationalizations and data sources of all controls are given in Table 1.

First, we control for *population size*. Consistent with the very robust evidence from the existing literature on the determinants of terrorism (Gassebner and Luechinger, 2011; Krieger and Meierrieks, 2011), we expect population size to be a positive predictor of terrorism. For one, this may due to higher policing costs associated with larger populations, which may complicate counter-terrorism measures. For another, the positive association between population size and terrorism may be due to a scale effect, given that larger countries ought to have more terrorism targets, victims and potential terrorists.

Second, we consider the effect of *unemployment* on terrorism, where we expect a higher unemployment rate to coincide with more terrorist activity. As argued by Piazza (2006), the unemployed ought to be more likely to resort to terrorism to change the unfavorable economic status quo in their favor.

Third, we control for *government consumption*. According to the model of Kirk (1983), higher government consumption is expected to coincide with higher rents from government activity, which in turn may invite terrorist activity to capture them. We thus expect government size to be positively associated with terrorism.

Fourth, we consider the impact of regime type (*democracy*) on terrorism. Possibly, democratic institutions enable political participation, thus making terrorist violence a less likely option to achieve political goals (Li, 2005). However, it is also possible that the protection of civil liberties and political freedoms by democratic institutions may compromise

counter-terrorism measures, e.g., by making the surveillance of potential terrorists more difficult (Li, 2005). Given these two diametrically opposed lines of reasoning on the role of democracy in terrorism, we remain agnostic about the expected effect of the former on the latter.

Fifth, we control for *regime stability*. Arguably, more instable regimes may also be more likely to experience terrorism. For instance, domestic instability may create power vacuums that make it easier to carry out terrorism (e.g., as counter-terrorism means are constrained), while also positively influencing the possibility of terrorist success (e.g., as an instable regime is more likely to be overwhelmed by terrorism).

Finally, we control for the effect of *external conflict* on terrorism. As stressed in Conrad (2011) and Findley et al. (2012), conflicts between states may also lead to more terrorist activity. For instance, countries may actively or passively support terrorist activity against their foreign policy rivals so as to weaken these rivals and boost their own domestic and international position. Thus, we expect countries engaged in external conflict to experience more terrorist activity.

As part of our robustness analysis, we amend our baseline model with additional economic and institutional controls indicating a country's *income level*, rate of *economic growth*, level of *trade openness* and the strength of a country's judicial system (*rule of law*). These variables are also described in Table 1. In detail, we expect terrorism to become less likely with variables indicating favorable socio-economic conditions and performance (higher per capita income, higher rates of economic growth and higher levels of trade openness). We also anticipate terrorism to become less likely with institutional improvements (i.e., a better rule of law).

3.4 Econometric Methods

In order to assess the influence of income inequality on terrorism, we first run a series of ordinary OLS regressions. We then run a series of the instrumental-variable (*IV*) OLS regressions, where inequality is instrumented by the wheat-sugar ratio. As discussed above, the IV-approach is employed to account for potential endogeneity in the inequality-terrorism relationship. Comparing the ordinary and IV-OLS estimates ought to give us a better understanding as to how endogeneity actually shapes this relationship.

As a robustness check, we also employ additional count-data dependent variables. The econometric methods when using count-data variables are discussed in more detail below.[8]

4. Empirical results

4.1 Main Results

In Table 2 we report our findings when endogeneity is not considered. Irrespective of the model specification, we find no evidence that income inequality affects terrorist activity. This finding is in line with the empirical mainstream and consistent with earlier findings reported by, e.g., Li (2005), Abadie (2006), Kurrild-Klitgaard et al. (2006) and Piazza (2006). More generally speaking, our result mirrors the empirical consensus that economic variables do not matter strongly to the emergence of terrorism (see the reviews by Gassebner and Luechinger, 2011; Krieger and Meierrieks, 2011). Correspondingly, we also do not find that the other economic variables we consider in the various specifications (indicating unemployment, per capita income, economic growth and trade openness) share a statistically significant relationship with terrorism.

Considering the remaining control variables, we also detect no robust effect of government consumption, democratic institutions, regime age and the rule of law on terrorism. However, we find that population size is positively associated with terrorism. For one, this may be due to policing costs that increase with population size and thereby reduce counter-terrorism efficiency. For another, terrorism may also be more likely in countries that are more populous because larger countries simply provide a larger pool of potential terrorists and terrorism victims. In any event, the positive association between population size and terrorism has been reported in almost all empirical studies on the determinants of terrorism (see the reviews by Gassebner and Luechinger, 2011; Krieger and Meierrieks, 2011). We also find that a higher risk of external conflict leads to more terrorist activity. This speaks to a number of more recent studies that find that international political factors are important determinants of terrorism (e.g., Conrad, 2011; Findley et al., 2012). The finding also corresponds to the post-

[8] As further robustness checks, we also re-run all model specifications with the Poisson and GMM-Poisson estimators (Gourieroux et al., 1984; Windmeijer and Santos Silva, 1997). Tobit and IV-Tobit models are run as well. Here, our findings are in line with those reported in the main text, especially with respect to the role of inequality in terrorism (results available upon request).

9/11 environment in which terrorist conflicts are often found to, e.g., transcend borders or result in foreign military interventions.

—Table 2 here—

Our results when endogeneity in the inequality-terrorism relationship is considered are reported in Table 3. Here, our findings show the wheat-sugar ratio is a sound instrument for income inequality (first-stage *F*-statistics).[9] Instrumenting income inequality, we find that higher levels of inequality are associated with higher levels of terrorist activity. For one, this suggests that inequality is indeed endogenous to terrorism, possibly because of measurement error or due to simultaneity that arises from the distributional effects of terrorism. Comparing our findings in Tables 2 and 3, it is obvious that disregarding endogeneity may mean that the terror-augmenting effect of inequality is masked. For another, finding that more inequality leads to more terrorism suggests that grievances due to an unequal distribution of wealth indeed induce terrorism. For instance, this finding speaks to Gurr's (1970) relative deprivation theory in which discontent due to inequality is argued to result in aggression (in our case, terrorism).

Notably and adding to the robustness of our main finding, with respect to the control variables the only difference to the ordinary OLS estimates (Table 2) is that government consumption now positively predicts terrorism when the IV-OLS approach is used.[10] This finding is consistent with the model of Kirk (1983) who argues that higher government consumption ought to coincide with higher rents from government activity, making it more attractive for terrorist groups to use violence to capture rents associated with government size.

—Table 3 here—

[9] Consistent with Easterly (2007), the first-stage regression results (not reported) show that a higher wheat-sugar ratio is robustly associated with less inequality.

[10] Government consumption and income inequality are rather strongly and negatively correlated (r=-0.51, p=0.00). This correlation influences the first-stage OLS estimates. To rule out that this correlation affects our main IV-OLS estimation results, we re-run all model specifications omitting the government consumption variable. Importantly, this does not change our main result. Income inequality still exerts—when properly instrumented—a positive impact on terrorist activity (results available upon request).

4.2 Robustness Analysis

4.2.1 Count-Data Estimates

As a first robustness check, we consider whether our findings also hold when we run count-data models. As shown in the literature review by Krieger and Meierrieks (2011), count-data models are commonly used to study the determinants of terrorism. For our robustness analysis, we accordingly use two alternative dependent variables: the per-country counts of (domestic and transnational) terrorist incidents and the per-country counts of terrorism victims (i.e., the number of individuals killed or wounded in terrorist incidents). As shown in Table 1, both of these variables are non-negative integers with variances that are larger than their respective means. We use two approaches to accommodate for these data traits and for endogeneity in the inequality-terrorism relationship. First, we run a series of maximum-likelihood negative binomial models. To account for endogeneity in count-data models, we follow the two-step method described by Wooldridge (1997). Here, in the first step we estimate a reduced-form (OLS) equation to explain income inequality, also using our instrument for inequality (i.e., the wheat-sugar ratio) as a regressor. The residual from the reduced-form equation is stored and, in the second step, included in a count-data model. This two-step approach ought to remove any bias due to the potential endogeneity of income inequality (Wooldridge, 1997). Second, we employ the GMM-Poisson estimators (Gourieroux et al., 1984; Windmeijer and Santos Silva, 1997). The GMM estimator uses our inequality instrument to specify moment conditions that hold in the population, where the instrument is assumed to be correlated with the endogenous regressor (i.e., the Gini coefficient) but independent of the error term. The GMM estimates make the sample versions of these population-moment conditions to approximate their true values.

The count-data and IV-/GMM-count-data estimates are reported in Table 4. Consistent with the results reported in Tables 2 and 3, we find that income inequality is a positive predictor of terrorism (regardless of its operationalization) once endogeneity is properly accounted for (regardless of the econometric method). Confidence in the count-data findings is further buttressed by the fact that the control variable results mirror those of the OLS and IV-OLS estimates. In particular, we find that both a larger population size and a higher risk of external conflict are robustly associated with more terrorist activity.

—Table 4 here—

4.2.2 Alternative Inequality Instrument

As another robustness check, we consider an alternative instrument for income inequality. Following Higgins and Williamson (2002) and Leigh (2006), we instrument inequality by the *relative size of mature-aged cohorts*. Higgins and Williams (2006) argue that "fat cohorts" tend to get lower economic rewards. When the mature-aged cohorts are relatively large (i.e., "fat"), this ought to lead to a more equal distribution of income due to more labor market competition. In the words of Higgins and Williamson (2002: 269):

> "When those fat cohorts lie in the middle of the age-earnings curve, where life-cycle income is highest, [a] labor market glut lowers their income, thus tending to flatten the age earnings curve. Earnings inequality is moderated."

We consequently operationalize the relative size of mature-aged cohorts as the size of the population between the ages of 40 and 59 to a country's population between the ages of 15 and 69, following the example of Leigh (2006). The population data are drawn from *United Nations Population Division*[11] (see Table 1 for the summary statistics). In the context of our study, we expect mature-aged cohort size to be a negative predictor of income inequality and to affect terrorism only through its effect on income inequality.[12]

The empirical findings using the alternative income inequality instrument are reported in Table 5. In short, the findings suggest that relative cohort size is a sound instrument for inequality (first-stage *F*-test results).[13] What is more, we find that income inequality is associated with more terrorist activity once endogeneity is accounted for; terrorism is further swayed by population size and external conflict risk. That is, both with respect to the main variable of interest (inequality) and with respect to the controls, our findings are in line with

[11] The data are available at http://tinyurl.com/crv24t6.

[12] Even though the individual (active) terrorist tends to be younger, there is no corresponding macro-level evidence that countries with younger populations produce more terrorism. For instance, Gassebner and Luechinger (2011: 254) come to the conclusion that "citizens from countries with a large share of young people are less likely to be victimized and, importantly, not more likely to commit attacks. Especially the latter result contradicts the literature on "youth bulge"." Thus, we believe that our identification strategy is appropriate.

[13] The first-stage regression results (not reported) show that the relative size of mature-aged cohorts is a strong and negative predictor of income inequality. This corresponds to the findings of Higgins and Williamson (2002) and Leigh (2006).

those reported above. In other words, we find that our main empirical result—income inequality is a positive predictor of terrorism when endogeneity is properly considered—is not sensitive to the choice of the instrument for income inequality.

—Table 5 here—

4.3 Potential Transmission Channels

Summing up our main findings and the robustness analysis, our empirical results suggest that grievances due to income inequality contribute to terrorism. In the literature review above, we argued that the terror-augmenting effect of inequality may be due to (i) a frustration-aggression mechanism related to relative deprivation and (ii) unfavorable effects of inequality on various social conditions (e.g., institutional or socio-economic factors) which in turn may incite terrorism.

In this subsection we shall further study the aforementioned transmission channels running from income inequality to terrorism. To measure the level of societal frustration, we collect data on the *risk of ethno-religious tensions*; a higher tension risk ought to coincide with higher societal frustration.[14] Furthermore, we collect data on country-level institutional conditions (*property rights protection*), education (*secondary school enrollment*) and economic development (*per capita fixed capital formation*), given that these variables may also account for the positive association between inequality and terrorism. The data sources and operationalizations of all variables are described in Table 1. We regress income inequality (instrumented by the wheat-sugar ratio) on these outcomes to study the effect of inequality on them.

[14] It is difficult to operationalize the frustration-aggression mechanism postulated by relative deprivation theory with country-level data. We believe that the risk of ethno-religious tensions captures at least some of the frustration that is latent in a society. Ethno-religious conflicts are often associated with strong economic differences between ethnic or religious groups within a society, which incentivizes violence (Østby, 2008). Also, previous research has shown that ethno-religious tensions and discrimination are positively associated with terrorist activity (e.g., Basuchoudhary and Shughart, 2010; Piazza, 2011). This latter relationship may be explained—in parts—by the aggravating (i.e., aggression-inducing) impact of inequality on society-wide frustration due to relative deprivation.

The corresponding IV-OLS and GMM-Poisson estimates are reported in Table 6.[15] We find that inequality leads to a higher risk of ethno-religious tensions, poorer institutional conditions and reduced levels of socio-economic development. Thus, the causal effect of inequality on terrorism—identified by our instrumental-variable estimates—may materialize through these transmission channels. Indeed, this notion is consistent with the literature on the determinants of terrorism. Here, several empirical studies suggest that terrorism becomes more likely when the means of economic participation are constrained (e.g., Basuchoudhary and Shughart, 2010; Gassebner and Luechinger, 2011), ethno-religious tensions and economic discrimination prevail (e.g., Basuchoudhary and Shughart, 2010; Piazza, 2011) and socio-economic conditions are unfavourable (Burgoon, 2006; Freytag et al., 2011; Brockhoff et al., forthcoming). Our findings indicate that these terrorism-inducing (intervening) factors are in turn rooted in by income inequality, suggesting a causal link running from inequality via more societal frustration and poor further institutional and socio-economic conditions to more terrorist activity.

—Table 6 here—

5. Conclusion

In this contribution we analyze the relationship between income inequality and terrorism for 79 countries for the 2002-2012 period. Ordinary OLS and count-data models suggest that inequality does not influence terrorist activity. Once endogeneity is considered, however, our results strongly indicate that higher levels of income inequality lead to more terrorist activity. The latter result is robust to different definitions of the dependent variable, different econometric approaches and different instruments for income inequality. Our empirical findings thus suggest that endogeneity matters to the inequality-terrorism nexus and may mask the terror-augmenting effect of inequality; previous empirical studies may have

[15] We use the GMM-variant of the pseudo-maximum likelihood Poisson estimator described in Gourieroux et al. (1984) and Windmeijer and Santos Silva (1997) to study the influence of inequality on the risk of ethno-religious tensions. This method is better suited to deal with zero values of the dependent variable, as it is the case with the ethno-religious tension variable. In general, however, the results reported in Table 6 are robust to different estimation techniques (IV-OLS, GMM-Poisson and IV-Tobit) as well as the inclusion of control variables (results available upon request).

underestimated the role of inequality in terrorism. Here, endogeneity may be due to measurement error but also be a consequence of feedback/simultaneity between inequality and terrorism, e.g., due to the distributional effects of terrorism.

In sum, our statistical analysis suggest that in the post-9/11 era higher levels of income inequality lead to more terrorism. We argue that, on the one hand, inequality may fuel terrorism by promoting societal frustration, in line with relative deprivation theory. For instance, such frustration may manifest itself through increased tensions along ethnic and/or religious lines. On the other hand, inequality may also exacerbate institutional and socio-economic conditions (such as poor socio-economic development) that are by themselves potentially conducive to terrorism.

Our findings suggests that policymakers are well advised to keep inequality in check to accommodate grievances that may otherwise result in violence. Here, inequality may be countered through (targeted) public spending, e.g., through the provision of social policies that reduce inequality in the long run. Indeed, some evidence suggests that higher levels of public spending on education and health may be a disincentive to terrorism (Burgoon, 2006; Krieger and Meierrieks, 2010). However, public spending—particularly when excessive—may be harmful to economic growth, e.g., by introducing inefficiencies or crowding out private economic activity (Scully, 2002). Thus, policymakers may also try to counter inequality through the provision and protection of institutions which level the playing-field but do not interfere strongly with market activity. Such sound institutions may in turn have inequality-reducing effects. For instance, Scully (2002) shows that higher levels of economic freedom—safeguarded by governmental action—can also be conducive to income equity.

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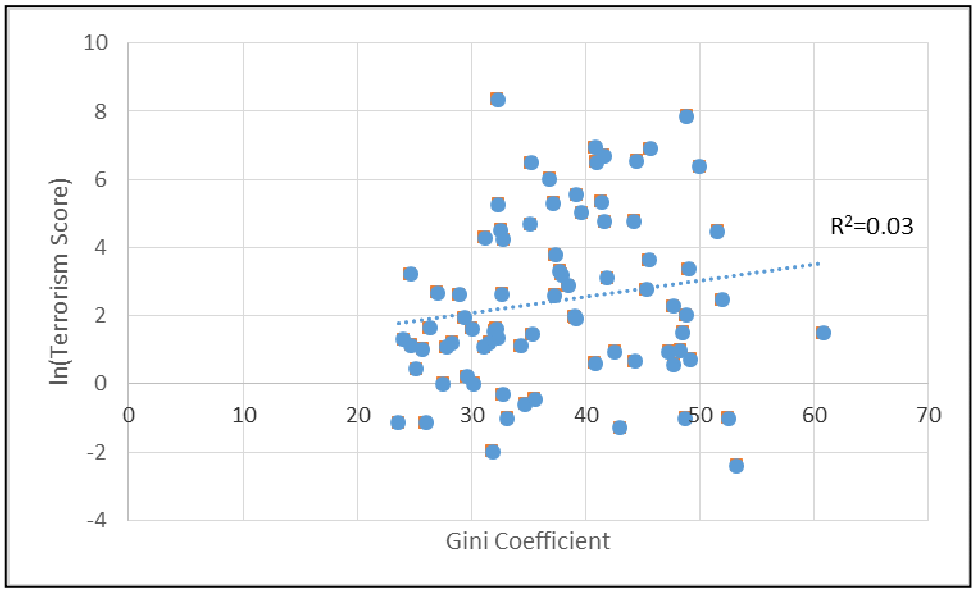

Figure 1: Inequality and Terrorism

Variable	Mean	SD	Minimum	Maximum	Operationalization	Source
Terrorism Score	2.46	2.49	-2.40	8.36		
Terrorism Index	4.50	2.54	0	10.39		
Terrorism Incidents	243.41	725.02	1	4747		
Terrorism Victims	1255.04	3895.92	0	27904		
Income Inequality	37.84	8.52	23.58	60.81		
Wheat-Sugar Ratio	0.13	0.20	-0.33	0.58		
Mature Cohort Size	0.28	0.05	0.21	0.37		
Population Size	16.89	1.60	5.28	11.08	Total population size, logged	(a)
Unemployment	7.61	4.01	1.24	24.41	Share of labor force without work but seeking employment, ILO estimates	(a)
Government Consumption	15.39	4.89	2.80	25.66	General government final consumption (e.g., purchases of goods and services) as percentage of GDP	(a)
Democracy	6.05	4.78	-7	10	Combined polity score, ranging from -10 (autocracy) to +10 (democracy)	(b)
Regime Durability	2.91	1.19	-2.40	5.29	Number of years since the most recent regime change, logged	(b)
External Conflict	1.75	0.95	0	4.34	Index of external conflict risk (e.g., due to diplomatic pressures, cross-border conflicts, war)	(c)
Per Capita Income	8.43	1.60	5.28	11.08	Per capita income in constant 2005 U.S. dollars, logged	(a)
Rule of Law	6.31	2.23	2.54	10	Index of strength of the legal system and popular observance of the law	(c)
Economic Growth	3.99	2.56	-2.03	13.20	Annual percentage change of real per capita GDP	(a)
Trade Openness	79.78	37.07	25.78	198.28	Sum of exports and imports as percentage of GDP	(a)
Property Rights Protection	7.37	1.86	1.13	10	Index of investment risk (e.g., due to expropriations)	(c)
Ethnic and Religious Tensions	2.97	1.79	0	7.5	Index measuring the risk of ethnic tension (e.g., due to a lack of different races or nationalities within a country to compromise on policy issues) and of religious tensions (e.g., due to the desire of a single religious group to dominate governance)	(c)
Secondary Schooling	83.15	26.85	11.32	137.36	Gross secondary school enrollment as percentage of the population of official secondary education age	(a)
Gross Fixed Capital Formation	6.96	1.65	3.85	9.52	Additions (in constant 2005 U.S. dollars) to the fixed assets of the economy (commercial and industrial buildings, machinery purchases etc.) plus net changes in the level of inventories, logged, adjusted by population size	(a)

Sources: (a) *World Development Indicators* (http://tinyurl.com/y5gp4xc); (b) *Polity4 Dataset* (http://tinyurl.com/qxshj8g); (c) *International Country Risk Guide* (http://tinyurl.com/npshls8).

Table 1: Summary Statistics and Data Operationalization and Sources

	(1)	(2)	(3)	(4)	(5)	(6)
Income Inequality	0.011	-0.027	0.010	-0.003	-0.041	-0.004
	(0.035)	(0.038)	(0.035)	(0.034)	(0.037)	(0.034)
Population Size	0.965	0.984	0.997	0.999	1.018	1.058
	(0.187)***	(0.188)***	(0.222)***	(0.188)***	(0.188)***	(0.229)***
Unemployment	-0.001	-0.004	0.001	-0.007	-0.010	-0.003
	(0.064)	(0.065)	(0.067)	(0.067)	(0.068)	(0.069)
Government Consumption	0.080	0.108	0.086	0.076	0.104	0.078
	(0.074)	(0.075)	(0.079)	(0.070)	(0.070)	(0.074)
Democracy	-0.049	-0.020	-0.036	-0.039	-0.007	-0.024
	(0.046)	(0.045)	(0.049)	(0.048)	(0.047)	(0.049)
Regime Durability	-0.331	-0.116	-0.345	-0.334	-0.118	-0.341
	(0.214)	(0.258)	(0.210)*	(0.223)	(0.265)	(0.219)
External Conflict	0.546	0.555	0.548	0.635	0.642	0.653
	(0.280)*	(0.297)*	(0.298)*	(0.288)**	(0.305)**	(0.301)***
Per Capita Income		-0.259			-0.279	
		(0.227)			(0.239)	
Rule of Law		-0.178			-0.164	
		(0.179)			(0.175)	
Economic Growth			0.040			0.035
			(0.103)			(0.104)
Trade Openness			0.002			0.004
			(0.008)			(0.009)
Dependent Variable	Terrorism Score			Terrorism Index		
Adjusted R^2	0.41	0.44	0.41	0.42	0.45	0.42
Number of Observations	79	79	79	79	79	79

Notes: Constant not reported. Heteroskedasticity-consistent standard errors in parentheses. *p<0.1, **p<0.05, ***p<0.01.

Table 2: Terrorism and Income Inequality (OLS Estimates)

	(1)	(2)	(3)	(4)	(5)	(6)
Income Inequality	0.166	0.241	0.170	0.148	0.221	0.153
	(0.064)***	(0.105)**	(0.063)***	(0.066)**	(0.113)*	(0.065)**
Population Size	0.833	0.789	0.884	0.870	0.828	0.946
	(0.234)***	(0.264)***	(0.261)***	(0.231)***	(0.258)***	(0.263)***
Unemployment	-0.041	-0.033	-0.034	-0.047	-0.039	-0.038
	(0.093)	(0.110)	(0.095)	(0.091)	(0.106)	(0.093)
Government Consumption	0.204	0.192	0.193	0.197	0.186	0.184
	(0.096)**	(0.109)*	(0.099)*	(0.091)**	(0.102)*	(0.093)**
Democracy	-0.083	-0.104	-0.090	-0.072	-0.089	-0.078
	(0.058)	(0.076)	(0.068)	(0.059)	(0.077)	(0.067)
Regime Durability	-0.183	-0.383	-0.151	-0.189	-0.379	-0.149
	(0.237)	(0.347)	(0.240)	(0.242)	(0.356)	(0.249)
External Conflict	0.558	0.531	0.605	0.646	0.618	0.710
	(0.233)**	(0.245)**	(0.269)**	(0.236)***	(0.246)**	(0.266)***
Per Capita Income		0.105			0.077	
		(0.308)			(0.314)	
Rule of Law		0.330			0.332	
		(0.272)			(0.288)	
Economic Growth			-0.041			-0.046
			(0.147)			(0.140)
Trade Openness			0.004			0.005
			(0.009)			(0.009)
Dependent Variable	Terrorism Score			Terrorism Index		
First-Stage *F*-statistic	21.69	13.14	18.95	21.69	13.14	18.95
(Prob. > *F*)	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Adjusted R^2	0.22	0.05	0.21	0.24	0.09	0.23
Number of Observations	79	79	79	79	79	79

Notes: Constant not reported. Heteroskedasticity-consistent standard errors in parentheses. Instrument for income inequality: wheat-sugar ratio. *p<0.1, **p<0.05, ***p<0.01.

Table 3: Terrorism and Income Inequality (IV-OLS Estimates)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Income Inequality	0.017	0.169	0.041	0.303	-0.014	0.163	-0.024	0.304
	(0.043)	(0.051)***	(0.053)	(0.059)***	(0.039)	(0.065)**	(0.037)	(0.107)***
Population Size	1.120	0.895	1.147	0.845	0.968	0.902	1.011	0.848
	(0.186)***	(0.174)***	(0.251)***	(0.198)***	(0.225)***	(0.249)***	(0.268)***	(0.346)**
Unemployment	0.050	-0.029	0.005	-0.140	0.033	-0.027	0.057	-0.148
	(0.076)	(0.076)	(0.071)	(0.072)*	(0.068)	(0.109)	(0.059)	(0.155)
Government	0.187	0.163	0.072	0.334	-0.032	0.155	-0.034	0.336
Consumption	(0.086)	(0.066)**	(0.123)	(0.074)***	(0.051)	(0.080)*	(0.049)	(0.137)**
Democracy	0.038	0.007	-0.107	-0.227	0.079	0.009	0.057	-0.232
	(0.080)	(0.059)	(0.090)	(0.066)***	(0.047)*	(0.077)	(0.046)	(0.111)**
Regime Durability	-0.002	0.101	0.129	0.315	-0.447	0.109	-0.461	0.343
	(0.285)	(0.243)	(0.330)	(0.254)	(0.206)**	(0.276)	(0.229)**	(0.339)
External Conflict	0.518	0.637	0.641	0.950	0.502	0.638	0.538	0.973
	(0.228)**	(0.208)***	(0.254)**	(0.209)***	(0.261)*	(0.216)***	(0.267)**	(0.289)***
Dependent Variable	No. of Terrorist Incidents		No. of Terrorist Victims		No. of Terrorist Incidents		No. of Terrorist Victims	
Estimation Technique	NBR	IV-NBR	NBR	IV-NBR	Poisson	GMM-Poisson	Poisson	GMM-Poisson
Number of Observations	79	79	79	79	79	79	79	79

Notes: Constant not reported. Heteroskedasticity-consistent standard errors in parentheses. Instrument for income inequality: wheat-sugar ratio. NBR=Negative Binomial Regression. *p<0.1, **p<0.05, ***p<0.01.

Table 4: Terrorism and Income Inequality (Count-Data and IV-Count-Data Estimates)

	(1)	(2)	(3)	(4)
Income Inequality	0.011	0.122	-0.003	0.109
	(0.035)	(0.051)**	(0.034)	(0.051)**
Population Size	0.965	0.870	0.999	0.903
	(0.187)***	(0.215)***	(0.188)***	(0.215)***
Unemployment	-0.001	-0.029	-0.007	-0.037
	(0.064)	(0.080)	(0.067)	(0.081)
Government Consumption	0.080	0.169	0.076	0.166
	(0.074)	(0.083)**	(0.070)	(0.079)**
Democracy	-0.049	-0.074	-0.039	-0.064
	(0.046)	(0.052)	(0.048)	(0.055)
Regime Durability	-0.331	-0.225	-0.334	-0.226
	(0.214)	(0.216)	(0.223)	(0.223)
External Conflict	0.546	0.555	0.635	0.643
	(0.280)*	(0.235)**	(0.288)**	(0.240)***
Dependent Variable	Terrorism Score		Terrorism Index	
Estimation Technique	OLS	IV-OLS	OLS	IV-OLS
Robust Score χ^2		8.68		8.73
(Prob. > χ^2)		(0.00)***		(0.00)***
First-Stage *F*-statistic		43.06		43.06
(Prob. > *F*)		(0.00)***		(0.00)***
Adjusted R^2	0.41	0.31	0.42	0.32
Number of Observations	79	79	79	79

Notes: Constant not reported. Heteroskedasticity-consistent standard errors in parentheses. Instrument for income inequality: mature cohort size. *p<0.1, **p<0.05, ***p<0.01.

Table 5: Terrorism and Income Inequality (Alternative Instrument)

	(1)	(2)	(3)	(4)
Dependent Variable	Ethnic and Religious Tensions	Property Rights Protection	Secondary Schooling	Gross Fixed Capital Formation
Income Inequality	0.035	-0.1.67	-2.663	-0.012
	(0.013)***	(0.038)***	(0.496)***	(0.002)***
Estimation Technique	GMM-Poisson	IV-OLS	IV-OLS	IV-OLS
Robust Score χ^2		4.34	6.74	7.70
(Prob. > χ^2)		(0.04)**	(0.00)***	(0.00)***
First-Stage *F*-statistic		5347	48.33	50.13
(Prob. > *F*)		(0.00)***	(0.00)***	(0.00)***
Number of Observations	79	79	76	77

Notes: Constant not reported. Heteroskedasticity-consistent standard errors in parentheses. Instrument for income inequality: wheat-sugar ratio. *p<0.1, **p<0.05, ***p<0.01.

Table 6: Income Inequality and Various Development Outcomes

Appendix. List of Countries

Algeria, Argentina, Armenia, Australia, Austria, Azerbaijan, Bangladesh, Belarus, Belgium, Bolivia, Brazil, Bulgaria, Canada, Chile, China, Colombia, Cote d'Ivoire, Czech Republic, Denmark, Ecuador, Egypt, Estonia, Ethiopia, Finland, France, Germany, Greece, Guatemala, Guyana, Honduras, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Kenya, Korea (South), Lebanon, Madagascar, Malaysia, Mali, Mexico, Moldova, Netherlands, New Zealand, Niger, Nigeria, Norway, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Portugal, Romania, Russia, Senegal, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Tanzania, Thailand, Tunisia, Turkey, Uganda, Ukraine, United Kingdom, United States, Uruguay, Venezuela, Zambia, Zimbabwe

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