Military Expenditure and Internal Violence in Latin America

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Abstract: This research examines the relationship between internal violence and military expenditure in Latin America. The region, largely free from interstate wars, has faced significant violence from non-state groups, prompting governments to increasingly deploy the armed forces in domestic missions. I use a mixed-methods approach, combining panel data analysis and case studies. The results indicate that, within the sampled countries, military expenditure is positively associated with internal violence, as well as interstate disputes, foreign military aid, and military involvement in politics, while it is negatively associated to democracy levels. Between the sampled countries, higher military expenditure is similarly linked to higher internal violence, interstate disputes, and foreign military aid. Counterintuitively, the results show that military expenditure is higher in more democratic countries, and lower in countries with greater military involvement in politics.

Keywords: Defence economics; Latin America; Military spending; Panel data; Violence

JEL classification: C33 (Panel Data Models); C51 (Model Construction and Estimation); H56 (National Security and War)

1. Introduction

What drives military expenditure in a region that has remained free of interstate wars in the 21st century? Is internal violence a relevant factor? Historically, the primary driver of military expenditure were actual and potential interstate conflicts. However, the relative stability of the post-Cold War international system, combined with the emergence of new security challenges, has allowed for an expansion of the role of the armed forces. Consequently, scholars have adapted models of military expenditure to account for a wider array of security challenges beyond traditional interstate conflicts.[1]

Latin America provides a compelling example of how the military's role has expanded beyond its conventional defense functions. While the region has avoided interstate wars in the 21st century, organized violence by non-state groups presents a significant security challenge for many countries. As a result, Latin American governments have been increasingly deploying their armed forces on domestic missions to dismantle these groups.[2]

My goal is to understand if the share of GDP allocated by governments towards military expenditure is influenced by the levels of internal violence experienced by the country. To do so, I empirically evaluate the relationship between military expenditure and internal violence in Latin America. I use an integrative multimethod approach: first, I build and estimate a model of military expenditure; then, I use case studies to refine the model. If internal violence is a relevant factor driving military expenditure, it would further illustrate how the armed forces' role has expanded from traditional external defense to addressing internal security challenges.

In the next section, I review the literature on models of military expenditure, which serves as the foundation for building a model specific to Latin America. I then operationalize and estimate this model using the data and methods presented in the third section. The fourth section presents the results. In the fifth section, I examine the pattern of major arms imports in the region to analyze how military resources are being allocated. The final section summarizes the key findings.

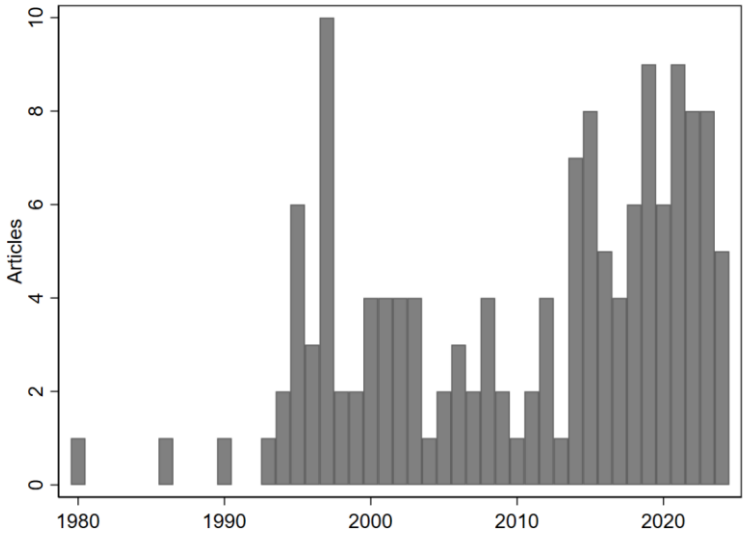
2. Literature Review

Bibliometric analyses offer a quantitative method for reviewing academic literature, providing a systematic, transparent, and replicable way to analyze publication patterns. For example, this approach allows researchers to identify the key contributors and main themes discussed by other scholars within a field of study.[3] To select the relevant literature on models of military expenditure, I conducted a

[1] Paleologou, "Modelling the Demand for National Security Expenditure."
[2] Pion-Berlin, *Military Missions in Democratic Latin America*.
[3] Aria and Cuccurullo, "Bibliometrix."

systematic search using the Web of Science Core Collection database.[4] I focused on journal articles in English, resulting in 142 articles, published between 1980 and September 2024. **Figure 1** illustrates the number of articles published each year. A notable trend is the consistent level of research output in recent years, reflecting sustained academic interest in the subject.

Figure 1. Number of articles identified by our query, per publication year (1980-2024)



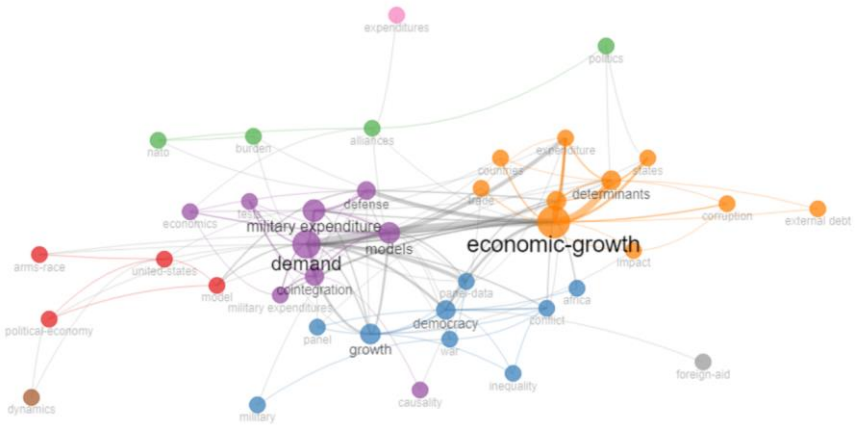
Note: 1 I did the graph using Stata (v. 15.1) and the "bibliometrix" package in R (v. 4.4.1) with data from Web of Science Core Collection.

A representation of the most frequent words and their co-occurrence patterns allows us to visualize the main terms used in a body of literature and how they are interconnected.[5] **Figure 2** shows the co-occurrence network of terms extracted from the titles, abstracts, keywords, and keywords plus (additional keywords generated by Web of Science based on the titles and abstracts) of the 142 articles identified by our query. This network provides insight into the main topics discussed and their relationships across the literature. The co-occurrence network reveals two major research areas within military expenditure studies. One area explores military expenditure as an independent variable, primarily examining its impact on economic growth (centred around the term "economic growth"). The other area focuses on military expenditure as a dependent variable, concentrating on models of the demand for military expenditure (centred around the term "demand").

[4] I conducted and advanced search in all fields for ("demand for" OR "determinants of") AND ("military expenditure" OR "military spending" OR "defense expenditure" OR "defense spending" OR "defence expenditure" OR "defence spending") totalling 157 results. We included only documents of the type "Article" (resulting in 146 articles) and language "English" (142 articles). The query can be accessed at < https://www.webofscience.com/wos/woscc/summary/a227ff70-5bea-48ca-86d8-77e942a9a661-0107bdf355/relevance/1> Last accessed on September 12th, 2024.

[5] Batagelj and Cerinšek, "On Bibliographic Networks"; Aria and Cuccurullo, "Bibliometrix."

Figure 2. Keywords Plus Co-occurrence Network



Note: 2 I did the graph using the "bibliometrix" package in R (v. 4.4.1) with data from Web of Science Core Collection. We chose the Fruchterman & Reingold layout algorithm.

Within this latter area, there are two main strands of empirical research: one uses arms race models to analyse the relationship between military expenditure and conflict between states, while the other focuses on the relationship between military expenditure and a range of economic, political, and strategic factors.[6] This research contributes to the second strand by including violence between non-state groups into models of the demand for military expenditure in Latin America.

At the international level, interstate disputes, international alliances, arms races, and foreign aid are the main factors associated with military expenditure. Historically, interstate disputes, such as unresolved territorial claims, historical enmities and strategic rivalries, have been the primary concern for armed forces. These disputes can lead to larger military expenditure as governments often increase investment in their military in response to ongoing or potential conflicts with other states.[7]

A country's membership in international alliances can further influence their military spending patterns. For example, NATO members are expected to contribute to collective defence efforts, which can lead to increased military expenditure within countries. Conversely, some members might "free ride" on the spending of their allies and reduce their military investments.[8]

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[6] Dunne and Perlo-Freeman, "The Demand for Military Spending in Developing Countries:"; Dunne, Perlo-Freeman, and Smith, "The Demand for Military Spending in Developing Countries."

[7] Smith, "The Demand for Military Expenditure"; Smith, "Models of Military Expenditure"; Refenes, Kollias, and Zapranis, "External Security Determinants of Greek Military Expenditure:"; Dunne and Perlo-Freeman, "The Demand for Military Spending in Developing Countries:"; Kollias and Paleologou, "Domestic Political and External Security Determinants of the Demand for Greek Military Expenditure"; Dunne, Perlo-Freeman, and Smith, "The Demand for Military Spending in Developing Countries"; George, Hou, and Sandler, "Asia-Pacific Demand for Military Expenditure"; George and Sandler, "African Union Defense Demand and Spatial Spillovers."

[8] Palmer, "Alliance Politics and Issue Areas"; George and Sandler, "Demand for Military Spending in NATO, 1968–2015."

In addition, arms races, characterized by the competitive buildup of military capabilities among rival states, can lead to increased military spending as governments seek to surpass each other.[9] Besides, foreign aid can drive military expenditure up by providing additional financial resources to recipient countries, which can be allocated to bolster their military budgets.[10]

At the domestic level, internal violence, economic growth, and democracy levels are key factors associated with military expenditure. The decline in interstate conflicts in the post-Cold War era has allowed for a greater focus on internal security issues. Early research primarily examined the relationship between military expenditure and civil wars, often using *dummy* variables to indicate the presence of conflict between the government of a country and an insurgent group in a given country-year observation.[11] More recently, scholars have started to explore the relationship between military expenditure and a broader range of measures of internal violence. For example, previous research has used intentional homicide rates to operationalize criminal violence in Latin America.[12] There is also an emerging body of literature concentrating on more organized forms of violence.[13]

Economic factors, such as economic growth, can provide governments with the resources to increase military spending, as expanding economies often lead to larger budgets and more flexibility in expenditure.[14] Nonetheless, previous studies have found that "in developing countries, economic conditions are not the most important determinant of military burden."[15]

Political factors are also relevant. As countries become more democratic, they usually exhibit lower military expenditure, both because decisionmakers are accountable to the broader public, which tends to prioritize social spending over military investment, as well as because democracies are less likely to go to war than autocracies, which further contributes to reduced military expenditure.[16] Furthermore, within democratic systems, the form of government matters. Presidential democracies, where the executive has substantial control over defence policymaking, often allocate more funds to the military compared to parliamentary democracies, where such decisions are often subject to broader scrutiny and compromise.[17] However, military influence in politics complicates this dynamic. In many Latin American countries, even as democratization advances, the military remain influent in national politics and this influence often results in increased military expenditure.[18]

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[9] Smith, Dunne, and Nikolaidou, "The Econometrics of Arms Races"; Smith and Tasiran, "The Demand for Arms Imports"; Collier and Hoeffler, "Unintended Consequences"; Dunne, Perlo-Freeman, and Smith, "The Demand for Military Expenditure in Developing Countries," August 2008.
[10] Collier and Hoeffler, "Unintended Consequences."
[11] Dunne and Perlo-Freeman, "The Demand for Military Spending in Developing Countries."
[12] Kollias et al., "The Demand for Military Spending in Latin American Countries."
[13] George, Hou, and Sandler, "Asia-Pacific Demand for Military Expenditure"; George and Sandler, "African Union Defense Demand and Spatial Spillovers."
[14] Looney and Frederiksen, "Economic Determinants Of Latin American Defense Expenditures"; Smith, "Models of Military Expenditure."
[15] Dunne and Perlo-Freeman, "The Demand for Military Spending in Developing Countries," 462.
[16] Brauner, "Military Spending and Democracy."
[17] Albalate, Bel, and Elias, "Institutional Determinants of Military Spending."
[18] Bove and Nisticò, "Military in Politics and Budgetary Allocations."

Based on the literature review, I build a model for military expenditure in Latin America as the dependent variable and internal violence, interstate disputes, foreign aid, economic growth, democracy levels, and military involvement in politics as covariates. In the next section, I present the data chosen to operationalize the variables and the method used for the analysis.

3. Data and methodology

What is the relationship between military expenditure and internal violence? To answer this question, I employ a multimethod approach, combining regression analysis with case studies. First, I use regression analysis to summarize the relationship between our measures of military expenditure and internal violence, while adjusting for other factors previous studies have related to military expenditure Latin America. Second, the regression results guide the case selection for the case studies, which aim at improving the model and enhancing its accuracy by searching for omitted variables that can account for the errors of the estimations.[19]

I have collected unbalanced data for 10 Central and South American countries, namely Bolivia, Brazil, Colombia, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Paraguay, and Peru, from 1989 to 2015.[20] The sample includes countries with different patterns of domestic military deployment. While in Bolivia, Brazil and Peru, the armed forces are deployed in operations with clear geographical and temporal limitations, in Colombia, Ecuador, El Salvador, Honduras, and Mexico they are more systematically involved in domestic missions.[21] There are an average of 24.8 observations per country, with a minimum of 19 observations and a maximum of 26. The fact that the time dimension is larger than the number of countries (N<T) informs the selection of the regression bias correction method.

3.1. Dependent variable

3.1.1. Military expenditure as a share of GDP

The dependent variable is military expenditure as a share of GDP, collected from the Stockholm International Peace Research Institute (SIPRI)'s Military Expenditure Database.[22] SIPRI's military expenditure data includes all current and capital spending on the armed forces (including peacekeeping forces), defense ministries, government agencies involved in defense projects, paramilitary forces equipped for military operations, and military space activities. This encompasses costs related to

[19] Lieberman, "Nested Analysis as a Mixed-Method Strategy for Comparative Research"; Seawright, "Better Multimethod Design"; Seawright, *Multi-Method Social Science*.
[20] The time spam of the regression analysis is limited backwards in time by the Uppsala Conflict Data Program's Country-Year Dataset on Organized Violence within Country Borders, v. 24.1, which starts only in 1989; and forward in time by the Correlates of War Project's Militarized Interstate Dispute (MID) Data, v.5.0, which extends only as far as 2014.
[21] Flores-Macías and Zarkin, "The Militarization of Law Enforcement."
[22] "SIPRI Military Expenditure Database."

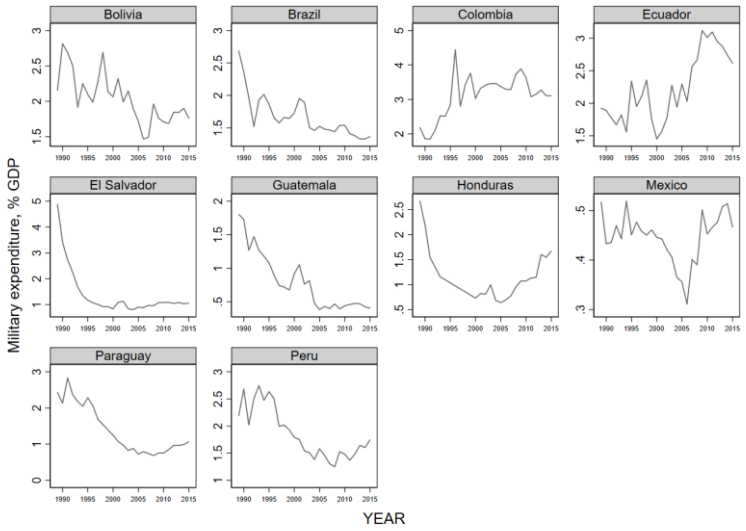
personnel, operations, maintenance, procurement, research and development, infrastructure, and military aid (in the military expenditure of the donor country).[23] I use a lead value of this variable (t+1) in our regression analysis to address possible endogeneity bias.

Nonetheless, SIPRI military expenditure data faces some validity, reliability, and comparability issues that should be acknowledged. Governments themselves produce military expenditure data, which could be a source of bias. SIPRI applies a standard definition to military expenditure, but acknowledges that due to data limitations, adherence to this definition can be challenging. Besides, the data represents an input measure, i.e. the funds allocated to the military, rather than an output measure of military capabilities. For any given value of military expenditure, the associated military capabilities are influenced by several other factors, such as the cost of weapons, equipment maintenance, logistics, leadership, morale, and training.[24] Besides, we note that, in Latin America, a large share of military expenditure is allocated to personnel costs, including both current wages and pensions of retired military staff.

Figure 3 plots military expenditure as a share of GDP for each country over the years. In Bolivia, military expenditure fluctuated between 1.5% and 3% of GDP in the 1990s, gradually declining to stabilize around 1.5% by 2015. Brazil's spending dropped from about 2.5% in the early 1990s to 1.5% after 2005, with minor fluctuations in the 2010s. Colombia saw a sharp rise in the mid-1990s, peaking above 4% in 2002, before settling around 3.5% by 2010. Ecuador's spending gradually rose in the 1990s, peaking above 3% in 2010, before falling slightly by 2015. El Salvador experienced a steep decline from nearly 5% in the 1990s to about 1%, remaining low after 2000. Guatemala's military spending dropped sharply from 2% in the early 1990s to 0.5% by the mid-2000s, maintaining a low level thereafter. Honduras saw a decline from about 2.5% in the 1990s to 0.5% by 2005, followed by a rise to 1.5% by 2015. Mexico's expenditure was stable between 0.4% and 0.5% until the mid-2000s, increasing slightly to 0.5% by 2015. Paraguay's spending gradually decreased from 3% in the early 1990s to about 1.5% by the 2010s. Peru's expenditure peaked around 2.5% in the mid-1990s, declined, and then rose slightly after 2010, nearing 2% by 2015. These trends reflect diverse national contexts, with some countries experiencing steady declines in military expenditure, while others saw an increase.

[23] Perlo-Freeman, "SIPRI's New Long Data-Set on Military Expenditure."
[24] Smith, "Military Expenditure Data."

Figure 3. Military expenditure as a share of GDP, per country, 1989-2015



Note: 3 I did the graphs using Stata (v. 15.1) and data from SIPRI's Military Expenditure Database 1948-2023

3.2. Independent variables

3.2.1. Measuring internal violence

There is a considerable variety of internal security challenges that Latin American governments face, ranging from common crime to insurgencies. I focus on insurgent movements and organized crime groups, because they are the most "widespread and lethal" in the region.[25]

Insurgent movements seek to replace a country's economic and political system. They typically employ violence to create instability and to challenge state power. Examples of such movements include *Fuerzas Armadas Revolucionarias Colombianas* (FARC) and *Ejército de Libertación Nacional* (ELN) in Colombia, which have employed guerrilla tactics extensively. In El Salvador, *Frente Farabundo Martí de Libertación Nacional* (FMLN) initially engaged in armed struggle before transitioning to political means after peace agreements. Similarly, *Unidad Revolucionaria Nacional Guatemalteca* (UNRG) in Guatemala and the *Ejército Zapatista de Liberación Nacional* (EZLN) in Mexico began with armed rebellion but later became political parties. In Peru, *Sendero Luminoso* (Shining Path) and the *Movimiento Revolucionário Tupac Amaru* (MRTA) employed extreme violence, including bombings and massacres, to disrupt the government.

Organized crime groups are primarily motived by economic gain and use violence to secure control over the illicit trade of goods and services, resources, and territory. Examples range from criminal gangs such as the Central American *maras*, for example *Mara Salvatrucha* (MS-13), drug trafficking organizations (DTOs) like the Mexican Sinaloa and Jalisco New Generation *cárteles*, as well as other transnational criminal organizations (TCOs) involved in cross-border smuggling of arms,

[25] Pion-Berlin, *Military Missions in Democratic Latin America*, 75.

contraband and people. Some organized crime groups, such as Brazilian *facções* like *Comando Vermelho* (CV) and *Primeiro Comando da Capital* (PCC), further complicate these distinctions, as they operate across multiple areas of illicit activity.[26]

I operationalize internal violence as the number of fatalities in violent events involving a non-state group within the borders of a country in a given year. I limit the analysis to the physical, fatal dimension of violence, as it is more easily quantifiable. The original data was collected from the Uppsala Conflict Data Program (UCDP)'s Country-Year Dataset on Organized Violence within Country Borders, v. 24.1.[27] More specifically, I use the sum of the number of fatalities per 100,000 due to intrastate violence, non-state violence, and one-sided violence by a non-state group. I use the natural logarithm of this variable to ease the interpretation of the regression results.

It is important to note that any actors, governments or non-state groups, are included in the UCDP dataset after they cross a threshold of 25 fatalities in a calendar-year. Once they have crossed the threshold, the number of fatalities in conflicts involving the actor is listed in the following years, even if the number of fatalities does not exceed 25.[28] However, fatalities below 25 in years prior to having crossed the threshold are not included.[29]

While previous research has often operationalized internal violence as the rate of intentional homicides per 100,000 people, this metric encompasses a wide range of isolated events that may not reflect the organized and sustained nature of violence against which governments engage their armed forces.[30] UCDP's data on organized violence focuses on larger-scale and more systematic events, arguably offering a more accurate reflection of the type of violence against which governments engage their armed forces.

Non-state conflicts are generally less lethal than state-based armed conflicts, as states possess greater resources, weaponry, and training. Most non-state conflicts result in fewer than 100 fatalities annually, with an average of 228 deaths per year.[31] However, violence between organized crime groups in Mexico, such as the Sinaloa and Jalisco New Generation *cartéles*, stand out as exceptions, as their access to high-caliber weapons and advanced technology makes these conflicts extremely deadly. For

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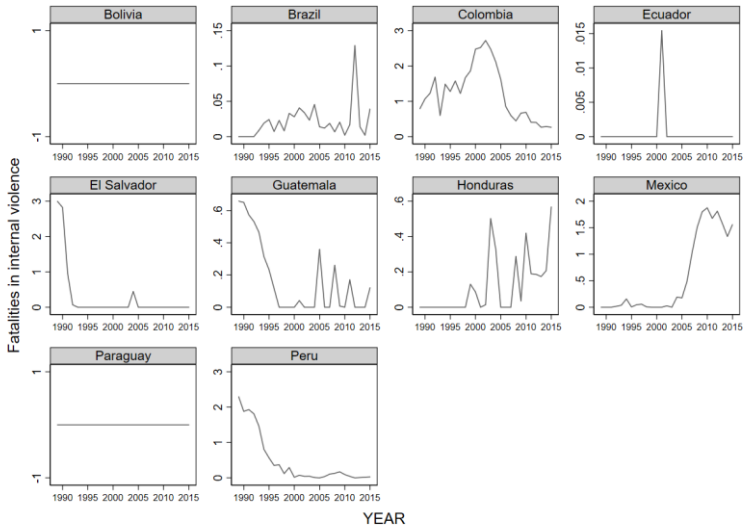
[26] Pion-Berlin, *Military Missions in Democratic Latin America*.
[27] Davies et al., "Organized Violence 1989–2023, and the Prevalence of Organized Crime Groups.". Data on total population was collected from the World Bank's World Development Indicators "World Development Indicators, The World Bank.".
[28] Davies et al., "Organized Violence 1989–2023, and the Prevalence of Organized Crime Groups."
[29] See the Annex 1-3 for lists of all violent events included in the coding of this variable. Importantly, I excluded the 150 fatalities in intrastate violence between the Government of Paraguay and the forces of Andres Rodriguez in 1989 since it was a military coup. Besides, I recoded the 4,924 fatalities in intrastate violence between the Government of El Salvador and the Frente Maribundo Martí de Libertación Nacional (FMLN) as 1,000 fatalities to address an outlier observation that could bias the regression estimates; even after recoding it is the most extreme observation when measured as fatalities per 100,000 population. I also excluded the observations for violence between non-state groups in Bolivia and Ecuador that refer to events between groups of native people (in Bolivia, there were conflicts between the Laime and Qaqachac in 1998 and 2000; in Ecuador, there was a conflict between the Huaorani and Tagaeri in 2003).
[30] Kollias et al., "The Demand for Military Spending in Latin American Countries.".
[31] Davies et al., "Organized Violence 1989–2023, and the Prevalence of Organized Crime Groups."

example, in 2010, Mexico registered 6,122 total fatalities due to violence between non-state groups, stemming from multiple incidents.

Figure 4 displays the natural logarithm of number of fatalities per 100,000 population resulting from intrastate (government vs non-state group), non-state (non-state versus non-state group), and one-sided non-state violence for the sampled countries from 1989 to 2015.

In Bolivia, the fatality rate remains consistently low and nearly flat across the entire period, indicating a stable internal security situation. Brazil shows a steady increase in fatalities starting from the mid-1990s, peaking around 2010 with a sharp rise in violence before slightly declining by 2015, associated to conflicts between organized crime groups for control over territories and illicit markets. Colombia experienced a marked increase in fatalities during the late 1990s, reaching a peak around 2002, before a significant decline after 2005, attributed to improvements in demobilization efforts against insurgent groups. Ecuador shows a brief spike around 2000, due to a conflict between the Government of Colombia and the FARC which took place in its territory, with otherwise negligible levels of fatalities throughout the period. In El Salvador, fatalities sharply declined from a high in the early 1990s, dropping to nearly zero by the mid-1990s, remaining low up until 2015, even though gang violence later threatened this stability. Guatemala shows a similar trend, with fatalities dropping significantly from the early 1990s, reaching a stable low level by the 2000s, despite ongoing challenges from drug trafficking and gangs. Honduras experienced an upward trend in fatalities starting in the late 1990s, with considerable volatility, peaking around 2015, largely driven by gang violence and organized crime. Mexico shows relatively stable fatality levels until the mid-2000s, when violence escalates sharply, peaking around 2010, reflecting the intensification of organized crime and drug-related violence. Paraguay remains consistently flat throughout the period, with no significant fluctuations in fatalities, indicating a relatively stable environment despite the presence of organized crime groups. Peru shows a steep decline from a high level of violence in the early 1990s, related to internal conflict, tapering off by the early 2000s with fatalities stabilizing at low levels thereafter.

Figure 4. Internal violence, natural logarithm of fatalities per 100,000 population, per country, 1989-2015



Note: 4 I did the graphs using Stata (v. 15.1) and data from UCDP's Country-Year Dataset on Organized Violence within Country Borders (v. 24.1)

3.2.2. Adjusting for multicausality

Furthermore, I control for both international and domestic factors that have been theoretically and empirically linked to military expenditure in Latin America by previous research, including interstate disputes, foreign aid, economic growth, democracy levels, and military involvement in politics.[32]

I expect interstate disputes to positively influence military expenditure because such disputes drive countries to enhance their military capabilities. I gathered data on interstate disputes from the Correlates of War (CoW) project Militarized Interstate Dispute (MID) Data, v. 5.0. Each dispute is categorized into five "hostility levels": (1) no militarized action, (2) threat to use force, (3) display of force, (4) use of force and (5) war.[33] The measure of militarized interstate dispute corresponds to the highest score for hostility level registered for a dispute in which a country was involved in a given year.

I operationalize foreign aid as the value of U.S. military assistance, per capita. I expect that U.S. military assistance will lead to an increase in military expenditure in Latin American countries, as it provides additional financial resources to be allocated to recipient countries' military budgets. The original data on the value of gross military obligations in constant 2019 U.S. dollars was collected from the U.S. Agency for International Development (USAID)'s Greenbook.[34]

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[32] Looney and Frederiksen, "Economic Determinants Of Latin American Defense Expenditures"; Smith, "Models of Military Expenditure"; Dunne and Perlo-Freeman, "The Demand for Military Spending in Developing Countries"; Dunne, Perlo-Freeman, and Smith, "The Demand for Military Expenditure in Developing Countries," August 2008; Kollias et al., "The Demand for Military Spending in Latin American Countries."
[33] Palmer et al., "The MID5 Dataset, 2011–2014."
[34] "U.S. Overseas Loans and Grants: Obligations and Loan Authorizations, July 1, 1945–September 30, 2019."

I expect economic growth to positively influence military expenditure, since increased resources should allow governments to allocate more funds to all sectors. Nonetheless, some studies have found no significant relationship between the variables in developing countries.[35] I collected data on the percentage of annual GDP growth from the World Bank's World Development Indicators.[36]

I expect higher levels of democracy to negatively influence military expenditure because democratic governments tend to prioritize social spending and are less likely to engage in military conflicts. Our measure of democracy is based on the Varieties of Democracy (v. 13) electoral democracy index, which takes into account freedom of association, clean elections, freedom of expression, elected officials and suffrage.[37]

In contrast, I expect military involvement in politics to positively influence military expenditure, because military officials in positions of political power are likely to advocate for more resources for their institutions. I operationalize military involvement in politics as the number of cabinet ministers with a military title, with data drawn from The WhoGov Dataset, v. 2.0.[38]

Table 1 reports the descriptive statistics of all variables. Appendix A1-7 report histograms of each variable by country.

Table 1. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Military expenditure, % GDP	263	1.622	0.896	0.311	4.872
Internal violence, log. of fatalities per 100,000 pop.	270	0.285	0.605	0.000	2.994
Militarized interstate dispute, hostility level	260	0.546	1.253	0.000	4.000
U.S. military assistance, per capita	264	1.291	2.722	0.000	26.791
GDP growth (%)	270	3.350	2.777	-12.312	12.308
Electoral Democracy Index	270	6.088	1.465	1.930	8.770
N. of cabinet ministers with military titles	270	0.719	1.025	0.000	4.000

Note: 5 We did the table using Stata (v. 15.1)

3.3. Regression analysis

I use regression analysis to summarize the relationship between the observed variables, rather than to make causal claims. This is because I cannot claim to have accounted for every factor causing both military expenditure and non-state violence, and the sampled countries were not randomly selected for treatment and control groups, but rather chosen based on data availability for the period under study. Consequently, "all inferences of interest are conditional on the observed units" rather than an underlying population, as often is the case for analysis with time series cross section (TSCS) data.[39]

[35] Dunne and Perlo-Freeman, "The Demand for Military Spending in Developing Countries."
[36] "World Development Indicators, The World Bank."
[37] Teorell et al., "Measuring Electoral Democracy with V-Dem Data: Introducing a New Polyarchy Index."
[38] Nyrup and Bramwell, "Who Governs?"
[39] Beck, "Time-Series-Cross-Section Data," 273.

Researchers are often interested in the relationship between the dependent and independent variables within countries over time, because this within-country variation can be influenced by informed public policies. In contrast, between-country variation is usually due to contextual factors, such as geography (e.g. country size) or historical influences (e.g. colonial heritage).[40] To assess the within-country relationship between these variables, most researchers estimate their models using unit fixed effects. This approach can be implemented by either including country *dummies* or centering the variables (i.e. subtracting the country mean of each observation) to isolate within-country variation and eliminate all between-country variation from the estimation. Even though the fixed effects estimator is consistent, it effectively controls context out, instead of explicitly modelling it. To address this limitation, researchers can split the covariates into within- and between-country components and fit the model using random effects.[41]

The within-country formulation of the variable is its centered value, whereas the between-country formulation is the average value of a variable for a given country. Splitting the covariates into within- and between-country components ensures that the assumption of no correlation between covariates and residuals holds, thus allowing the estimation of the model using random effects.[42] The combination of this "within-between" formulation of the covariates and random effects estimation allows for more reliable predictions for TSCS data with repeated measures of countries, "regardless of the result of a Hausman test."[43] The Hausman test assesses if the difference between fixed and random effects coefficients are systematic, i.e. the similarity of within- and between-country coefficients. A properly specified random effects model will yield identical within-country results to a fixed effects model, in addition to between-country estimates.

The variables are stationary according to the results of the Fisher-type unit-root tests based on Phillips-Perron tests.[44] Nevertheless, we must address possible sources of bias associated with TSCS data. Specifically, heteroscedasticity, autocorrelation, and cross-sectional dependence of the errors can bias the results. The result of the modified Wald test for groupwise heteroskedasticity indicates this is an issue in our estimations.[45] Similarly, the result of the Wooldridge test for autocorrelation in panel data indicate there is first order autocorrelation.[46] The result persists even after adding a lagged

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[40] Mummolo and Peterson, "Improving the Interpretation of Fixed Effects Regression Results."
[41] Bell and Jones, "Explaining Fixed Effects."
[42] Bell and Jones.
[43] Bell and Jones, 144.
[44] Arltová and Fedorová, "Selection of Unit Root Test on the Basis of Length of the Time Series and Value of AR(1) Parameter."
[45] Modified Wald test for groupwise heteroskedasticity in fixed effect regression model:
H0: sigma(*i*)^2 = sigma^2 for all *i*
chi2(10) = 909.97
Prob > chi2 = 0
[46] Wooldridge test for autocorrelation in panel data (without a lagged dependent variable):
H0: no first order autocorrelation
F(1, 9) = 4.999
Prob > F = 0.0522

dependent variable (LDV).[47] Consequently, to avoid estimating biased coefficients, we do not include a LDV in our model.[48] Additionally, the Breusch-Pagan statistic for cross-sectional independence in the residuals of a panel data regression model indicates there is cross-sectional dependence.[49]

I address these sources of bias using Driscoll-Kraay standard errors, which produce heteroskedasticity-consistent standard errors that are robust to both cross-sectional dependence and serial correlation, up to some lags.[50] Driscoll and Kraay's methodology applies a Newey-West type correction to the sequence of cross-sectional averages of the moment conditions, using a weighted average of autocovariance estimates to smooth the covariance matrix and ensure robustness across both spatial and temporal dimensions. I use the user-written Stata package "xtscc" to estimate generalized least squares random effects regressions with Driscoll-Kraay standard errors.[51]

3.4. Case studies

Subsequently, I delve into case studies designed to refine our model of military expenditure in Latin America between 1989 and 2015. The regression results guide the case selection. This integrative approach to multimethod analysis aims at improving the model and enhancing its accuracy, which can be done by searching for omitted variables, validating the measurement of included variables, and evaluating the plausibility of the hypothesized causal path.[52]

We focus on "deviant" cases, or outliers, which are cases poorly explained by our model. They are particularly useful to search for omitted variables. The goal of "deviant" case studies is to identify a factor that can account for our models' residuals and that can be precisely measured as a variable (or variables) across our cases. Including such variable should enhance the model's accuracy.[53]

4. Results

I regressed the lead (t+1) value of military expenditure as a share of GDP on both within- and between-transformed values of the measures of internal violence, interstate dispute, foreign aid, democracy

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[47] Wooldridge test for autocorrelation in panel data (with a lagged dependent variable):
H0: no first order autocorrelation
F(1, 9) = 10.561
Prob > F = 0.0100

[48] "If the model residuals exhibit significant autocorrelation, the LDV is inappropriate without at least some change in specification, if not a change in estimator." Keele and Kelly, "Dynamic Models for Dynamic Theories," 203.

[49] Breusch-Pagan LM test of independence:
H0: no cross-sectional dependence
chi2(45) = 177.321
Pr = 0
Based on 18 complete observations over panel units

[50] Driscoll and Kraay, "Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data."

[51] Hoechle, "Robust Standard Errors for Panel Regressions with Cross-Sectional Dependence."

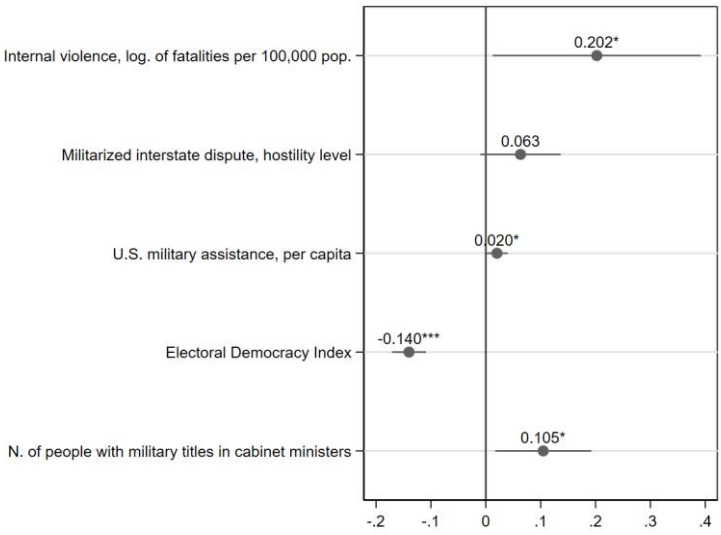
[52] Lieberman, "Nested Analysis as a Mixed-Method Strategy for Comparative Research"; Seawright, "Better Multimethod Design"; Seawright, *Multi-Method Social Science*.

[53] Seawright and Gerring, "Case Selection Techniques in Case Study Research."

levels, and military involvement in politics, using generalized least squares random effects and Driscoll-Kraay standard errors.[54] **Figure 5** displays the results for the within-country relationship between military expenditure and the included variables, while **Figure 6** displays the results for the between-country relationship between the variables. The plots are split for easier reading, but they refer to the same model fit. Appendix A8 reports the full regression table, Appendix A9 displays the diagnostic plots, and Appendix A10 presents the results of Leave-One-Out Cross-Validation, which evaluates the model's predictive accuracy.

Figure 5 displays the coefficients and 90% confidence intervals estimated for the within-formulation of the covariates. The plotted coefficients summarize the relationship between military expenditure and the covariates within the countries. The coefficient for the natural logarithm of the number of fatalities per 100,000 population in internal organized violence indicates how a one percent increase in the independent variable is associated with a change in military expenditure as a share of GDP, on average, within the sampled countries, holding all the other included variables constant. The coefficients for the control variables indicate how a one unit increase in the independent variable is associated with a change in military expenditure as a share of GDP, on average, within the sampled countries, holding all the other included variables constant.

Figure 5. Random Effects with Driscoll-Kraay Standard Errors (Within-Country Formulation)



Note: 6 Observations = 248; Countries = 10; Overall R^2 = 0.802. The dependent variable is the lead (t+1) value of military expenditure as a share of government expenditure. Maximum lag: two. The plot reports 90% confidence intervals. *** indicate statistical significance at the 1% level, ** at the 5% level and * at the 10% level. The

[54] After initially fitting the model, I excluded the measure for GDP growth because it greatly affected the variance inflation factor (VIF). High VIF values suggest that the estimated coefficients of the affected variables may be unreliable due to inflated standard errors that result from multicollinearity among covariates. The decision was based on the results of cross-validation using the LASSO (Least Absolute Shrinkage and Selection Operator) method with the LSE (Least Squares Estimator) option, and reduced the VIF to acceptable levels. The use of other measures of economic growth, such as GDP per capita growth, led to the same issue. Consequently, I focused on the remaining variables to enhance model reliability.

coefficients for the between-formulation and the constant were omitted. I ran the estimations using Stata (v. 15.1) and the user-written "xtscc" package.

The results conform to theoretical expectations. They point to positive within-country relationships between military expenditure and internal violence, interstate disputes, foreign military aid, and military involvement in politics. Conversely, they point to a negative within-country relationship between military expenditure and the electoral democracy index.

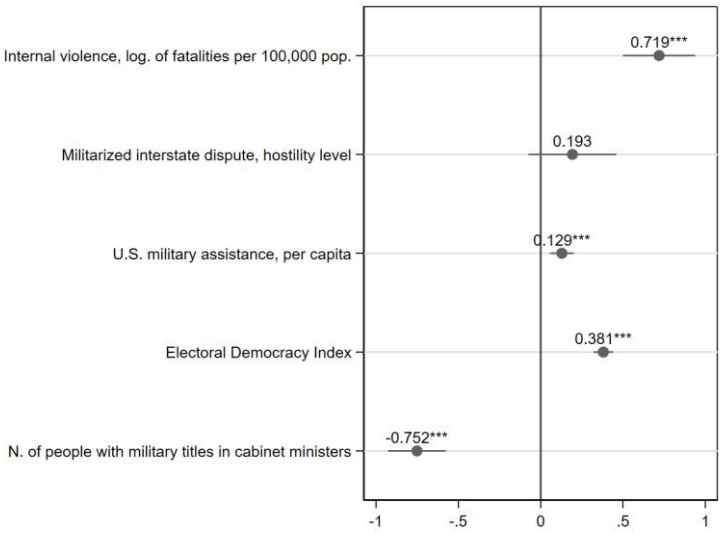
The positive coefficient (0.202; p<0.081; 90% C.I.: [0.013; 0.392]) estimated for internal violence indicates that, if the number of fatalities per 100,000 population increases by one percent within a country, military expenditure as a share of GDP will increase by 0.202%, on average, holding all the other included variables constant, with a 90% confidence interval of: [0.013%; 0.392%].

Regarding international factors, the estimated coefficient for the hostility level of militarized interstate disputes is positive (0.063; p<0.253; 90% C.I.: [-0.010; 0.137]), indicating that greater interstate hostility is associated to higher military expenditure within countries. Likewise, the positive coefficient estimated for U.S. military assistance per capita (0.020; p<0.092; 90% C.I.: [0.000; 0.040]) indicates that external military support from the U.S. is associated with increased military expenditure within recipient countries.

Regarding domestic factors, the results point to a negative relationship between military expenditure and the electoral democracy index (-0.140; p=0; 90% C.I.: [-0.171; -0.109]), indicating that as democratic governance levels increase within a country, its military expenditure decreases. In contrast, the results point to a positive relationship between military spending and the number of people with military titles in cabinet ministers (0.105; p<0.052; 90% C.I.: [0.017; 0.192]), indicating that a greater presence of military personnel in government positions is associated with increased military expenditure within countries.

Figure 6 displays the coefficients and 90% confidence intervals estimated for the between-formulation of the independent variables**.** The plotted coefficients reflect how variations in the average values of the independent variables across different countries are associated with differences in military expenditure as a share of GDP. The coefficient for the natural logarithm of the number of fatalities per 100,000 population in internal organized violence indicates how a one percent increase in average value of this variable is associated with a change in military expenditure as a share of GDP between countries, on average, holding all the other included variables constant. The coefficients for the control variables indicate how a one unit increase in the average value of the independent variable is associated with differences in military expenditure between countries, on average, holding all other included variables constant.

Figure 6. Random Effects with Driscoll-Kraay Standard Errors (Between-Country Formulation)



Note: 7 Observations = 248; Countries = 10; Overall R^2 = 0.802. The dependent variable is the lead (t+1) value of military expenditure as a share of government expenditure. Maximum lag: two. The plot reports 90% confidence intervals. *** indicate statistical significance at the 1% level, ** at the 5% level and * at the 10% level. The coefficients for the within-formulation and the constant were omitted. I ran the estimations using Stata (v. 15.1) and the user-written "xtscc" package.

The results point to positive between-country relationships regarding military expenditure and internal violence, interstate disputes, and foreign military aid. Counterintuitively, they point to a positive between-country relationship for the electoral democracy index, and to a negative relationship between military expenditure and military involvement in politics across countries.

The positive coefficient (0.719; p=0; 90% C.I.: [0.500; 0.939]) estimated for the between formulation of the measure of internal violence indicates that a one percent increase in the average number of fatalities per 100,000 population is associated with a 0,719% increase in military expenditure across countries, with a 90% confidence interval of: [0.500%; 0.939%].

The hostility level of militarized interstate disputes estimated coefficient (0.193; p<0.229; 90% C.I.: [-0.074; 0.460]) is also positive, indicating that greater interstate hostility is associated to higher military expenditure across countries. Likewise, the estimated coefficient for U.S. military assistance, per capita is positive (0.129; p<0.006; 90% C.I.: [0.056; 0.202]), indicating that increased U.S. military aid is linked to higher military expenditure across countries.

Counterintuitively, the positive relationship between military expenditure and the electoral democracy index (0.381; p=0; 90% C.I.: [0.321; 0.441]) indicates that more democratic countries allocate more resources to the military than less democratic ones. Nonetheless, more democratic countries may maintain higher military spending than their less democratic counterparts to ensure readiness against both international and domestic security challenges, as well as to fulfil international commitments, such as participation in peacekeeping missions.

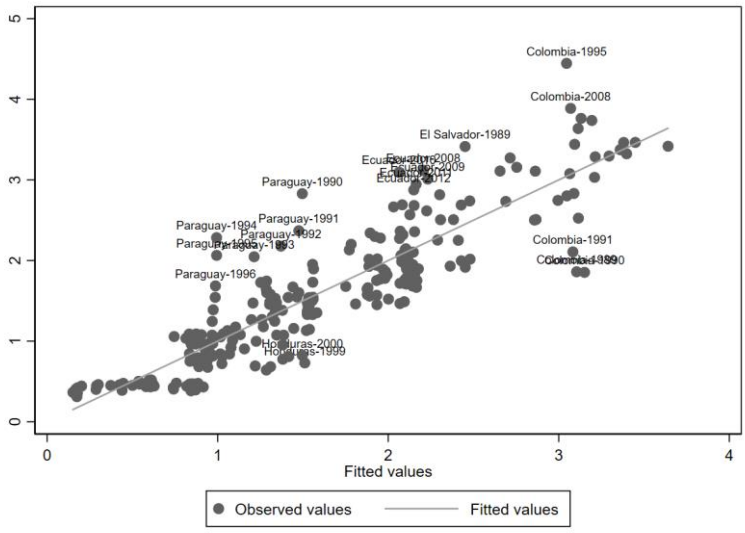
Another unexpected finding is the negative relationship between military expenditure and the number of people with military titles in cabinet ministers (-0.752; p=0; 90% C.I.: [-0.926; -0.577]),

indicating that countries with a greater presence of military personnel in government positions have lower military expenditure than their counterparts. The negative relationship can be better understood within the historical context of re-democratization in Latin America. Many of the countries in the dataset experienced transitions from military rule to civilian-led governments during the late 1980s and early 1990s, including Brazil, Guatemala, Paraguay, El Salvador, Honduras, and Peru. During this period, military officers still held prominent positions within the government as remnants of prior authoritarian regimes, but overall military expenditure was on a declining trajectory as these countries sought to reduce the influence of the military in politics and redirect resources towards social and economic development.

The next step in the analysis involves conducting case studies, with the primary objective of identifying omitted variables and improving the model. To guide case selection, I identified outliers by examining the regression residuals, which represent the difference between actual military expenditure and the values estimated by the model. I defined outliers as observations where the absolute value of the residuals exceeds 1.645 standard deviations from the mean of the residuals, corresponding to a 90% confidence interval.

Outliers are labeled in **Figure 7**. Alphabetically, they are Colombia (1989, 1990, 1991, 1995, 2008), Ecuador (2008, 2009, 2010, 2011, 2012), El Salvador (1989), Honduras (1999, 2000), and Paraguay (1990, 1991, 1992, 1993, 1994, 1995, 1996).

Figure 7. Observed *versus* fitted values, outliers labeled



Note: 8 I did the plot using Stata (v. 15.1)

7. Conclusion

Despite being free from interstate wars, Latin America faces significant security challenges posed by violent non-state groups, against which governments increasingly deploy their armed forces. This research contributes to the literature on the demand for military expenditure by investigating the relationship between of non-state organized violence within the borders of a country and the demand for military expenditure in Latin American countries.

This research builds on existing models of the demand for military expenditure and incorporates organized violence by non-state groups as a significant factor shaping the demand for our sampled countries. The key findings reveal that, within our sampled countries, military expenditure is positively associated with internal violence, interstate disputes, foreign military aid, and military influence in politics, and negatively associated with democracy levels. Between our sampled countries, military spending is greater where internal violence, interstate conflicts, and foreign military aid is greater, but also unexpectedly where democracy levels are higher. Furthermore, military spending appears to be smaller where military involvement in politics is higher, likely reflecting the late 1980s and early 1990s democratic transitions in Brazil, Guatemala, Paraguay, El Salvador, Honduras, and Peru. The analysis of the pattern of major arms imports further underscores the region's focus on deploying their armed forces on domestic missions, particularly in relation to insurgent and organized crime groups.

Many areas remain open for further research. Critically, comparative studies between Latin America and other regions with similar non-state violence dynamics could provide valuable context for these findings, revealing whether the observed patterns are unique to this region or indicative of broader global trends.

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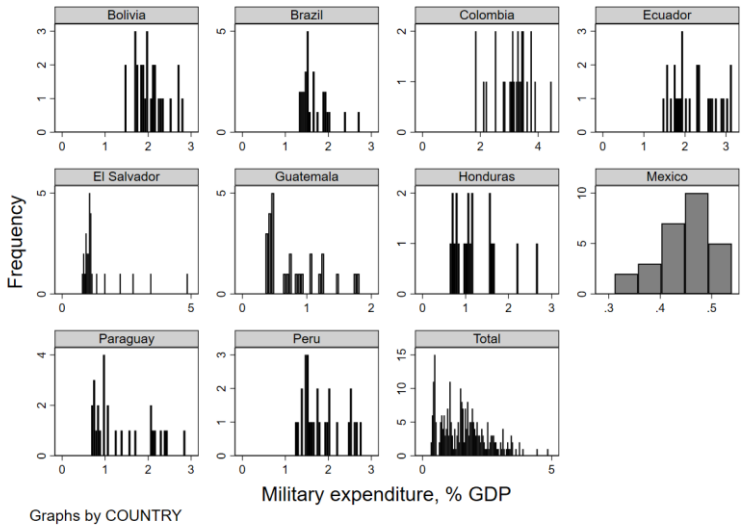
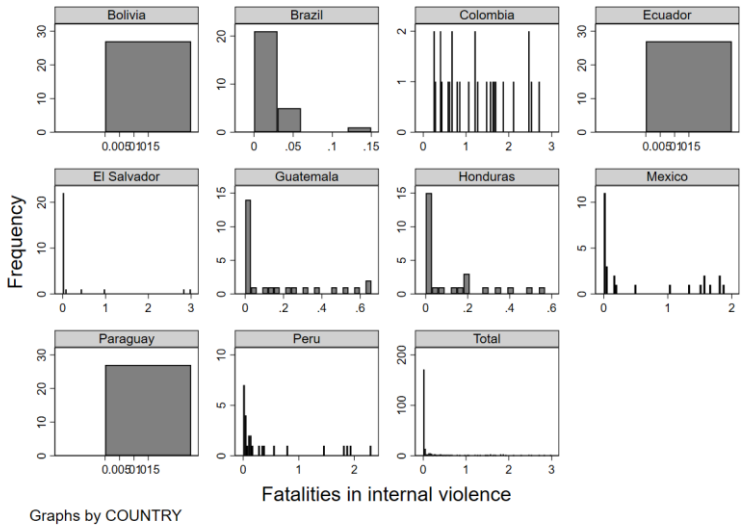
Appendix

Appendix A1. Histogram of Military Expenditure, % GDP, by country, 1989-2015



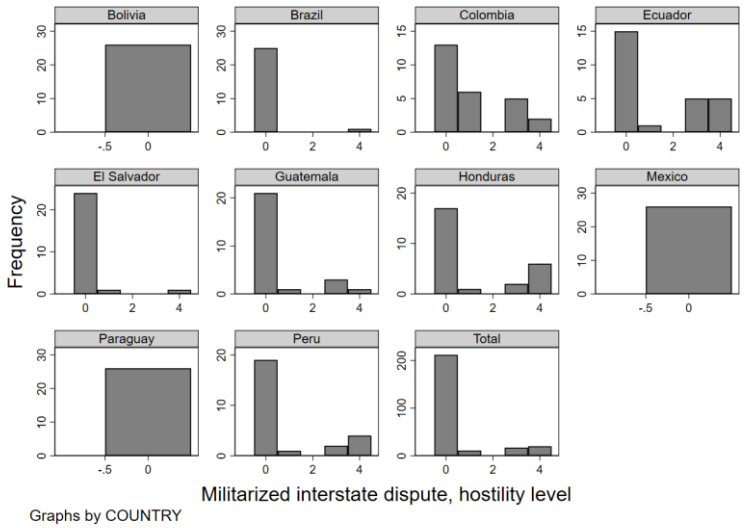
Note A1: I did the graph using Stata (v. 15.1) and data from SIPRI's Military Expenditure Database 1949–2023

Appendix A2: Histogram of Internal Violence, natural logarithm of fatalities per 100,000 pop., by country, 1989-2015



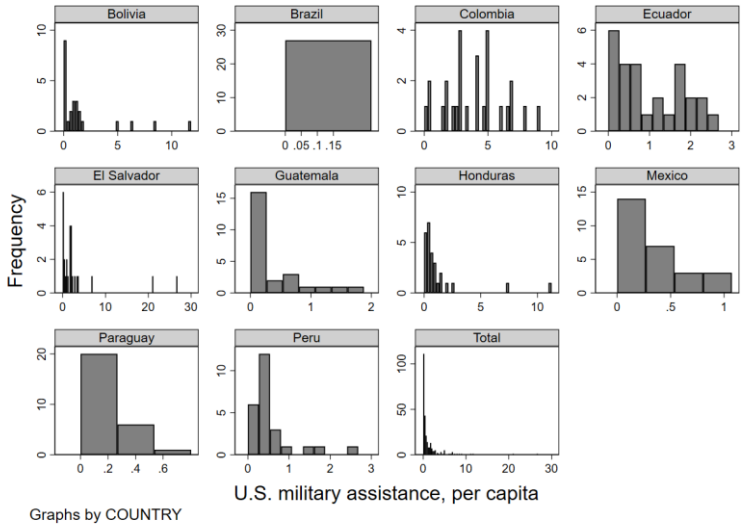
Note A2: I did the graph using Stata (v. 15.1) and data from UCDP's Country-Year Dataset on Organized Violence within Country Borders (v. 24.1)

Appendix A3. Histogram of Militarized Interstate Dispute, hostility level, by country, 1989-2015



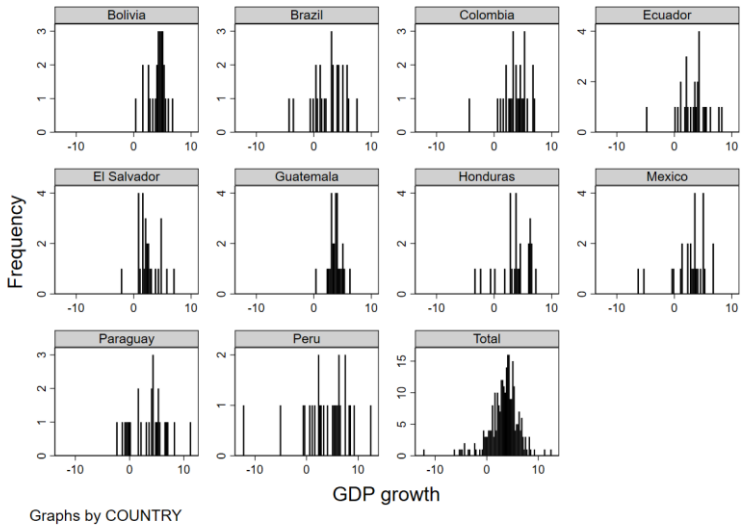
Note A3: I did the graph using Stata (v. 15.1) and data from the CoW Militarized Interstate Dispute Data (v. 5.0)

Appendix A4. Histogram of U.S. military assistance, per capita, by country (1989-2015)



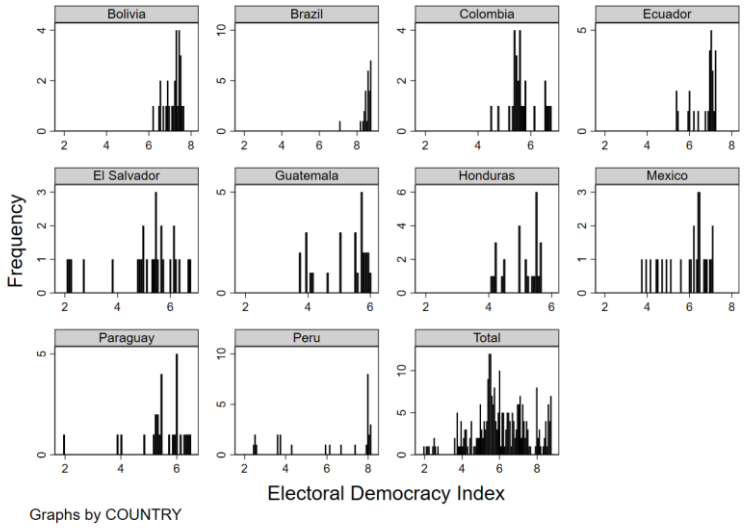
Note A4: I did the graph using Stata (v. 15.1) and data from USAID's Greenbook 1946-2019

Appendix A5. Histogram of GDP growth, by country (1989-2015)



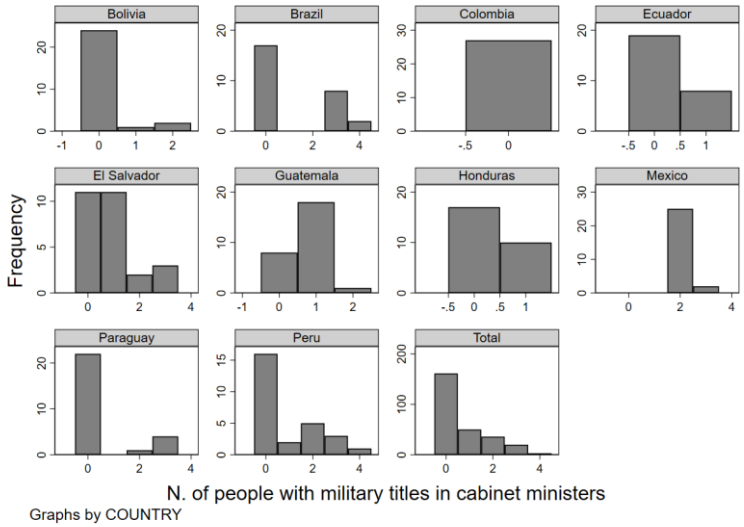
Note A5: I did the graph using Stata (v. 15.1) and data from The World Bank's World Development Indicators

Appendix A6. Histogram of Electoral Democracy Index, by country (1989-2015)



Note A6: I did the graph using Stata (v. 15.1) and data from Varieties of Democracy (v. 13).

Appendix A7. Histogram of N. of people with military titles in cabinet ministers, by country (1989-2015)



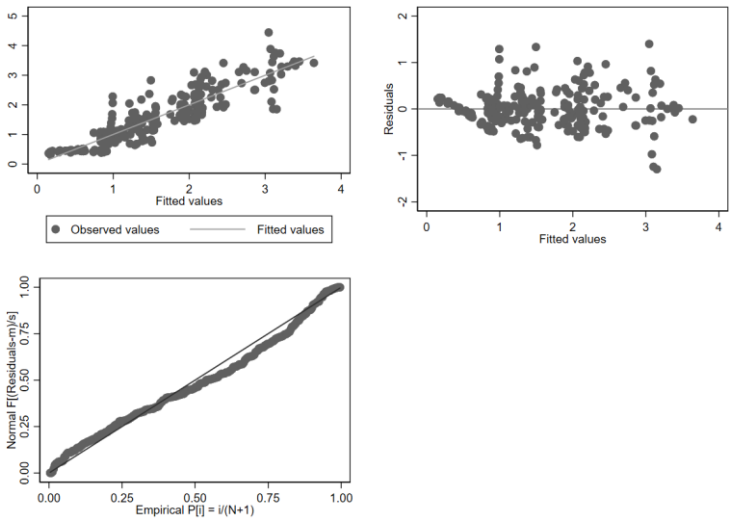
Note A7: I did the graph using Stata (v. 15.1) and data from The WhoGov Dataset (v. 2.0)

Appendix A8. Within-Between Formulation and Generalized Least Squares Random Effects with Driscoll-Kraay Standard Errors

VARIABLES	Coef.	Std.Error	P-value	90%C.I.
Within formulation				
Internal violence, log. of fatalities per 100,000 pop.	0.202	0.111	0.081	[0.013; 0.392]
Militarized interstate dispute, hostility level	0.063	0.043	0.153	[-0.010; 0.137]
U.S. military assistance, per capita	0.020	0.012	0.092	[0.000; 0.040]
Electoral Democracy Index	-0.140	0.018	0.000	[-0.171; -0.109]
N. of people with military titles in cabinet ministers	0.105	0.051	0.052	[0.017; 0.192]
Between formulation				
Internal violence, log. of fatalities per 100,000 pop.	0.719	0.128	0.000	[0.500; 0.939]
Militarized interstate dispute, hostility level	0.193	0.156	0.229	[-0.074; 0.460]
U.S. military assistance, per capita	0.129	0.043	0.006	[0.056; 0.202]
Electoral Democracy Index	0.381	0.035	0.000	[0.321; 0.441]
N. of people with military titles in cabinet ministers	-0.752	0.102	0.000	[-0.926; -0.577]
Constant	-0.669	0.393	0.101	[-1.341; 0.003]
Observations			248	
Number of countries			10	
Overall R^2			0.802	
σe			0.366	

Note A8: The dependent variable is the lead (t+1) value of military expenditure as a share of government expenditure. Maximum lag: two. I ran the estimations in Stata (v. 15.1) using the user-written 'xtscc' package.

Appendix A9. Diagnostic plots



Note A9: I did the plots using Stata (v. 15.1)

Appendix A10. Leave-One-Out Cross-Validation Results

Method	Value
Root Mean Squared Errors	0.40967356
Mean Absolute Errors	0.2998378
Pseudo-R2	0.78289837

Note A10: I ran the estimations in Stata (v. 15.1) using the user-written ‘loocv’ package.

Annex

Annex 1 List of dyads involved in intrastate violence

Country	Year	Dyad	Total fatalities
Colombia	1989	Government of Colombia - ELN; Government of Colombia - EPL; Government of Colombia - FARC	238
Colombia	1990	Government of Colombia - ELN; Government of Colombia - EPL; Government of Colombia - FARC	501
Colombia	1991	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	731
Colombia	1992	Government of Colombia - ELN; Government of Colombia - FARC	1479
Colombia	1993	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	186
Colombia	1994	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	1132
Colombia	1995	Government of Colombia - ELN; Government of Colombia - FARC	823
Colombia	1996	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	1195
Colombia	1997	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	561
Colombia	1998	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	940
Colombia	1999	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	1375
Colombia	2000	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	1870
Colombia	2001	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	1879
Colombia	2002	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	3392
Colombia	2003	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	2090
Colombia	2004	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	1355
Colombia	2005	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	1403
Colombia	2006	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	508
Colombia	2007	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	329
Colombia	2008	Government of Colombia - ELN; Government of Colombia - FARC	219
Colombia	2009	Government of Colombia - ELN; Government of Colombia - FARC	388
Colombia	2010	Government of Colombia - ELN; Government of Colombia - FARC	419
Colombia	2011	Government of Colombia - FARC	202
Colombia	2012	Government of Colombia - FARC	211
Colombia	2013	Government of Colombia - ELN; Government of Colombia - FARC	140

Colombia	2014	Government of Colombia - ELN; Government of Colombia - FARC	141
Colombia	2015	Government of Colombia - ELN; Government of Colombia - EPL - Megateo; Government of Colombia - FARC	139
El Salvador	1989	Government of El Salvador - FMLN	4924
El Salvador	1990	Government of El Salvador - FMLN	849
El Salvador	1991	Government of El Salvador - FMLN	88
El Salvador	1992	Government of El Salvador - FMLN	4
Guatemala	1989	Government of Guatemala - URNG	82
Guatemala	1990	Government of Guatemala - URNG	83
Guatemala	1991	Government of Guatemala - URNG	72
Guatemala	1992	Government of Guatemala - URNG	67
Guatemala	1993	Government of Guatemala - URNG	58
Guatemala	1994	Government of Guatemala - URNG	37
Guatemala	1995	Government of Guatemala - URNG	27
Guatemala	1996	Government of Guatemala - URNG	13
Mexico	1994	Government of Mexico - EZLN	145
Mexico	1995	Government of Mexico - EZLN	4
Mexico	1996	Government of Mexico - EPR; Government of Mexico - EZLN	43
Mexico	1997	Government of Mexico - EPR	10
Mexico	1998	Government of Mexico - EPR	6
Nicaragua	1989	Government of Nicaragua - Contras	526
Nicaragua	1990	Government of Nicaragua - Contras	39
Paraguay	1989	Government of Paraguay - Military faction (forces of Andres Rodriguez)	150
Peru	1989	Government of Peru - MRTA; Government of Peru - Sendero Luminoso	1827
Peru	1990	Government of Peru - MRTA; Government of Peru - Sendero Luminoso	1099
Peru	1991	Government of Peru - MRTA; Government of Peru - Sendero Luminoso	1138
Peru	1992	Government of Peru - MRTA; Government of Peru - Sendero Luminoso	1042
Peru	1993	Government of Peru - MRTA; Government of Peru - Sendero Luminoso	672
Peru	1994	Government of Peru - MRTA; Government of Peru - Sendero Luminoso	273
Peru	1995	Government of Peru - Sendero Luminoso	178
Peru	1996	Government of Peru - MRTA; Government of Peru - Sendero Luminoso	96
Peru	1997	Government of Peru - MRTA; Government of Peru - Sendero Luminoso	110
Peru	1998	Government of Peru - Sendero Luminoso	25
Peru	1999	Government of Peru - Sendero Luminoso	75
Peru	2000	Government of Peru - Sendero Luminoso	5
Peru	2001	Government of Peru - Sendero Luminoso	21
Peru	2002	Government of Peru - Sendero Luminoso	12
Peru	2003	Government of Peru - Sendero Luminoso	13
Peru	2004	Government of Peru - Sendero Luminoso	3

Peru	2006	Government of Peru - Sendero Luminoso	8
Peru	2007	Government of Peru - Sendero Luminoso	32
Peru	2008	Government of Peru - Sendero Luminoso	40
Peru	2009	Government of Peru - Sendero Luminoso	50
Peru	2010	Government of Peru - Sendero Luminoso	28
Peru	2011	Government of Peru - Sendero Luminoso	12
Peru	2013	Government of Peru - Sendero Luminoso	3
Peru	2014	Government of Peru - Sendero Luminoso	6
Peru	2015	Government of Peru - Sendero Luminoso	9

Source: 1 Data from the Uppsala Conflict Data Program's Country-Year Dataset on Organized Violence within Country Borders, v. 24.1

Annex 2 List of dyads involved in non-state violence

Country	Year	Dyad	Total fatalities
Brazil	1993	Comando Vermelho - Terceiro Comando	13
Brazil	1994	Comando Vermelho - Terceiro Comando	28
Brazil	1995	Comando Vermelho - Terceiro Comando	40
Brazil	1996	Comando Vermelho - Terceiro Comando	12
Brazil	1997	Barriga gang - Sujeirinha gang; Comando Vermelho - Terceiro Comando	37
Brazil	1998	Comando Vermelho - Terceiro Comando	14
Brazil	1999	Amigos dos Amigos - Comando Vermelho; Barriga gang - Sujeirinha gang; Comando Vermelho - Terceiro Comando	58
Brazil	2000	Amigos dos Amigos - Comando Vermelho; Barriga gang - Sujeirinha gang; Comando Vermelho - Terceiro Comando	46
Brazil	2001	Comando Vermelho - Terceiro Comando	74
Brazil	2002	Amigos dos Amigos - Comando Vermelho; Comando Vermelho - Terceiro Comando	61
Brazil	2003	Amigos dos Amigos - Comando Vermelho; Comando Vermelho - Terceiro Comando	43
Brazil	2004	Amigos dos Amigos - Comando Vermelho; Comando Vermelho - Terceiro Comando Puro; Comando Vermelho - Terceiro Comando	86
Brazil	2005	Amigos dos Amigos - Comando Vermelho; Comando Vermelho - Terceiro Comando	20
Brazil	2006	Amigos dos Amigos - Comando Vermelho; Comando Vermelho - Terceiro Comando Puro; Comando Vermelho - Terceiro Comando	23
Brazil	2007	Amigos dos Amigos - Comando Vermelho; Comando Vermelho - Terceiro Comando Puro; Comando Vermelho - Terceiro Comando	36
Brazil	2008	Amigos dos Amigos - Comando Vermelho; Comando Vermelho - Terceiro Comando Puro; Comando Vermelho - Terceiro Comando	13
Brazil	2009	Amigos dos Amigos - Comando Vermelho	40
Brazil	2010	Amigos dos Amigos - Comando Vermelho	4
Brazil	2011	Comando Vermelho - Terceiro Comando Puro; Nova Okaida - Estados Unidos	34
Brazil	2012	Amigos dos Amigos - Comando Vermelho; Bonde dos 40 - PCM; Comando Vermelho - Terceiro Comando; Nova Okaida - Estados Unidos	275

Brazil	2013	Bonde dos 40 - PCM; Comando Vermelho - Terceiro Comando Puro	27
Brazil	2014	Bonde dos 40 - PCM; Comando Vermelho - Terceiro Comando Puro	3
Brazil	2015	Anti-Bala - Bala na Cara; Bonde dos 40 - PCM; Comando Vermelho - PCC; PCC - Sindicato do Crime	82
Colombia	1990	Cali Cartel - Medellín Cartel	41
Colombia	1993	Medellín Cartel - PEPES	45
Colombia	1997	AUC - ELN; AUC - FARC	64
Colombia	1998	AUC - ELN; AUC - FARC	189
Colombia	1999	AUC - ELN; AUC - FARC	147
Colombia	2000	ACC - FARC; AUC - ELN, FARC; AUC - ELN; AUC - FARC	447
Colombia	2001	AUC - ELN, FARC; AUC - ELN; AUC - FARC	724
Colombia	2002	AUC - ELN, FARC; AUC - ELN; AUC - FARC; Bloque Central Bolívar - ELN, FARC	807
Colombia	2003	ACC - FARC; AUC - ELN, FARC; AUC - ELN; AUC - FARC; Bloque Central Bolívar - ELN, FARC	293
Colombia	2004	AUC - ELN, FARC; AUC - ELN; AUC - FARC	301
Colombia	2005	AUC - ELN, FARC; AUC - FARC	213
Colombia	2006	AUC - FARC	5
Ecuador	2001	AUC - FARC	2
El Salvador	2004	La Raza - Mara 18 (El Salvador)	34
Guatemala	2001	Mara 18 (Guatemala) - Mara Salvatrucha (Guatemala)	5
Guatemala	2005	Mara 18 (Guatemala) - Mara Salvatrucha (Guatemala)	56
Guatemala	2008	Gulf Cartel - Sinaloa Cartel; Mara 18 (Guatemala) - Mara Salvatrucha (Guatemala)	41
Guatemala	2009	Mara 18 (Guatemala) - Mara Salvatrucha (Guatemala)	1
Guatemala	2015	Mara 18 (Guatemala) - Mara Salvatrucha (Guatemala)	20
Honduras	1999	Mara 18 (Honduras) - Mara Salvatrucha (Honduras)	9
Honduras	2000	Mara 18 (Honduras) - Mara Salvatrucha (Honduras)	6
Honduras	2002	Mara 18 (Honduras) - Mara Salvatrucha (Honduras)	1
Honduras	2003	Mara 18 (Honduras) - Mara Salvatrucha (Honduras)	24
Honduras	2004	Mara 18 (Honduras) - Mara Salvatrucha (Honduras)	1
Honduras	2008	Paisas (Honduras) - Pesetas (Honduras)	27
Honduras	2009	Paisas (Honduras) - Pesetas (Honduras)	3
Honduras	2010	Gulf Cartel - Sinaloa Cartel; Mara 18 (Honduras) - Mara Salvatrucha (Honduras)	44
Honduras	2011	Mara 18 (Honduras) - Mara Salvatrucha (Honduras)	18
Honduras	2012	Mara 18 (Honduras) - Mara Salvatrucha (Honduras)	18
Honduras	2013	Mara 18 (Honduras) - Mara Salvatrucha (Honduras); Paisas (Honduras) - Pesetas (Honduras)	17
Honduras	2014	Mara 18 (Honduras) - Mara Salvatrucha (Honduras)	21
Honduras	2015	Mara 18 (Honduras) - Mara Salvatrucha (Honduras)	68
Mexico	1992	Sinaloa Cartel - Tijuana Cartel	15
Mexico	1993	Garcia clan - Peña Rojas clan; Sinaloa Cartel - Tijuana Cartel	34
Mexico	1994	Sinaloa Cartel - Tijuana Cartel	5
Mexico	1995	Hells Angels - Rock Machine	1

Mexico	2002	Jalisco Cartel New Generation - Santa Rosa de Lima Cartel; Santiago Xochiltepec - Santo Domingo Teojomulco	27
Mexico	2004	Gulf Cartel - Sinaloa Cartel; Juarez Cartel - Sinaloa Cartel; Mara 18 (Guatemala) - Mara Salvatrucha (Guatemala); Sinaloa Cartel - Tijuana Cartel	219
Mexico	2005	Gulf Cartel - Sinaloa Cartel; Sinaloa Cartel - Tijuana Cartel	204
Mexico	2006	Gulf Cartel - Sinaloa Cartel; Juarez Cartel - Sinaloa Cartel; Sinaloa Cartel - Tijuana Cartel	669
Mexico	2007	Gulf Cartel - Sinaloa Cartel; Juarez Cartel - Sinaloa Cartel; Sinaloa Cartel - Tijuana Cartel	1938
Mexico	2008	Beltrán Leyva Cartel - Sinaloa Cartel; Gulf Cartel - Sinaloa Cartel; Juarez Cartel - Sinaloa Cartel; Los Aztecas - La Linea; Tijuana Cartel - Tijuana Cartel - El Teo	3841
Mexico	2009	Gulf Cartel - Sinaloa Cartel; Juarez Cartel - Sinaloa Cartel; Tijuana Cartel - Tijuana Cartel - El Teo	5600
Mexico	2010	Beltrán Leyva Cartel - Beltrán Leyva Cartel - Valdez Villareal faction; Beltrán Leyva Cartel - Sinaloa Cartel; Gulf Cartel - Los Zetas; Gulf Cartel - Sinaloa Cartel; Gulf Cartel, La Familia, Sinaloa Cartel - Los Zetas; Jalisco Cartel New Generation - La Familia; Jalisco Cartel New Generation - La Resistencia; Juarez Cartel - Sinaloa Cartel; La Familia - Los Zetas; Los Zetas - Sinaloa Cartel; Tijuana Cartel - Tijuana Cartel - El Teo	6122
Mexico	2011	Beltrán Leyva Cartel - Sinaloa Cartel; Cartel Independiente de Acapulco - La Barredora; Gulf Cartel - Los Zetas; Jalisco Cartel New Generation - La Resistencia; Jalisco Cartel New Generation - Los Zetas; Juarez Cartel - Sinaloa Cartel; La Familia - Los Caballeros Templarios; Los Zetas - Sinaloa Cartel	4583
Mexico	2012	Beltrán Leyva Cartel - Sinaloa Cartel; Cartel Independiente de Acapulco - La Barredora; Guerreros Unidos - Los Rojos; Gulf Cartel - Los Zetas; Jalisco Cartel New Generation - Los Caballeros Templarios; Jalisco Cartel New Generation - Los Zetas; Juarez Cartel - Sinaloa Cartel; La Familia - Los Caballeros Templarios; La Familia - Los Zetas; Los Zetas - Los Zetas - Velazquez Caballero faction; Los Zetas - Sinaloa Cartel	5883
Mexico	2013	Autodefensas Unidas de Michoacán - Los Caballeros Templarios; Beltrán Leyva Cartel - Sinaloa Cartel; Gulf Cartel - Los Zetas; Gulf Cartel - Ramirez Treviño faction - Gulf Cartel - Villareal faction; Jalisco Cartel New Generation - Los Caballeros Templarios; Juarez Cartel - Sinaloa Cartel; La Familia - Los Caballeros Templarios; La Mochomera - Sinaloa Cartel; Los Zetas - Sinaloa Cartel	4492

Mexico	2014	Autodefensas Unidas de Michoacán - Los Caballeros Templarios; Beltrán Leyva Cartel - Sinaloa Cartel; Cartel Independiente de Acapulco - La Barredora; Guerreros Unidos - Los Rojos; Gulf Cartel - Dragones de Sheyla faction - Gulf Cartel - Los Fresitas faction; Gulf Cartel - Los Zetas; Jalisco Cartel New Generation - Los Caballeros Templarios; Jalisco Cartel New Generation - Los Zetas; Juarez Cartel - Sinaloa Cartel; La Familia - Los Caballeros Templarios; La Mochomera - Sinaloa Cartel; Los Ardillos - Los Rojos; Los Zetas - Sinaloa Cartel; Sinaloa Cartel - Forces of Damaso; Sinaloa Cartel - Los Chavez Matamoros faction - Sinaloa Cartel - Los Salgueiro faction	3315
Mexico	2015	Autodefensas Unidas de Michoacán - Los Caballeros Templarios; Beltrán Leyva Cartel - Sinaloa Cartel; Cartel Independiente de Acapulco - La Barredora; Guerreros Unidos - Los Rojos; Gulf Cartel - Los Zetas; Jalisco Cartel New Generation - Los Caballeros Templarios; Jalisco Cartel New Generation - Los Zetas; Jalisco Cartel New Generation - Sinaloa Cartel; Juarez Cartel - Sinaloa Cartel; Los Ardillos - Los Rojos; Los Zetas - Sinaloa Cartel; Sinaloa Cartel - El Pepillo faction - Sinaloa Cartel - Los 28 faction; Sinaloa Cartel - Forces of Damaso; Sinaloa Cartel - Los Memos faction - Sinaloa Cartel - Los Salazar faction; Sinaloa Cartel - Tijuana Cartel	4511
Peru	1989	MRTA - Sendero Luminoso	11
Peru	1990	MRTA - Sendero Luminoso	6
Peru	1991	MRTA - Sendero Luminoso	50

Source: 2 Data from the Uppsala Conflict Data Program's Country-Year Dataset on Organized Violence within Country Borders, v. 24.1

Annex 3 List of one-sided violence by a non-state group

Country	Year	Dyad	Total fatalities
Brazil	1993	Comando Vermelho - Civilians	1
Brazil	1994	Comando Vermelho - Civilians	3
Brazil	1997	Comando Vermelho - Civilians	2
Brazil	2000	Comando Vermelho - Civilians	4
Brazil	2002	Comando Vermelho - Civilians	1
Brazil	2005	Comando Vermelho - Civilians	6
Brazil	2013	Bonde dos 40 - Civilians	1
Brazil	2014	Bonde dos 40 - Civilians	1
Colombia	1989	AUC - Civilians; ELN - Civilians; FARC - Civilians; Medellín Cartel - Civilians	146
Colombia	1990	AUC - Civilians; ELN - Civilians; MAS - Civilians; Medellín Cartel - Civilians	78
Colombia	1991	ELN - Civilians; FARC - Civilians; MAS - Civilians; Medellín Cartel - Civilians	71
Colombia	1992	ELN - Civilians; FARC - Civilians; MAS - Civilians	10
Colombia	1993	AUC - Civilians; ELN - Civilians; FARC - Civilians; Medellín Cartel - Civilians	53
Colombia	1994	AUC - Civilians; ELN - Civilians; FARC - Civilians	71
Colombia	1995	AUC - Civilians; ELN - Civilians; FARC - Civilians	106
Colombia	1996	AUC - Civilians; ELN - Civilians; FARC - Civilians	206

Colombia	1997	ACCU - Civilians; AUC - Civilians; ELN - Civilians; FARC - Civilians	266
Colombia	1998	AUC - Civilians; ELN - Civilians; FARC - Civilians	506
Colombia	1999	AUC - Civilians; ELN - Civilians; FARC - Civilians	571
Colombia	2000	ACCU - Civilians; AUC - Civilians; ELN - Civilians; FARC - Civilians	1950
Colombia	2001	AUC - Civilians; ELN - Civilians; FARC - Civilians	1955
Colombia	2002	AUC - Civilians; Bloque Central Bolívar - Civilians; ELN - Civilians; FARC - Civilians	1535
Colombia	2003	AUC - Civilians; Bloque Central Bolívar - Civilians; ELN - Civilians; FARC - Civilians	2088
Colombia	2004	AUC - Civilians; Bloque Central Bolívar - Civilians; ELN - Civilians; FARC - Civilians	1390
Colombia	2005	AUC - Civilians; ELN - Civilians; FARC - Civilians	99
Colombia	2006	FARC - Civilians	59
Colombia	2007	AUC - Civilians; FARC - Civilians	24
Colombia	2008	FARC - Civilians	27
Colombia	2009	FARC - Civilians	30
Colombia	2010	FARC - Civilians	23
Colombia	2011	ELN - Civilians; FARC - Civilians	25
Colombia	2012	ELN - Civilians; FARC - Civilians	15
Colombia	2014	AGC - Civilians; ELN - Civilians; FARC - Civilians	12
Colombia	2015	ELN - Civilians; FARC - Civilians	3
Guatemala	2011	Los Zetas - Civilians	27
Honduras	2003	Mara Salvatrucha (Honduras) - Civilians	23
Honduras	2004	Mara Salvatrucha (Honduras) - Civilians	28
Honduras	2015	Mara Salvatrucha (Honduras) - Civilians	3
Mexico	1997	Paz y Justicia - Civilians	45
Mexico	2006	Sinaloa Cartel - Civilians	1
Mexico	2007	Sinaloa Cartel - Civilians	2
Mexico	2009	Sinaloa Cartel - Civilians	4
Mexico	2010	Los Zetas - Civilians; Sinaloa Cartel - Civilians	90
Mexico	2011	Los Zetas - Civilians; Sinaloa Cartel - Civilians	377
Mexico	2012	Jalisco Cartel New Generation - Civilians; Los Zetas - Civilians; Sinaloa Cartel - Civilians	47
Mexico	2013	Jalisco Cartel New Generation - Civilians; Los Zetas - Civilians; Sinaloa Cartel - Civilians	24
Mexico	2014	Jalisco Cartel New Generation - Civilians; Los Zetas - Civilians	6
Mexico	2015	Jalisco Cartel New Generation - Civilians; Los Ardillos - Civilians	2
Peru	1989	Sendero Luminoso - Civilians	90
Peru	1990	Sendero Luminoso - Civilians	123
Peru	1991	Sendero Luminoso - Civilians	146
Peru	1992	Sendero Luminoso - Civilians	139
Peru	1993	Sendero Luminoso - Civilians	107
Peru	1994	Sendero Luminoso - Civilians	24
Peru	1995	Sendero Luminoso - Civilians	8
Peru	1996	Sendero Luminoso - Civilians	9
Peru	1997	Sendero Luminoso - Civilians	4
Peru	1998	Sendero Luminoso - Civilians	8

Peru	1999	Sendero Luminoso - Civilians	14
Peru	2006	Sendero Luminoso - Civilians	3
Peru	2009	Sendero Luminoso - Civilians	4
Peru	2010	Sendero Luminoso - Civilians	1
Peru	2011	Sendero Luminoso - Civilians	1

Source: 3 Data from the Uppsala Conflict Data Program's Country-Year Dataset on Organized Violence within Country Borders, v. 24.1