Military Expenditure and Growth in Conflict: An Instrumental Approach*

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Abstract

The study of the relationship between military expenditure and economic growth contains a large history of contradictory results. While the literature includes many different samples of countries of different income groups, threat levels, and government spending decisions, none incorporate the presence of civil conflict into the relationship. Using an over-identified instrumental variable of U.S. military foreign aid to developing countries from 1990-2014, this study investigates how civil conflict affects the relationship between military expenditure and economic growth in developing countries. While military expenditure alone yields insignificant results, the presence of civil conflict creates a negative relationship between military spending and GDP growth rate.

Keywords: Military Expenditure, Civil Conflict, Foreign Aid, Instrumental Variable

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Contents

List of Tables

List of Figures

1 Introduction

Military spending is an essential element of government spending necessary to maintain the authority of the existing government and protect a nation from existential threats. Governments of developing countries face many difficult options when making expenditure decisions. While military expenditure seems to be a necessary element of government, the trade-off between spending money on military instead of other public investment creates a controversial decision.

As Emile Benoit discussed in his canonical work in 1973, Keynesian economic theory asserts government spending increases economic growth as an element of output. In this vein, military spending, just as other government spending, should spur growth. Alongside this Keynesian multiplier effect, there are benefits to the structure and hierarchy of the military: protection provided by the government, increased industrialization through supply-side investment into military ware and public infrastructure, and a structured hiring and technical training for enlisted soldiers.

However, these effects are countered by the opportunity cost of military investment. Military expenditures reallocate money that could have been invested in public programs, lower the savings rate, and increase the tax burden on an already-straining public for government spending that will not be as productive. The counter-factual of the effect the money could have had in other areas is difficult to measure, yet is still an important variable in the decision to allocate money to the military (Schmidt 1987, p. 100). Smith (1977) provides evidence for the hypothesis that the investment share of GDP is a function of military expenditure share and GDP growth and finds a significant negative relationship between military expenditure and investment (Lindgren 2006, p. 23). Previous studies also show that military spending generally doubles when civil conflict arises (Collier 2009, p. 90). This trade-off between investment and military spending becomes even sharper in developing countries that have limited resources and weaker infrastructure.

With unreliable infrastructure, the positive benefits of military expenditures continually

become less pronounced: the hiring system is faulty and contracts are not honored, the resources are still scarce and do not create a legitimate protection service, and the leadership is unorganized. Stronger militaries tend to benefit the upper echelons of the society and government rather than the civilians, leaving lower-level military personnel to resort to corruption and rent-seeking through civilians. In this vein, military spending no longer serves its original purpose of protecting its citizens; rather, it protects the status quo of those in power from the citizens. The combined instability of insurgency and the increase in military spending also leads to capital flight, where people are less likely to invest in both land and capital, dealing another blow to establishing markets in developing countries (Collier 2009, p. 91). The negative effects, particularly this income shift from public development to military investment, create larger gaps in economic growth and oppose the existing economic benefits from allocating government expenditures to the military.

Developing countries also face very different types of threats: intrastate conflict, or organized violence between the state and a non-state actor, or between two non-state actors, are much more prevalent than external threats, and last more than ten times longer than interstate conflict (Collier 2009, p. 109). Fearon and Laitin (2003) find that poverty, political instability, and terrain are better predictors for civil conflict than ethnicity. This instability challenges the sovereignty of the existing government and deters economic growth. Increased violence makes it harder to establish business and uphold contracts, and creates a violence trap where growth cannot occur, so the opportunity cost for violence becomes even lower. Weingast et al. (2015) introduce the concept of violence traps as an impediment to stable growth. Violence occurs without strong institutions that both protect property and personal rights and punish those who violate them equally. The absence of rule of law c commitment problem makes it difficult to enforce contracts and discourages investment in capital. With low prospects, civilians are more likely to partake in violence. This phenomenon has been coined the Feasibility Hypothesis: where violence can occur, it will occur (Collier, Hoeffler, and Rohner, 2009). Civil war literature converges on the hypothesis that conflict is moti-

vated more by the void of order and rule of law rather than large social grievance (Fearon and Laitin, 2003, 2011; Cederman, et al., 2013, p.17). The Feasibility Hypothesis compounds with the fact that governments in developing countries are generally less democratic and face internal military threats at a much higher rate because of the lack of clear avenues for political participation (Collier, 2006, p. 117). This means that when developing countries are making the decision to allocate military expenditures, their considerations usually involve the perceived threat from internal rebellion and violence. These militaries largely end up operating within the country's own borders, further weakening trust in institutions and perpetuating the violence trap. The battle involving non-state actors also blurs the line between civilian and soldier, creating more suspicion of civilians and a higher propensity for civilian deaths. When the military's targets are rebels within the country's borders, militaries responding to internal threats are more likely to interact with and negatively affect civilians in order to deter civil conflict, creating a new negative effect of military spending on economic growth.

This paper works to answer the question: how does civil conflict affect the relationship between military expenditures and economic growth in developing countries? While the relationship is largely found to be either negative or insignificant, the presence of civil conflict is rarely included in analysis for developing countries. Civil conflict portends that the military expenditures will go directly into minimizing the largest existential threat, which exists within the country's borders. This involves diminishing uprisings and fighting battles against a nations own citizens. Repressive and purposeful targeting of citizens that are rebelling as well as civilians caught in the crossfire hurt economic growth not only through the direct attack on citizens, but also through the increased perception of instability that deters investment into these developing countries (Weingast, et al., 2015). In the event of civil conflict, an increase in military expenditure should hamper economic growth even more than a peaceful developing country.

The main impediment to the study of this relationship lies in the entangled relationship

between military expenditure and economic growth. Government spending decisions involve many idiosyncratic factors and are subject to budget constraints. Consequently, finding a clear causal relationship between military expenditure and economic growth introduces possibilities for error. While current literature defers to testing the relationship despite this issue, this study uses an over-identified instrument to study the relationship without the endogeneity bias. By instrumenting current and lagged U.S. military foreign aid for military expenditure, the effect of military expenditure on economic growth is insignificant. However, the interaction between conflict and military expenditure reports a large and significant negative effect on GDP growth.

2 Literature Review

The study of the effect of military spending on economic growth began with the novel study by Benoit (1973, 1978) in which he found a positive relationship in that countries with higher growth rates have higher defense burdens. He characterized the government decision to allocate expenditures in two ways: the marginal defense elasticity of investment, or how much government money is taken away from investment to be used in military expenditure, and marginal capital output, how this reduction hurts output. While recognizing these effects, Benoit stated the Keynesian multiplier effect of government expenditure, as well as the infrastructure created by military spending, created a positive relationship between military expenditure and growth. This study spurred others who questioned Benoit's methodology and sought different models to study the relationship. The findings from Weede (1983) supported the industrial output effect that Benoit found by showing how military employment can provide structure and can improve the labor pool in the long run. Fredericksen and Looney (1983) used the same data studying Least Developed Countries (LDCs) with limited and rich resource endowments. This study suggested a positive relationship for LDCs with rich resource endowments, but no significant relationship for LDCs with limited resource

endowments.

The wide range of sample sizes and countries used throughout the literature create differing results. Cappelen et. al. (1984) and Landau (1996) both used cross-country time-series models of OECD countries; the former found a negative relationship, and the latter an insignificant effect. Many other studies found very different results through different methodologies, mostly finding insignificant results (Faini, Annez and Taylor, 1980, 1984; Nabe, 1983; Biswas and Ram, 1986; and Maizels and Nissanke, 1986). Deger and Smith (1983) found a positive direct effect of military expenditure on economic growth, but the indirect effects created a net negative effect for developing countries. While these studies vary in their methodology and results, a common economic explanation for the relationship remained: military expenditure crowds out other growth-enhancing investments, as well as changes the composition of a country's industrial output with input-output effects. There is also evidence that while there may be positive channels for economic growth through military expenditure as Benoit originally posited, the negative indirect effects of crowding out investment, higher tax rates, and lower savings rates overrule the direct positive effects to create a net negative relationship (Gyimah-Brempon, 1989; Dunne and Mohammed, 1995; Bose, et. al, 2007).

One of the reasons for the differing results comes from the difficulty in creating a study that implies causality, particularly with countries that face internal threats. Many different econometric and theoretical models have been used to map the relationship. The ratio of military spending to GDP is predominately used as the measure of military expenditure (Sala-i-Martin et. al. 2004; Smith 1977, 1978, 1980; Deger and Smith 1983; Happe and Wakeman-Linn, 1994; Knight, Loayza and Villanueva 1996; Hauk and Wacziarg, 2004; Chang, Huang and Yang, 2011).

Smith (1995), Mintz and Stevenson (1995), and Awaworyi and Yew (2014) assert that the differences within the literature are due to econometric limitations in studying the relationship between economic growth and military expenditure . The measure of military expenditure creates heteroscedasticity because a change in military spending should have very different

effects on countries with higher capacity and resources, as well as an endogeneity bias in the fact that governments can choose their own military expenditure ratios, and economic growth changes government expenditure decision-making. Many analyses work to separate the impact of disaggregated government spending (Caiden and Wildavsky, 1980; Aschaur, 1989; Easterly and Rebelo, 1993; Devajaran, et. al, 1996; Mulas-Granados, et. al., 2002; Bose, et. al, 2007). Easterly and Rebelo (1993) find that the positive relationship between transport and communication expenditure and growth is the most robust, indicating military spending does not have a clear net positive effect.

Bose, et. al. (2007) expand upon this notion and find that at the disaggregated level, government investment in education provides the largest positive significant relationship with growth. Alongside that, they find private investment share of GDP is positively and significantly related to economic growth, as well as evidence that a government budget deficit is related to adverse growth effects. These findings build evidence against the positive relationship between military expenditure and economic growth, as military expenditure has a reallocation effect from private investment and other government investment choices. It also challenges the positive effect from industrial output effects, since military expenditure is a supply-side investment with little output beside labor and infrastructure. In this light, military expenditure as a trade-off in government spending has a negative effect.

Maizels and Nissanke (1986) branch from previous literature by including analysis of the role of the military in developing countries, particularly the perceived threats and need for military power. They highlight the fact that governments in developing countries with unstable institutions and internal violence may perceive a need for military expansion that would not aim to improve economic growth through increased industrialization and worker training, but rather to repress uprisings at the expense of civilian and economic freedom.

Few studies include civil conflict in the relationship between military expenditures and economic growth. Collier and Hoeffler (2004) find that grievances through ethnic or other channels provide little predictive power for civil war, yet a low opportunity cost is a more

accurate indicator of initiation of rebellion. This also aligns with the theory of violence traps, where lower economic growth lowers the opportunity cost of civil violence (Weingast, et al. (2015). As mentioned earlier,the Feasibility Hypothesis complements this, in that the motivating factors for civil war are not as important as the circumstances that allow it to occur. (Collier and Hoeffler, 2009). These different studies reveal a link between civil conflict and economics. Economic development has been shown to promote peace, while civil conflict reverts tax revenues and roughly doubles government spending (Collier, 2006, p. 90).

Collier and Rohner (2008) use Polity Score IV to predict how democracy affects reversion to violence. They find that in low-income countries, democracy increases the risk of reversion to violence. This finding suggests that economic factors are not being addressed in conflict research. More recent studies use measures of external threat or test a non-linear relationship between military expenditure and economic growth, dependent upon the motivation behind the military spending (Dunne, Smith and Willenbockel, 2004; Aizenman and Glick, 2003). Typically, the Uppsala Conflict Data Program (UCDP) is used as a measure of civil conflict. However, recent literature has attempted to find more subtle measure of civil violence beyond battle deaths. Krause (2016) indicates many different events where the UCDP estimates underestimate the true deaths that occurred through political violence. Lacina and Gleditsch (2005) introduce a new dataset meant to complement existing conflict datasets to create a more accurate portrayal of deaths caused by political violence.

3 Data

This study includes 91 countries with 1, 241 observations from 1990-2014 and employs an instrumental variable model to investigate the relationship between military expenditures and economic growth. The data for the outcome variable, GDP growth, is the logged measure of output-side real GDP using PPP goods that are constant across countries and is obtained from the Penn World Tables from 1990-2014. Empirical growth factor controls of real GDP at

constant national prices and population and are also obtained from the Penn World Tables. The conflict dataset used is the Uppsala Conflict Data Program and Peace Research Institute, Oslo (UCDP/PRIO) Armed Conflict dataset. This dataset defines a conflict as, "a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths" (Lacina and Gleditsch, 2005). While there are four types of conflict in the dataset, this study limits the scope of conflict to internal disputes, so extrasystemic armed conflict that occurs outside of a country's territory are not included and interstate wars are not included. Internationalized internal armed conflict that qualifies as internal conflict according to the above metric and where one party receives international help is included in the analysis, but recoded to the location of the conflict rather than the parties funding or supporting a side in the conflict. Lacina and Gleditsch (2005) append this dataset with more precise estimates of deaths associated with conflict by including battle deaths, combatant deaths, and war deaths.

Military expenditure data measured as a percentage of GDP comes from the SIPRI military expenditure database, using government-reported data and SIPRI estimates for unreported country-years. U.S. military foreign aid data is provided by the dataset used to create the publication U.S. Overseas Loans and Grants of annual foreign assistance flows since the passing of the Foreign Assistance Act and is the authoritative dataset of U.S. foreign assistance. Only foreign assistance money labeled for military purposes are used in this study. See Appendix A for complete list of specified purposes of aid. Countries in the sample are identified by income group according to the World Bank's classifications.

4 Methodology

The SIPRI military expenditure database provides estimates for military expenditure by country and year as a percentage of GDP from 1990-2014. However, there are many differ-

ent issues with the database. Many data points are missing throughout years and countries, and many are either SIPRI estimates or come from highly uncertain data. Table 1 shows the extent of missing data points by income groups. There are many political and institutional reasons that a country does not release military expenditure data, so the sparseness makes it difficult to provide unbiased estimates; countries with more open governance are more likely to honestly report military expenditures.

Table 1: Missing Data for Military Expenditure as Share of GDP by Income Group

Income Group	Frequency	Percent
Low Income	109	38.65
Lower Middle Income	108	38.30
Upper Middle Income	65	23.05

As Table 1 shows, attenuation of data is not random and affects the separate income groups at different rates. This would lead to biased estimates because a larger percentage of poorer countries are missing data. Since poorer countries are more likely to experience conflict, a larger portion of richer countries relative to the true population of countries would present a skewed estimate of the relationship.

Beyond the existing data attenuation bias, military spending as a regressor for GDP growth produces an endogeneity bias. Many different elements go into the decision-making of government spending, and military expenditure decisions depend on many different factors, including threat levels, size of government, type of government, etc. Also, a change in GDP can affect a change in the percent of GDP used in military expenditures, leading to additional issues of reverse causality. While this measure is consistently used in the literature, OLS cannot produce an unbiased estimator.

4.1 Validity of the Instrument

In order to avoid this endogeneity bias, I use an instrumental variable of military foreign aid dispensed by the U.S. from 1990-2014. The U.S. Agency for International Development

catalogues all aid provided by the U.S. since 1946 and categorizes each obligation by agency dispensed, type of aid, and purpose of aid. Figure 1 reports average military foreign aid over the years of study. The U.S. has spent between three and six billion dollars in specified military aid each year between the years of study. By narrowing the study to the World Banks definition of a developing country, nations with an income group of High Income were removed from the sample. Only developing countries as denoted by the World Bank as Low Income, Lower Middle Income, or Upper Middle Income that received foreign aid from the U.S. within the sampled countries are included in this study.

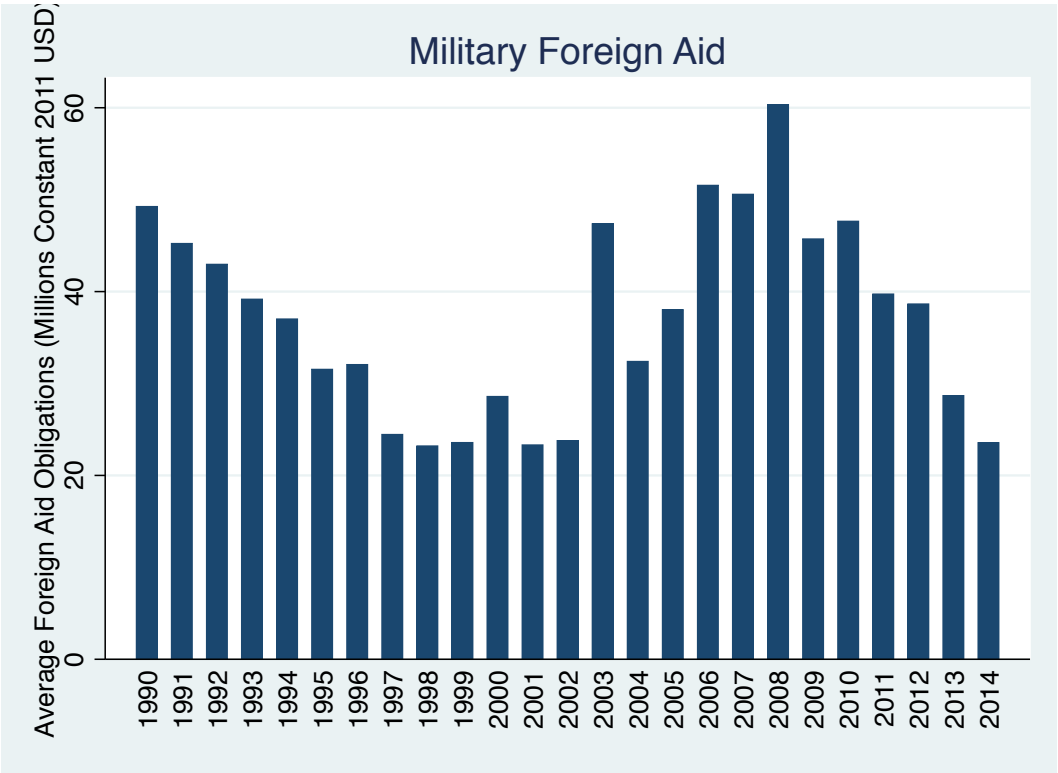

Figure 1: Average Foreign Aid Obligations Allocated to Military Purposes in Millions of Constant 2011 US Dollars

As Figure 1 displays, military foreign aid slightly decreases over the years of 1990-2002 both in the average aid provided and total aid in each year. This indicates that military foreign aid is for the most part independent of existing military conflicts in the recipient countries. Beginning in 1992, President Bill Clinton's two terms in office included multiple foreign

policy crises that involved military altercations in developing countries that ultimately led to less American involvement worldwide, from the Rwandan genocide to the withdrawal of American troops from Somalia despite continuing violence. The decline in military foreign aid in this time period correlates to President Clinton's two terms. Low average military foreign aid continues into President George W. Bush's first term, until there is a large and persistent increase in military foreign aid begins in 2003, the beginning of the U.S. War on Terror.

The War on Terror, coined by President George W. Bush, came in response to the terrorist attack on New York on September 11, 2001. In order to combat the terrorist groups that carried out the attack, U.S. foreign policy shifted to strengthening foreign government in the hopes that stronger institutions would make it more difficult for terrorism to maintain and spread. This involved a much stronger foreign policy stance for the U.S. and shifted toward a more active, present approach that largely diverged from the previous presidency. Figure 2 shows how economic foreign aid changed as a result.

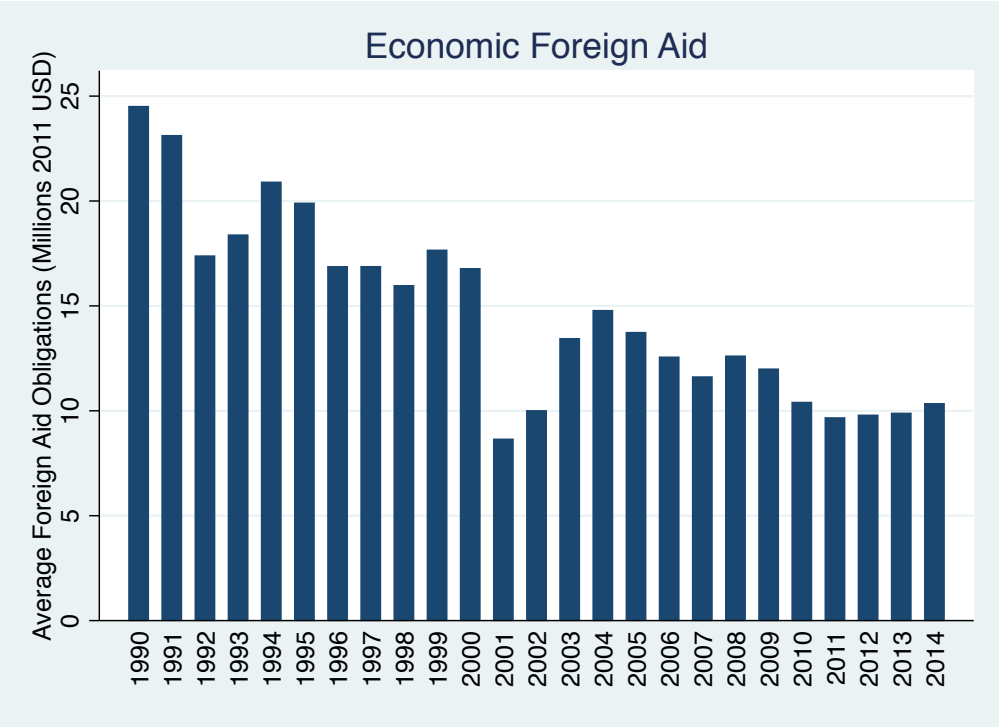

Figure 2: Average Foreign Aid Obligations Allocated to Economic Purposes in Millions of Constant 2011 US Dollars

The U.S.'s military stance and its increased presence abroad called for a shift in foreign aid decisions. The onset of the War on Terror in 2003 was denoted by a large and persistent increase in foreign aid directed toward military financing, cooperative threat reduction, peace keeping, drug interdiction, peacekeeping operations, and general military assistance (See Appendix B for published avenues of aid). However, Figure 2 shows how economic foreign aid changed in relation to military foreign aid and the War on Terror. While military foreign aid spiked and remained much higher than previous levels in the 1990s and reached its peak in 2008, the last year of President Bush's term, the average obligations for economic foreign aid began to increase after 2003 but continued on a general downward trend. Economic foreign aid also does not increase as sharply as military foreign aid. Figure 3 focuses on the larger changes in total foreign aid and how these differential trends relate.

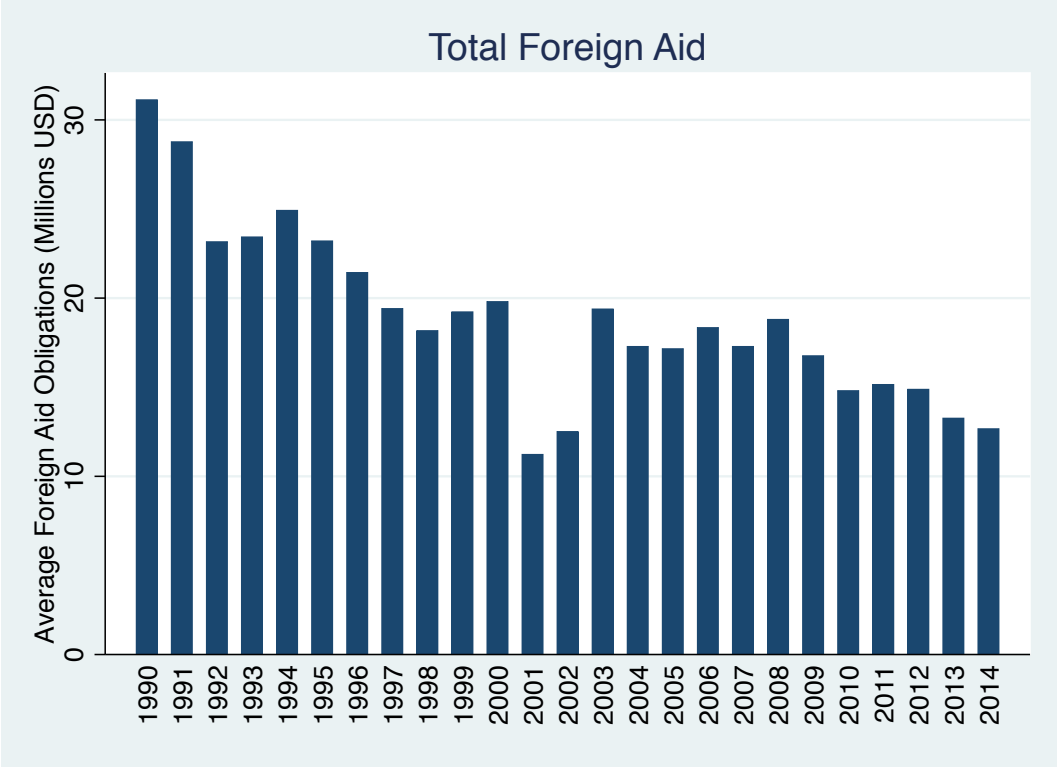

Figure 3: Average Foreign Aid Obligations in Millions of Constant 2011 US Dollars

Total foreign aid average obligations remained relatively constant with the exception of 2001 and 2002,and were on a general downward trend similar to economic foreign aid. Even

though military foreign aid increases, total foreign aid does not reflect this change. This suggests foreign aid was prioritized for military purposes, at the expense of economic foreign aid.

This new U.S. foreign policy involved declaring war on Al-Qaeda and focused direct U.S. military intervention in the Middle East. As the hotbed of terrorist activity and the origin of the attack on American soil, the U.S. began an entrenched military campaign. However, the U.S. military mentality to stop internal rebellion and strengthen the sovereignty extended throughout foreign aid to other developing countries facing internal conflicts of their own that were not pertinent enough to guarantee direct U.S. military involvement. Figure 4 depicts average battle deaths for each income group over the years of study.

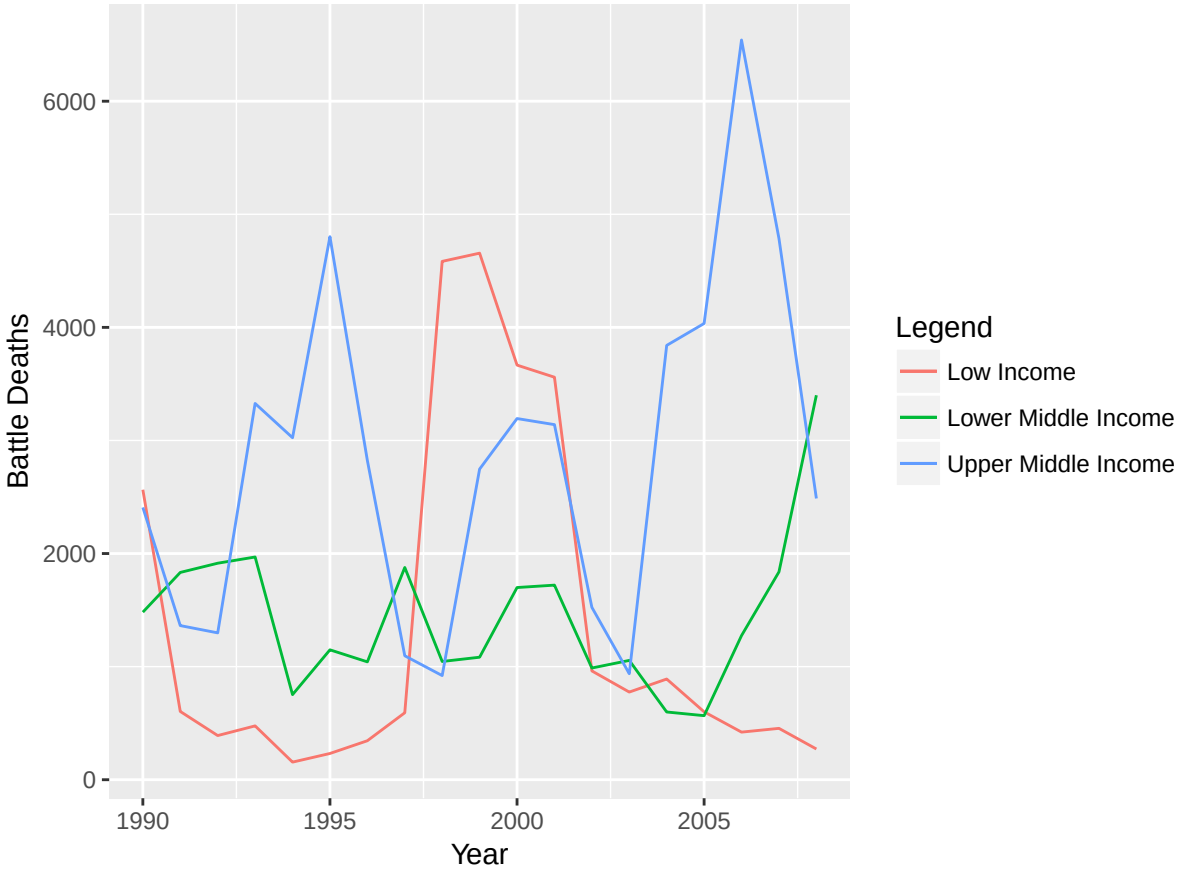

Figure 4: Average Battle Deaths by Income Group

While many developing countries received economic and military aid before the War on Terror, the shift in U.S. foreign policy and foreign aid decision-making presented these struggling governments with a new advantage over non-state actors: an influx of money for military expenditures. Figure 4 shows that many of the existing conflicts in the developing world were ongoing before and after the War on Terror began. Many countries were struggling with non-state actors, gang/social conflict, and civilian deaths and continued to receive the same foreign aid from the U.S. during the 1990s. In fact, the general trend for Low Income, Lower Middle Income, and Upper Middle Income countries was decreasing at the onset of the War on Terror policy change, despite a continually large average number of battle deaths. This suggests that the change in U.S. military foreign aid established by the War on Terror presented an exogenous increase in military expenditure for developing countries facing internal conflict.

For this reason, the increase in military foreign aid to developing countries yield a viable instrument for military expenditure that removes the endogeneity and measurement bias presented by the military expenditure data. As a foreign aid policy instrument, the money is directed into a governments account with a specified purpose. Since the U.S. government has the authority to stop future aid, governments have an incentive to use the money as directed. As indicated above, the military foreign aid is generally allocated to training, financing, and general military assistance. This provides evidence to the inclusion restriction in that the military foreign aid will affect military expenditures. It also satisfies the exclusion restriction for an instrument because this allocated foreign aid does not directly affect GDP growth of these countries except through the effect of military expenditures on GDP growth.

4.2 Limitations of the Instrument

One limitation to the validity of this instrument is that the decision-making of the U.S. in their military foreign aid allocation. While military foreign aid on average increased as a result of the War on Terror, U.S. decisions for sending foreign aid are not random. Countries

that are more sympathetic to the American system or those that provide strategic value to the U.S. are more likely to receive aid. For example, Iraq consistently received one of the highest amounts of aid in the early 2000s, as the War on Terror directly involved attacking a terrorist group located there. Colombia also remained high on the list for military foreign aid because of the large drug-trafficking system that affected the drug trade in the U.S. In fact, many of the countries that receive the most aid are not in the Low Income classification of countries.

This suggests aid is not need-based for conflict nor for budgetary issues. There obviously exists a political metric for allocating aid, as the U.S. government foreign assistance page says, "It is a strategic, economic, and moral imperative for the United States and vital to U.S. national security" (Foreignassistance.gov). U.S. national security concerns factor into how foreign aid is allocated, particularly for military foreign aid, since this would support regimes that the U.S. deems strategically convenient. This provides a possibility for bias in the model because military aid is relatively higher for countries with political ties to the U.S., independent of the military needs of each country.

Alongside possible mechanical limitations of the instrument, this model only identifies the local average treatment effect (LATE) of military expenditure on growth and assumes monotonicity. In this vein, estimates from this model cannot be used to make claims about the nature of the relationship between military expenditure and growth for developing countries as a whole. However, these results still provide insight into the relationship between military expenditure and GDP growth for countries who would increase military spending as a result of an increase in military foreign aid. It also presents policy implications for U.S. foreign aid and allocation decisions regarding the effect of military foreign aid on military expenditure and GDP growth.

5 Results

5.1 Preliminary Analysis

Table 2: Summary Statistics

	Mean	SD	Min	Max	Observations
Low Income					**706**
Population (millions)	15.24	16.33	0.84	96.96	
GDP (millions USD)	17912.39	19485.86	1161.17	142235.84	
GDP Growth	9.32	1.003	6.97	11.88	
Conflict	0.23	0.42	0	1	
MilAid (millions)	2.94	9.91	0.004	133	
MilEx (% of GDP)	0.02	0.04	0.00078	0.34	
Lower Middle Income					**1126**
Population (millions)	59.29	171.10	0.33	1295.29	
GDP (millions USD)	232648.34	639874.29	1161.17	6858145.50	
GDP Growth	10.65	1.70	6.97	15.73	
Conflict	0.18	0.38	0	1	
MilAid (millions)	65.82	291.88	0	2113.20	
MilEx (% of GDP)	0.02	0.02	0.00	0.10	
Upper Middle Income					**963**
Population (millions)	27.66	40.50	0.18	206.08	
GDP (millions USD)	353391.45	604561.13	1161.17	3493479.50	
GDP Growth	11.30	1.80	6.97	15.05	
Conflict	0.15	0.36	0	1	
MilAid (millions)	69.51	386.98	0.02	6235.75	
MilEx (% of GDP)	0.02	0.02	0.0015	0.22	
High Income					**1328**
Population (millions)	49.08	184.77	0.07	1369.44	
GDP (millions USD)	778157.34	1421635.82	1161.17	6858145.50	
GDP Growth	12.12	1.84	6.97	15.73	
Conflict	0.02	0.15	0	1	
MilAid (millions)	139.99	606.77	0.0001	4791.14	
MilEx (% of GDP)	0.028	0.032	0.0015	0.485	

Table 2 presents the summary statistics for the variables of interest and control variables stratified by income group. High income countries have higher GDP growth levels on average, alongside the obvious high GDP on average. Upper Middle Income countries have a similar distribution of GDP growth to High Income countries, both with means around 12,

and almost identical standard deviations, minimums and maximums. Lower Middle Income countries have a lower average but a similar distribution. Low Income countries have a much lower GDP growth rate than High Income countries with a mean of 9.32, and a tighter distribution.

In terms of military expenditure as a fraction of GDP, the difference between income groups is much smaller. While High Income countries on average spend 2.7% of their GDP on military, compared to 1.7% for Low Income and 2.06% for Lower Middle income, the range of values is much larger for High Income countries, reaching as high as 48.5% of GDP. This supports the hypothesis that investing in military is much more lucrative in countries with more infrastructure and removes the negative indirect effects that occur in lower-income countries.

Military foreign aid ranges widely for different income groups. Low Income countries receive an average of roughly $3 million per year even though they generally experience more conflict and have lower military budgets. Lower Middle Income countries have much higher average foreign aid inflows, with a yearly average of $65.82 million. Upper Middle Income countries have a similar distribution to Lower Middle Income countries, but the yearly average for High Income countries is double the average for the other two income groups. These differential amounts based on income group suggest the gross amount of foreign aid provided is related more to the GDP and military budget of the country rather than the existing conflict or aid need. This also means that High Income countries have a very different relationship with foreign aid than developing countries, since the expected inflow is more than one order of magnitude larger than expected aid for Low Income countries.

While Upper Middle Income countries seem to align more closely with High Income countries in terms of population, and GDP growth rate, there is a stark difference between the two groups in terms of conflict. Where only 3% of High Income countries on average have experienced internal conflict, Upper Middle Income countries have a much higher rate of roughly 15%. This statistic is much more similar to trends in Lower Middle and Low Income

countries, with rates of 14.5% and 24.5%, respectively. These lower three income groups also show larger distributions of conflict occurrences, with the Low Income group reporting a standard deviation more than double that of the High Income group. This supports research showing that poorer countries are more likely to experience internal conflict, and thus experience different decision points when addressing existential threats. The prevalence of internal violence is a decent indicator for residing in a lower income group and thus shows a different military environment for governments of developing countries contrasted with High Income countries.

These distributions of violence and military aid provide support for the decision to study developing countries separately from developed countries. Violence is much more prominent and has a much wider distribution for countries in the lower three groups and creates a factor in military spending decisions that does not affect High Income countries. Developed countries rarely focus on internal military threats when making military expenditure decisions, and their budgets and growth rates are much more stable on average.

The variation between income groups in these summary statistics create a clear delineation between the study of military expenditure decisions for developed and developing countries. Including High Income countries in this model would negate the effects of violence and military expenditure decisions affecting countries in the lower income groups. For this reason, High Income countries are excluded from the sample to investigate how military expenditure affects countries who will experience more of the negative effects of increasing military expenditure.

5.1.1 No Instrument

Using the endogenous military expenditure estimates, Table 3 shows the estimates of military expenditure on GDP. Columns (1) and (2) introduce either time or country fixed effects, Column (3) includes both, and Columns (4) and (5) include conflict, the interaction term, and empirical growth factors. Military expenditure has a significant and negative effect on

Table 3: Military Expenditure and GDP Growth without Instrument

VARIABLES	(1) GDP Growth	(2) GDP Growth	(3) GDP Growth	(4) GDP Growth	(5) GDP Growth	(6) GDP Growth
MilEx	2.278	-10.37***	-2.058***	-2.519	-2.530	-1.642
	(6.566)	(2.453)	(0.778)	(1.702)	(1.716)	(1.398)
MilEx × Conflict				0.945	0.913	0.985
				(1.578)	(1.586)	(1.324)
Conflict				-0.0872*	-0.0736	-0.00547
				(0.0476)	(0.0480)	(0.0405)
Population					0.00233**	0.000921
					(0.000983)	(0.000716)
Initial GDP						0.971***
						(0.0793)
Observations	2,340	2,340	2,340	2,340	2,340	2,340
R-squared	0.050	0.936	0.980	0.980	0.981	0.988
Time FE	Yes		Yes	Yes	Yes	Yes
Country FE		Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

This model runs an OLS regression using SIPRI military expenditure data and creates estimates for military expenditure, the interaction between military expenditure and conflict, the conflict indicator, and empirical growth factors. Variance is clustered by country.

GDP with country and time fixed effects are included. However, including controls and the interaction term between military expenditure and conflict report insignificant results for all coefficients except the control for GDP. While this evidence follows many of the results from previous studies, this could also indicate the endogeneity of the variable or the measurement bias of the variable that would bias these coefficients toward zero.

While much of the military expenditure literature involves using military expenditure data directly, the results show no significant effect for any coefficients except for initial GDP. This could be due to different econometric issues with the measurement of military expenditure. As mentioned earlier, the SIPRI military expenditure database uses reported statistics and estimates. 31 of the developing countries used in the dataset have missing data for at least

one year, and 44 countries have at least one data point estimated for military expenditure. Missing data that is correlated with income group leads to measurement bias, which will bias the OLS estimates toward zero. This differential data availability could explain the lack of significant results.

5.1.2 Long-Run Effects of Military Expenditure on Growth

In order to challenge the insignificant result of military expenditure on growth, Table 4 presents lagged military expenditure on GDP growth in order to test whether military expenditure has an effect, or if the effect lasts beyond the current year.

Table 4: Military Expenditure Lagged Effects on GDP Growth

VARIABLES	(1) GDP Growth	(2) GDP Growth	(3) GDP Growth	(4) GDP Growth	(5) GDP Growth	(6) GDP Growth	(7) GDP Growth
MilEx	-2.06***						0.376
	(0.778)						(0.955)
$MilEx_{t-1}$		-2.18***					-0.667
		(0.746)					(0.768)
$MilEx_{t-2}$			-2.53***				-1.674*
			(0.769)				(0.882)
$MilEx_{t-3}$				-2.99***			-0.999
				(0.845)			(0.650)
$MilEx_{t-4}$					-3.18***		-2.439**
					(0.877)		(1.047)
$MilEx_{t-5}$						-3.16***	-1.778**
						(0.864)	(0.885)
Observations	2,340	2,251	2,163	2,075	1,992	1,906	1,699
R-squared	0.980	0.981	0.981	0.982	0.982	0.983	0.985
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

This model shows the effect of military expenditure on GDP growth using the SIPRI data for military expenditure from the current year to five years in the past, as well as the effect of all current and lagged estimates in a single regression. Variance is clustered by country. Time and country fixed effects are included in all columns.

Columns (1) through (6) separately estimate the coefficient for current or time-lagged military expenditure data for each year. Column (7) performs OLS for all current and lagged data of military expenditure on GDP growth.

Column (1) reports a significant and negative coefficient for current military expenditure, similar to Table 3. Military expenditure lagged by one year in Column (2) has a similarly large and significantly negative coefficient. From the two-year to the five-year time lag, the estimator for military expenditure remains significant and increases, with the five-year time lag reporting the largest coefficient of -3.16. In Column (7), the four- and five-year lagged military expenditure still have a negative and significant effect, albeit smaller than in their single regressions. Two-year lagged military expenditure is negative and significant at the 10% level, and the rest of the time lags, including current military expenditure, are insignificant.

Lagged military expenditure provides insight into the underlying nature of the relationship between military expenditure and GDP growth because it removes the reverse causality bias that could be affecting the estimates for current military expenditure. Past military expenditure is not affected by current GDP growth, and GDP growth in year t is not taken into account when governments make military spending decisions in year $t-4$ or $t-5$.

Table 4 suggests that past military expenditure has lasting effects on GDP growth. This implies that military expenditure should influence GDP but might be crowded out by the endogeneity of the variable and measurement bias. While using lagged military expenditure still faces similar data issues to current military expenditure, an instrumental variable should solve these issues and provide an unbiased estimate of the relationship. The significant coefficients for lagged military expenditure also provide evidence that and over-identified instrument using lagged U.S. foreign military aid should be viable.

5.2 First Stage Analysis

5.2.1 The Instrument

Using the sample of 91 developing countries, this table reports the strength of the instrumental variable, U.S. military foreign aid for military expenditure. Table 5 reports the model:

$$MilEx_{it} = f_i + \lambda_t + \beta_1' \cdot \mathbf{MilAid} + \varepsilon_{it} \tag{1}$$

where MilEx is military expenditure as a share of GDP, **MilAid** is a vector of the different time lags of military foreign aid, including country and time fixed effects, and ε_{it} is an error term.

5.2.2 Inclusion Restriction

For an instrumental variable to provide a viable alternative to OLS with an endogenous variable, it must satisfy the inclusion restriction: the instrument affects the outcome variable through the endogenous variable. The strength of the instrument's ability to predict the endogenous variable is measured through the F-statistic in the first stage of the model. Typically, an significant F-statistic of 10 is the threshold for an instrument that is strong enough to use in place of the endogenous variable without negating the effect by introducing more bias.

Columns (1) through (3) report the estimates for current military foreign aid and include both time and country fixed effects in Column (3). Column (3) reports a significant and positive coefficient; since military foreign aid is in millions of dollars, the coefficient is larger than it originally appears. Without other instruments, a $1 million increase in military foreign aid predicts a two percentage-point increase in military expenditure as a share of GDP. However, military foreign aid alone, when including time and country fixed effects, only slightly passes the threshold F-statistic of 10 for a valid instrument.

The significance of the relationship despite a low F-statistic alongside the significant effects

Table 5: Power of Instrument

VARIABLES	(1) MilEx	(2) MilEx	(3) MilEx	(4) MilEx	(5) MilEx	(6) MilEx
MilAid	6.11e-06***	1.96e-06**	2.03e-06***	1.99e-06***	3.42e-06***	2.41e-06*
	(2.05e-06)	(9.38e-07)	(6.01e-07)	(5.55e-07)	(1.16e-06)	(1.38e-06)
$MilAid_{t-1}$				1.79e-07	-5.35e-07	1.57e-06
				(5.58e-07)	(4.05e-07)	(1.26e-06)
$MilAid_{t-4}$					1.94e-06	1.87e-06***
					(1.28e-06)	(3.99e-07)
$MilAid_{t-5}$						1.29e-06
						(1.90e-06)
Observations	1,914	1,914	1,914	1,755	1,410	1,290
R-squared	0.030	0.815	0.829	0.857	0.888	0.879
Time FE	Yes		Yes	Yes	Yes	Yes
Country FE		Yes	Yes	Yes	Yes	Yes
F-statistic	8.870	4.378	11.48	6.535	13.82	41.24
Prob > F	0.0036	0.0389	0.0010	0.0022	1.45e-07	0
J-Statistic				2.386	2.786	2.85
Prob > P				0.1225	0.2483	0.415

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 reports the power of a vector of both current and lagged military foreign aid to predict current military expenditure. Starting with an identified instrument of current military foreign aid, time lags of military foreign aid of one, four, and five years are included. The F-statistic for instrument power and J-statistic for over-identified instruments are included with their corresponding p-values. Variance is clustered by country, and country and time fixed effects are included after Column (2).

of past military expenditure on current GDP growth suggest that time lags of military aid will create a stronger, over-identified instrument. By including different time lags of military foreign aid, the predictive power of the over-identified instrument becomes stronger. The instrument of current military aid, 1-year lag, 4-year lag, and 5-year lag creates an instrument with a significant F-statistic of 41.24. They also still report positive and significant results for predicting military expenditure. This test provides evidence that this instrument follows the inclusion restriction that it is correlated with the endogenous variable. The power of this instrument is also true in the case of the interaction term between conflict and military

expenditure. Using this over-identified instrument, the interaction variable has a significant F-statistic of 32.02, suggesting that both the employment of the instrument will not introduce more bias or creating unnecessarily high standard errors for military expenditure and the interaction term (see Appendix C for full results).

5.2.3 Exclusion Restriction

The second requirement for a valid instrumental variable is the exclusion restriction: the instrument is not correlated with the error, so the instrument and will only affect the outcome variable through its correlation to the endogenous variable. Because this model uses an over-identified instrument, it is necessary to ensure that the inclusion of another instrument will provide more precision than the bias it introduces. Using a Sargan-Hansen test for the over-identified instrument, the joint null hypothesis is that all instruments are valid and uncorrelated to the error, and that the matrix of instruments do not introduce more bias.

The J-statistic in Column (6) for the complete instrument fails to reject the null hypothesis. With a J-statistic of 2.85 and a p-value of 0.415, this test provides support for the exclusion restriction since the statistic fails to reject the null. The strength of these tests persists as well for the interaction term between military expenditure and conflict, instrumented by military aid from the current year, one year past, and four and five years past and their interaction with the conflict indicator. The interaction term between military expenditure and conflict reported a J-statistic of 5.833 and a p-value of 0.212 (see Appendix C for full results). These two tests lend evidence to the validity of this instrument for military expenditure.

In satisfying both the inclusion restriction and inclusion restriction for both military expenditure and the interaction between military expenditure and conflict, the second stage of the model can be performed.

5.3 Second-Stage Analysis

Using the specified instrument for military expenditure, the second stage of the model to predict the instrumented effect of military expenditure on GDP growth rate is as follows:

$$ln(GDP)_{it} = f_i + \lambda_t + \beta_1 \cdot MilEx_{it} + \beta_2 \cdot Conflict_{it} + \beta_3 \cdot MilEx \times Conflict_{it} + \gamma' \mathbf{X_{it}} + v_{it} \quad (2)$$

where $Milex$ is instrumented through the first-stage, Conflict is an indicator for conflict occurring in country i in year t, $MilEx \times Conflict$ is the interaction between the two variables, and $\gamma' \mathbf{X_{it}}$ includes a vector of empirical growth factors of population and initial GDP. Time and country fixed effects are also included, and v_{it} is the error term.

Table 6: Second-Stage Military Expenditure and GDP Growth

VARIABLES	(1) GDP Growth	(2) GDP Growth	(3) GDP Growth	(4) GDP Growth	(5) GDP Growth	(6) GDP Growth
MilEx	155.6***	-43.27	-9.647	1.404	2.252	5.054
	(54.01)	(28.04)	(16.31)	(13.78)	(14.10)	(13.16)
MilEx × Conflict				-10.40	-12.30	-17.72**
				(9.833)	(9.693)	(8.878)
Conflict				0.252	0.317	0.490*
				(0.287)	(0.280)	(0.265)
Population					0.00147***	0.000400
					(0.000312)	(0.000370)
Initial GDP						0.782***
						(0.240)
Observations	1,243	1,241	1,241	1,241	1,241	1,241
R-squared	-1.032	0.957	0.993	0.993	0.993	0.993
Time FE	Yes		Yes	Yes	Yes	Yes
Country FE		Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses;*** p<0.01, ** p<0.05, * p<0.1

Table 6 reports the second-stage of the instrumental variable model. Columns (1) and (2) introduce different fixed effects separately and Column (3) reports the single coefficient with fixed effects. Column (4) introduces the interaction term and Columns (5) and (6) include empirical growth factor controls. Variance is clustered by country.

In Column (3), military expenditure is negative but insignificant. The addition of the interaction term and controls does not affect the significance even when all empirical growth factors are included in the model. However, the interaction term reports a large negative coefficient that is statistically significant when empirical growth factors are included. The conflict indicator has a positive result that is significant at the 10% level in this model.

6 Discussion

The insignificant result of military expenditure on GDP suggests that the effects of military expenditure on GDP growth is mixed and requires more in-depth investigation with a narrower scope. As mentioned earlier, this result could also be caused by the opposing positive and negative effects of military spending. Increasing military expenditure can help increase infrastructure, employment and create a demand for industrialization if the country produces its military equipment and R&D within its borders. However, these effects can be negated by a lack of organization within the military that leads to a breakdown in hierarchy, lack of complete enforcement of contracts for enlisted, and abuse of power by the military on subordinates and civilians. There is also a large opportunity cost to allocating money toward military instead of promising development-inducing government programs. The net effect of many different possible consequences of military expenditure vary widely by country because of the large differences in governmental regimes, infrastructure, natural endowments, and economic landscape.

This result suggests this analysis is too widespread to capture an effect, or that a uniform effect does not exist. Since military spending is a small portion of a government's budget for the countries involved in this study, it is difficult to find a clear, consistently negative effect across the sampled countries and income groups when many other elements of the governments decision-making can affect the relationship. Government systems that have less civilian participation are less likely to spend money on development-enhancing programs,

and developing countries largely have governments that do not encourage political activism. These are some possible explanations for the insignificant result for military expenditure. Additionally, the use of the instrumental variable indicates that these results are LATE, indicating that those who would change their military spending decisions based on an increase in military foreign aid do not have a clear predicted outcome for GDP growth.

The significant and negative coefficient for the interaction between military expenditure and conflict provide empirical evidence for the theory of violence traps. While military expenditure has an insignificant effect across the sample, a 1% increase in military spending as a share of GDP, while experiencing conflict, lowers the GDP growth rate by 17.7 percentage points. Again, since this estimate is LATE, this result indicates that governments that will increase their military expenditures during conflict when they receive more military foreign aid will lower their country's growth rate. Governments entrenched in civil war or violence that affects civilians direct military expenditure toward domestic non-state actors. The effect of warfare within the country outweighs all possible benefits from increasing the military because it lowers potential for growth. By continuing to spend money on military in the face of conflict, governments are perpetuating a cycle of violence. This also suggests that governments who experience internal conflict or the threat of non-state actors are already worse at creating infrastructure and rule of law, so the positive effects from military expenditure are much smaller in magnitude.

Stronger militaries in countries with civil conflict lead to an escalation of conflict and violence against civilians and internal rebels. This in turn threatens the stability of contracts and institutions, both in the presence of violence and the increased presence of militaries in civilian settings. With underdeveloped infrastructure both within the military and in the public, soldiers have little accountability and often resort to corruption and exploitation of civilians. These situations can create lower opportunity costs for violence because of the lack of justice and accountability for civilians as well, again escalating the necessity for the government to invest more in protective military.

The presence of conflict indicates that military expenditure is no longer investing in the economy and workers, but rather to preserve the political institutions already in place. In this study, the indicator for conflict is significant at the 10% level and reports a small but positive effect. While this seems to contradict the interaction between military expenditure and conflict, this result does not necessarily imply that the presence of conflict will increase GDP growth. Once again, this estimate only holds true for those affected by LATE. There is also a possibility there are other elements involved in GDP growth that were not included in this study. For example, Fredericksen and Looney (1983) found that the effect of military expenditure on GDP growth changed when a country's resource endowments were included as a control. Countries with high GDP growth rates in the developing world are largely countries with significant resource endowments, which can create revenue for the government and the country without solid infrastructure or an established market environment. Since resource endowment is not included as a control in this study, this conflict variable could be confounded by omitted variable bias.

Despite the limitations of the instrumental variable model, this over-identified instrument approach explored a new element of the relationship between military expenditure and economic growth. The LATE obtained from this model can provide insight into the decision-making of governments in developing countries and how they react to an increase in funding for the military. The implications of providing more military foreign aid in order to maintain a government facing civil conflict could hurt the country's long term growth, and end up creating more problems once the initial internal threat is solved. This only continues the violence trap. The results from this study suggest that there may be more effective solutions to helping governments maintain power over their countries that will not staunch growth.

7 Conclusion

Using an over-identified instrument of current and lagged military foreign aid flows for military expenditure, this study found that the presence of civil conflict turns the relationship between military spending and economic growth into a net negative. The local average treatment effect obtained by the model suggested that for those who would increase the amount of GDP spent on the military if military foreign aid increased, the effect of military spending on GDP growth was insignificant unless the government would use the increase to fight against internal threats. While conflict was significant at the 10% level, the coefficient was very small and could be explained by confounding factors of the countries affected by the local average treatment effect.

A novel element of this study is that it sheds light on the relationship between military expenditure and military foreign aid. Military foreign aid was a statistically significant predictor for military expenditure. Used as an instrument, the model reported a negative coefficient for interaction term. This suggests that military foreign aid to countries with internal conflict creates a net negative effect for the country. An increase in military spending motivated by an increase in military foreign aid in a civil conflict perpetuates the instability that originally allowed the violence to exist. In this vein, the U.S. should take into account the net effects military foreign aid could have on the recipient country, as well as the implication for further aid after the country's growth is hindered. U.S. military foreign aid does not lead to positive outcomes during civil war; this study suggests that it actually increases the chance of reversion toward violence through the political theory of civil conflict onset, as it contributes to the instability that makes violence more probable.

While there is not a clear consensus on the relationship between military expenditure and economic growth, civil conflict is costly beyond the quantitative measure of GDP growth. This study provides evidence for the theory of violence traps as an obstacle for development and shows how civil conflict can make government spending decisions more inefficient for the governing body and for the people.

Appendix A. Sample Countries and Income Groups

Table A1: Countries of Study and Income Groups

Low Income	Lower Middle Income	Upper Middle Income
Benin	Armenia	Albania
Burkina Faso	Bangladesh	Algeria
Burundi	Bolivia	Angola
Central African Rep.	Cambodia	Argentina
Chad	Cameroon	Azerbaijan
Congo, Dem. Rep.	Cape Verde	Belarus
Eritrea	Congo	Belize
Ethiopia	Cte dIvoire	Botswana
Gambia	Djibouti	Brazil
Guinea	Egypt	Bulgaria
Guinea-Bissau	El Salvador	Colombia
Haiti	Ghana	Dominican Rep.
Liberia	Guatemala	Ecuador
Madagascar	Honduras	Equatorial Guinea
Malawi	India	Fiji
Mali	Indonesia	Guyana
Mozambique	Kenya	Iraq
Nepal	Kyrgyzstan	Jamaica
Niger	Laos	Jordan
Rwanda	Lesotho	Kazakhstan
Senegal	Mauritania	Lebanon
Sierra Leone	Moldova	Malaysia
Tanzania	Mongolia	Mauritius
Togo	Morocco	Mexico
Uganda	Myanmar	Namibia
Zimbabwe	Nicaragua	Panama
	Nigeria	Paraguay
	Pakistan	Peru
	Papua New Guinea	Romania
	Philippines	South Africa
	Sri Lanka	Thailand
	Sudan	Turkey
	Swaziland	Turkmenistan
	Syria	USSR/Russia
	Tajikistan	Venezuela
	Tunisia	
	Ukraine	
	Uzbekistan	
	Viet Nam	
	Yemen	
	Zambia	

Appendix B. Military Foreign Aid

Table B1: Specified Aid Purposes

Published Aid Programs
International Military Education and Training
Foreign Military Financing
Other Military Assistance
Cooperative Threat Reduction
Drug Interdiction and Counter-Drug
Peace Keeping Operations

Table B2: Funding Account Names

Funding Account Names
International Military Education and Training
Foreign Military Financing Program
Military Assistance Programs (Old Code)
Foreign Military Financing, Direct Loan Program Account
Cooperative Threat Reduction Account, Defense
Excess Defense Articles
Drug Interdiction and Counter-Drug Activities, Defense
Iraq Relief and Reconstruction Fund, Executive Office of the President
Peace Keeping Operations
Iraq Security Forces Fund
Pakistan Counterinsurgency Fund
Operation and Maintenance, Defense-Wide
Military Construction, Army
Operations and Maintenance, Army

Appendix C. Interaction Variable Instrument Power

Table C1: Power of Interaction Variable with Over-Identified Instrument

VARIABLES	(1) MilEx×Conflict	(2) MilEx×Conflict	(3) MilEx×Conflict	(4) MilEx×Conflict
MilAid×Conflict	9.44e-06***	7.73e-06***	6.05e-06***	4.60e-06
	(3.19e-06)	(6.79e-07)	(3.99e-07)	(5.39e-06)
$MilAid_{t-1}$×Conflict		2.08e-06	-1.57e-06**	1.03e-06
		(3.02e-06)	(6.39e-07)	(3.85e-06)
$MilAid_{t-1}$×Conflict			1.43e-05***	1.75e-06
			(4.23e-06)	(5.18e-06)
$MilAid_{t-1}$×Conflict				1.28e-05*
				(6.97e-06)
Observations	1,905	1,749	1,406	1,288
R-squared	0.401	0.428	0.449	0.477
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
F-statistic	8.734	102	85.82	32.02
Prob > F	0.00390	0	0	0
J-Statistic		2.158	5.421	5.833
Prob > P		0.1418	0.1434	0.2120

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C1 reports the power of a vector of both current and lagged military foreign aid interacted with current conflict to predict the interaction term between military expenditure and conflict. Starting with an identified instrument of current military foreign aid, time lags of military foreign aid of one, four, and five years are included. The F-statistic for instrument power and J-statistic for over-identified instruments are included with their corresponding p-values. Variance is clustered by country, and country and time fixed effects are included in all columns.

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