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Output Response to Government Spending: Evidence from New International Military Spending Data

Viacheslav Sheremirov and Sandra Spirovska

Abstract:
Using 25 years of military spending data from more than a hundred countries, this paper provides new evidence on the effect of government spending on output. Following a popular assumption that military spending is unlikely to respond to output at business-cycle frequencies—and exploiting variation in military spending of a significantly larger magnitude than in the previous literature based on U.S. data—we find that the *pooled* government spending multiplier is small: below 0.2. This estimate, however, masks substantial heterogeneity: the *debt-financed* spending multiplier is larger and can be well above 1 *if monetary policy is accommodative*. The multiplier is especially large in recessions and when the government purchases durables. We also document substantial heterogeneity across countries with the spending multiplier larger in advanced economies and in countries with a fixed exchange rate. The output response to government spending persists for about two to three years. These findings suggest that the effectiveness of fiscal policy depends largely on the economic environment, policy implementation, and the central bank's response, and that the small multipliers found in historical or pooled data are a poor guide to evaluating the effectiveness of a specific stimulus program.

JEL Classifications: **E32, E43, E62, F44, H56**
Keywords: fiscal multiplier, military spending

Viacheslav Sheremirov is an economist in the research department of the Federal Reserve Bank of Boston. Sandra Spirovska was a senior research assistant in the research department of the Federal Reserve Bank of Boston at the time this paper written. Their email addresses are viacheslav.sheremirov@bos.frb.org, and spiro20s@gmail.com, respectively.

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1 Introduction

In 2008, the global economy was hit by a severe financial crisis, leading to a slump in output and employment of a magnitude unseen since the early 1930s' Great Depression. During this episode, policymakers found themselves in an environment that required an immediate, bold response and that was poorly explained by the dominant economic theories of the time. Fiscal policy, among other measures, was widely used to stimulate employment and to put the economy back on track. It was not the first time fiscal policy had been called to the rescue: Davies et al. (2012) identified 10 large fiscal stimulus programs in the United States during 1953–2011, many of which coincide with NBER recession dates. It is even more striking, then, how much disagreement there was—and still is—about the inner workings of fiscal policy and its effect on output and employment. At the time of the enactment of the American Recovery and Reinvestment Act (ARRA), a $787 billion stimulus package, European governments introduced massive fiscal consolidation programs intended to promote growth and employment by boosting confidence and preserving the solvency of governments. Paradoxically, on both sides of the Atlantic, the same problems were tackled by diametrically opposite policies, despite the similarities in the economies' development level and governance expertise.

Policymakers are not alone in their disagreement about the effects of fiscal policy. A vast academic literature fails to provide a definite answer to a simple question: by how much does output change in response to an extra dollar of government spending or, in other words, how large (or small) is the government spending multiplier? The answer suggested by numerous studies falls anywhere between negative and 2.5–3.[1] "The" multiplier is clearly a theoretical concept; in the real world, its size depends on policy specifics and the economic environment: in particular, on how spending is financed, on monetary policy response, on the degree of economic slack, on the economy's level of development, on the exchange-rate regime, on international business cycles, etc. Hence, the multipliers obtained for different countries or time periods may differ significantly from one another. At the same time, the estimation of fiscal multipliers is methodologically challenging, as government spending often reacts to current or anticipated changes in economic conditions, and requires bold identifying assumptions. Barro (1981), Hall (1986, 2009), Rotemberg and Woodford (1992), and Barro and Redlick (2011), among others, rely on military spending as an exogenous component of government expenditure. However, in the United States after World War II (and even more so after the Korean War), there has not been enough variation in military spending to estimate the multiplier with a high degree of precision.[2]

[1] Giavazzi and Pagano (1990), Alesina and Perotti (1997), and, more recently, Alesina and Ardagna (1998, 2013) suggest that fiscal consolidation can be expansionary, implying negative multipliers. On the other side of the spectrum, Romer and Bernstein (2009) and Fisher and Peters (2010) report multipliers that are between 1.5 and 2. Christiano, Eichenbaum, and Rebelo (2011) show that in a model with the zero lower bound, the multiplier may be as high as 2.3, while Auerbach and Gorodnichenko (2012) show empirically that, in recession, it can be even higher, up to 3.6. (See Ramey 2011a for a comprehensive literature review.)

[2] Other popular methods to identify the fiscal multiplier include the structural vector autoregression (SVAR) (Blanchard and Perotti 2002, Galí, López-Salido, and Vallés 2007, Perotti 2008, Mountford and Uhlig 2009) and the narrative approach (Ramey and Shapiro 1998, Leigh et al. 2010, Romer and Romer 2010, Ramey 2011b). SVAR's identifying as-

This paper addresses the lack of variation in military spending by focusing on a large panel of countries with significant time variation in such spending. Extending Hall's (2009) approach to 129 countries during 1988–2013, we find that the *gross* government spending multiplier is small: in the range of 0.15–0.19. However, the effect of government spending on output depends largely on (*i*) monetary policy response and (*ii*) how spending is financed. *Debt-financed* government spending (such as ARRA) and completely accommodative monetary policy produce multipliers in the range of 0.5–1 if applied separately, and above 1 if applied together.[3] As the timing and composition of the 2009 stimulus package was the subject of heated debates, we assess the duration of output response to government spending using the local projections method (Jordà 2005). We find that the effect of government spending on output lasts for about two to three years.

We also find substantial heterogeneity in the multiplier's size across countries. For advanced economies, the gross multiplier is larger, around 0.6, and the debt-financed multiplier under accommodative monetary policy is above 2. However, the effect of government spending on output lasts longer in developing countries (by a year in comparison to advanced economies), possibly due to a swifter response of rich countries' central banks or as a result of stricter adherence to monetary policy rules. Along with the level of development, exchange-rate regimes are also found to affect the multiplier's size. The gross multiplier in countries with a fixed exchange rate is larger by 0.5–0.6 than in countries with a floating rate. This is consistent with an old idea that under a fixed exchange-rate regime, fiscal expansion requires monetary accommodation in order to maintain the peg, leading to a stronger response in output (Mundell 1963).

Next, we present new evidence on the state-dependence of government spending multipliers, which has received attention in the recent literature (Auerbach and Gorodnichenko 2012, Ramey and Zubairy 2014). If the policy rate is kept fixed, the pooled multiplier in recessions is larger by 1.15 than in expansions (the difference is statistically insignificant in other specifications). In the sample of advanced economies, the difference between recessions and expansions is even larger, and statistically significant in most specifications.

Finally, we show that, contrary to the implications of many stylized models, it does matter what the government spends on: the multiplier of spending on durables is larger than the multiplier on nondurables and services, especially in recessions. There are a few reasons why the multiplier may be larger for durables than for nondurables or services. First, the durables sector is usually more volatile and is hit harder in recessions. Under imperfect product or factor mobility, the economy is better off when government spending offsets demand shocks in disproportionately affected sec-

sumption holds that government spending does not respond to output within a quarter. Although a plausible assumption *per se*, it has been shown that government spending may respond to *anticipated* changes in output, and that SVAR-identified shocks are generally forecastable, invalidating inference (Leeper, Walker, and Yang 2013). In comparison, the narrative approach is based on the analysis of historical documents, which often state explicitly whether a particular spending program was undertaken in response to changing (current or future) economic conditions. Although a cleaner strategy, it has some replication issues (historical documents are subject to interpretation by individual researchers), and it is often hard to construct long time-series for multiple countries, as the task is extremely labor intensive (and not all countries are as meticulous in preserving the documentation of policy meetings as the United States is).

[3]The debt-financed spending multiplier is 0.57, the gross multiplier under completely accommodative monetary policy is 0.98, and the debt-financed multiplier when interest rates are held fixed is 1.26.

tors. Second, the intertemporal elasticity of substitution for durables is higher than the one for nondurables and services. Barsky, House, and Kimball (2007) show that, under this condition, the effectiveness of monetary policy depends mostly on the price flexibility of durables. In a similar spirit, the differences in the intertemporal elasticity of substitution across sectors may contribute to the sectoral heterogeneity of the spending multiplier.[4]

The data on total military expenditure are compiled by the Stockholm International Peace Research Institute (SIPRI), an international research institute that combines official data from national governments with data from secondary sources such as NATO, IMF, Europa Yearbooks, etc. Gartzke (2001) goes back to primary sources (SIPRI Yearbooks and NATO press releases) and compiles two series of disaggregated military spending: one for durables and one for nondurables/services.[5] We follow his approach and extend the series to 2013 (the original data end in 1997). To the best of our knowledge, the data have not been used to estimate fiscal multipliers before. Next, we combine the military spending data with data on countries' real GDP, monetary policy rates, and marginal tax rates, obtained from multiple sources (HAVER Analytics, KPMG, OECD, United Nations Main Aggregates Database). Our benchmark exchange-rate classification follows Klein and Shambaugh (2008); for robustness checks, we also use the classifications of Shambaugh (2004), Levy-Yeyati and Sturzenegger (2005), Ilzetzki, Reinhart, and Rogoff (2009), and the IMF. Finally, to control for military activity, we rely on the Correlates of War (COW) project's data. The COW project, among other information, reports whether a country was engaged in military combat on domestic or foreign soil in a given year, and also provides the estimated number of casualties. The resulting dataset contains measures of output, government spending on the military (total, on durables, and on nondurables/services), monetary policy rates, tax rates, exchange-rate regimes, and military activity for 129 countries during 1988–2013. For NATO members, the data go back to 1970.

Our empirical strategy relies on a popular assumption that changes in military spending are driven mostly by geopolitical factors, and are unlikely to occur in response to current or anticipated changes in GDP, at least at the annual frequencies or higher. Although this assumption is widely accepted for developed countries that do not fight wars on domestic soil and that have global political and military presence, such as the United States, it is not innocuous for less developed countries whose governments are cash constrained and have to deal with security issues on domestic soil or in close proximity to their borders. However, we believe that, for our purposes, this is unlikely to be a problem. First, in our dataset, there are few countries that actually belong to this category. We exclude observations for countries and years for which wars led to significant economic damages, such as Kuwait during the Gulf War.[6] Second, we explicitly control for wars, using the war dummy

[4]Another important factor is the heterogeneity of price stickiness across sectors. Mankiw and Reis (2003), Benigno (2004), and Carvalho (2006), among others, study how such heterogeneity affects monetary policy and what measure of inflation the central bank should target.

[5]For developing countries during the 1950s–1980s, Gartzke (2001) uses data from Ball (1988). Due to a potentially large measurement error in the data reported by developing countries' governments in the '50s and '60s (in comparison to our primary source), we refrain from using Ball's series.

[6]We also exclude countries that have fewer than 15 years of observations, eliminating a number of war-torn countries, such as Afghanistan or Iraq, from the sample.

as our preferred measure and using the number of casualties as a robustness check. Although the data on wars are unavailable for some countries and end in 2007—leading to a smaller number of observations and to sample-composition issues—qualitatively, our main conclusions remain unaffected. Third, although a country likely increases its geopolitical influence as it becomes richer, we doubt that this channel plays a significant role at an annual frequency. Finally, any remaining endogeneity in military expenditure would lead to attenuation bias, implying that the fiscal multiplier might, in fact, be even greater than reported in this paper.

Our empirical strategy follows Hall (2009), extending his approach to a panel of countries, as well as to two types of spending. Hall's method relies on a simple ordinary least squares (OLS) estimation of the relationship between real GDP growth and the change in military expenditure normalized by the lag of real GDP. Using OLS is justified by the exogeneity assumption discussed in detail above. In this specification, the slope coefficient can be interpreted as a dollar change in output in response to a one-dollar change in military spending, a conventional definition of the multiplier. In our panel setup, we add country and time fixed effects, which control for heterogeneity across countries and international business cycles, respectively. To compute the output response to military spending at longer horizons, we rely on the direct projections method (Jordà 2005) popular in the spending multiplier literature.

This paper contributes to several strands of the literature on fiscal multipliers. First and foremost, we provide new estimates of the government spending multiplier; this literature is eloquently summarized by Ramey (2011a). Numerically, our results are in line with previous studies, but the estimates are somewhat more precise. Second, we estimate the multiplier in recessions and in expansions.[7] For the U.S. data and for a panel of OECD countries, Auerbach and Gorodnichenko (2012, 2013) find that the multipliers in recession are larger than in expansion, while Ramey and Zubairy (2014) question this result, based on evidence from U.S. historical data. We support Auerbach and Gorodnichenko's result, and find that it can be extended to developing countries. Third, we support empirically the theory of Ramey and Shapiro (1998) that spending multipliers may differ across sectors. We provide specific evidence that the multiplier for durables is larger than the multiplier for nondurables. Fourth, similar to Ilzetzki, Mendoza, and Végh (2013), we find that a country's economic development—which can be associated with significant differences in institutions and the degree of slack in the economy—and exchange-rate regime affect the multiplier's size. Unlike their study, we reach this conclusion without making any of the structural assumptions required by SVAR. Finally, we contribute to a vast literature that employs cross-sectional variation in government spending (Clemens and Miran 2012, Nakamura and Steinsson 2014, Suárez Serrato and Wingender 2014, Shoag 2015). However, instead of relying on *cross-state* variation to estimate the "relative" multiplier (which measures how much output rises in a state that spends an extra dollar relative to a state that does not), we use *cross-country* variation to estimate the "gross" multiplier (how much output rises if a country's government spends an extra dollar).[8]

[7]For an overview of the literature on multipliers in recessions and in expansions, see Parker (2011).

[8]There are also studies that look at the effect of a state's government spending on employment (Chodorow-Reich et al. 2012). Still other studies examine the effect of fiscal policy on GDP components such as consumption, often relying on

Empirical estimates of the spending multiplier can be used to validate—or to refute—theoretical models. Models set in the neoclassical tradition (Barro and King 1984, Aiyagari, Christiano, and Eichenbaum 1992, Baxter and King 1993) emphasize the wealth effect, which limits the output response to spending. Without distortionary taxation, such models often give rise to Ricardian equivalence (the equality of debt- and tax-financed spending multipliers), which we reject based on the data. In New Keynesian models, as shown by Woodford (2011), sticky prices and wages allow for multipliers larger than those in neoclassical models. However, to obtain multipliers that are bigger than 1, these models often require rule-of-thumb consumers with elastic labor supply (Galí, López-Salido, and Vallés 2007) or the zero lower bound (Eggertsson and Woodford 2003, Christiano, Eichenbaum, and Rebelo 2011, Eggertsson 2011). New Keynesian models' predictions are, by and large, consistent with our finding that the multiplier is generally smaller than 1, unless the policy rate, or the exchange rate, is fixed. Our findings are also consistent with a recent model of Michaillat (2014), who, by introducing search-and-matching frictions into the New Keynesian setup, shows that the multiplier in recession can be larger than in expansion, due to the effect of government spending on labor-market tightness.

The paper proceeds as follows. Section 2 describes the data and documents data sources. Section 3 presents an overview of methodology and main results. It provides estimates of the government spending multiplier for advanced and developing economies, examines the multipliers in recession and in expansion, explores the role of taxation and monetary policy response, and compares multipliers across exchange-rate regimes. In this section, we also provide the impulse responses of output to military spending. Section 4 extends the methodology to account for sectoral multipliers, and then presents multiplier estimates of spending on durables and on nondurables/services. Section 5 concludes.

2 Data

We compile annual data on military expenditure, economic activity, and policy for 129 countries during 1988–2013.[9] This dataset is unique in a number of ways. First, it is the first compilation of military expenditure data for a large panel of countries that allows one to estimate the size of the government spending multiplier with a high degree of precision and reliability. Second, the sample period covers a unique episode of the 2008 Global Financial Crisis and the subsequent Great Recession, which drove interest rates across the advanced economies toward the zero lower bound and triggered an unprecedented policy response from central banks and fiscal authorities, such as quantitative easing, forward guidance, and fiscal stimulus (in the United States) or fiscal consolidation (in the United Kingdom and across the European Union). Third, the dataset includes both advanced economies (36 countries) and developing countries (93 countries). As most of the previous studies that employ a multicountry panel to estimate the size of the fiscal multiplier focus predominantly on advanced economies, our data allow us to shed new light on the effect of fiscal

household surveys (Johnson, Parker, and Souleles 2006, Parker et al. 2013, Broda and Parker 2014).

[9] See Appendix A for additional details not provided in this section.

Table 1. Data Coverage and Source

	Number of Countries				
	Entire sample (1)	Advanced economies (2)	Developing countries (3)	Sample period (4)	Source (5)
GDP	129	36	93	1988–2013	U.N. Main Aggregates
Military spending	129	36	93	1988–2013	SIPRI
composition (1)	129	36	93	1988–1997	Gartzke (2001)
composition (2)	129	36	93	1998–2013	NATO
Wars	76	19	57	1988–2007	Correlates of War
Tax rates (1)	33	33	0	1988–2013	OECD
Tax rates (2)	88	36	52	2006–2013	KPMG
Corporate tax rates	96	36	60	2006–2013	KPMG
Policy rates (1)	75	36	39	1988–2013	HAVER
Policy rates (2)	75	36	39	1988–2013	IFS
Exchange-rate regime	127	36	91	1988–2013	Klein and Shambaugh (2008)

Notes: See Appendix A for details. Note that Klein and Shambaugh's (2008) classification is updated up to 2013.

policy in the developing world and to compare the size of the government spending multiplier across countries at different stages of development.[10] Finally, the dataset contains a breakdown of total military expenditure on durables and on nondurables/services, thereby allowing us to estimate the multiplier by sector.

The dataset was compiled using multiple sources (Table 1). The data on military expenditure come from SIPRI, a Stockholm-based independent international institute dedicated to research into conflict, armaments, arms control, and disarmament. The data on GDP are taken from the United Nations Main Aggregates Database (UNMAD). To make sure that military spending and GDP are converted to real units in the same way, we construct the real military spending series by multiplying the military spending–to–GDP ratio, taken from SIPRI, by real GDP at constant 2005 U.S. dollars, taken from UNMAD.

Up until now, the SIPRI military-expenditure dataset has not been widely employed in economic research. SIPRI collects information about military spending from three sources: (1) official data provided by national governments; (2) secondary sources that quote primary data, such as NATO, the IMF, the Europa Yearbook, country reports of the Economist Intelligence Unit, and country reports by the IMF staff; and (3) other secondary sources, such as specialist journals and newspapers. Since 1969, SIPRI has been publishing annual yearbooks, providing detailed data on countries' military expenditure, among other information on international security, arms production and trade, and armed conflicts. The information on countries' military expenditure is compiled into the SIPRI Military Expenditure Database, which contains time-series on the military spending of 171 countries since 1988, and of NATO members from 1949 (or from when a country joined the alliance).[11] To compute the ratio of military expenditure to GDP, SIPRI collects GDP data from the IMF's Economic Outlook.[12]

[10] Ilzetzki, Mendoza, and Végh (2013) also estimate the size of the government spending multiplier for developed and developing countries separately, but in a much smaller panel of countries (24 developing countries, 44 countries, overall). Unlike their study, we rely on military expenditure as a proxy for government spending shocks, instead of using SVAR, largely critiqued in the literature (see Ramey 2011b, among others).

[11] When we combine the data for military expenditure with those for real GDP and other covariates, we can extend the sample period for NATO members to 1970–2013. We report the results for this extended sample in Appendix B.

[12] For more details, see http://www.sipri.org/research/armaments/milex/milex_database.

To decompose total military expenditure into spending on durables and nondurables/services, we use data from Gartzke (2001). These data were compiled from three sources: United Nations Military Expenditure Data, NATO Press Releases, and SIPRI Yearbooks. In particular, NATO divides defense expenditure into four categories: equipment, infrastructure, personnel, and other expenditures (typically, operations costs). Gartzke combines the first two into "durables" (or "capital costs" in the original terminology) and the last two into "nondurables/services" (or "operating costs"). As the original series ends in 1997, we extend this dataset up to 2013, using the same approach and source (NATO).

Ilzetzki, Mendoza, and Végh (2013) point out that using military expenditure to estimate fiscal multipliers in developing countries is often problematic because a surge in military spending is often driven by wars, which are triggered by domestic economic conditions and are fought on domestic soil. To control for countries' military engagement, we use data from the COW project, which seeks to facilitate the collection, dissemination, and use of accurate and reliable quantitative data in international relations to stimulate research in this area. Specifically, we rely on the COW War Data, 1816–2007 (v4.0), which, among other information, contain a war dummy indicating whether a country was engaged in inter-, intra-, or extra-state war in a given year.[13]

As Ricardian equivalence does not hold in New Keynesian models, nor in neoclassical models with distortionary taxation, we collect data on taxes in order to separate the effects of deficit-financed spending from the effects of tax-financed spending. First, we use individual income marginal tax rates provided by OECD, data that cover only its member states. The OECD data provide information on the entire tax scale and personal allowances.

Next, to extend the coverage to developing countries, we supplement the OECD data with individual income marginal tax rates of top earners, collected by KPMG.[14] The KPMG data have two limitations for our study: (1) they provide marginal tax rates for top income earners only; and (2) they are not available before 2006. To use a consistent measure of marginal tax rates for the OECD and KPMG data, we focus on the marginal tax rate of top income earners. This method has the obvious limitation of ignoring the variation in tax rates for low-income brackets or in personal allowance. However, unlike the average marginal rate, this measure is not affected by changes in total income or its distribution and, given the long legislative lags in changing tax policy, can be assumed to be exogenous at an annual frequency.

To control for the central banks' response to changes in military spending, we use data on interest rates from multiple sources. First, we employ HAVER Analytics's G10 and INTDAILY databases to obtain end-of-period policy rates for 25 countries and the ECB.[15] These are official policy rates provided by the respective central banks. For all other cases, we rely on discount rates from the

[13]The dataset also contains information on the number of casualties. See Sarkees and Wayman (2010) for more details. The dataset and its description are available at http://www.correlatesofwar.org/data-sets/COW-war.

[14]The KPMG data also contain tax rates for developed countries; however, the dataset's time-series is shorter than that in the OECD data.

[15]HAVER's G10 provides policy rates for nine developed countries and the ECB, and INTDAILY provides rates for developing and upper middle income countries such as Brazil, Chile, the Czech Rep., and Russia, among others (16 countries, overall).

Table 2. Descriptive Statistics

	Entire sample			Advanced economies			Developing countries		
	Obs. (1)	Mean (2)	SD (3)	Obs. (4)	Mean (5)	SD (6)	Obs. (7)	Mean (8)	SD (9)
Real GDP growth	3,001	3.6	4.7	882	2.7	3.2	2,119	4.0	5.1
Military spending change	3,001	0.0	1.3	882	0.0	0.4	2,119	0.0	1.6
durables	548	0.0	0.2	484	0.0	0.2	64	0.0	0.2
nondurables and services	548	0.0	0.2	484	0.0	0.2	64	−0.1	0.6

Notes: See Table 1 for the list of data sources. A change in military spending is normalized by real GDP lag, as in Hall (2009).

IMF's International Financial Statistics (IFS), which may not necessarily be policy rates targeted by the respective central banks.[16] As a benchmark measure, we use the last nonmissing observation of a policy interest rate within a year, as this measure controls for the stance of monetary policy at the end of the period. In addition, we check the robustness of our results by using the average policy rate over the period.[17]

Textbook open economy models (for example, Mundell 1963) imply that the government spending multiplier is larger when the exchange rate is pegged. To test this result, we use the exchange-rate regime classification provided by Klein and Shambaugh (2008); a country is considered to be in a fixed exchange-rate regime if the end-of-month exchange rate stays within the 2-percent bands for the entire year.[18] Alternatively, we consider exchange-rate regime classifications compiled by the IMF, Shambaugh (2004), Levy-Yeyati and Sturzenegger (2005), and Ilzetzki, Reinhart, and Rogoff (2009).

Table 2 presents summary statistics for real GDP growth and the change in military expenditure normalized by the GDP lag. Developing countries, on average, grow faster than developed ones (4.0 vs. 2.7 percent per year), and also exhibit higher variability in growth rates, as measured by the standard deviation (5.1 vs. 3.2). Although the amount of military spending tends to be very persistent, similar to the U.S. data (Hall 2009), there is much more time variation in military spending in developing countries (the standard deviation of the spending growth rate is 1.6 in developing countries and 0.4 in developed ones); the difference comes mostly from spending on nondurables and services. Therefore, expanding sample coverage to developing countries makes the identification strategy cleaner, and produces more precise estimates of the spending multiplier than in the literature that relies on a single country's military-spending variation.

[16] In some cases, we splice the rates from IFS with those from INTDAILY, in order to obtain longer time-series or reduce the number of missing observations. See Appendix A for more details.

[17] As changes in GDP have a feedback effect on the policy rate i, we instrument i_t with a two-year lag i_{t-2}. Many central banks, during policy meetings, have access to GDP forecasts up to two years ahead; therefore, exogeneity restriction should hold.

[18] Klein and Shambaugh's (2008) classification updated up to 2013 can be found at http://www.gwu.edu/ iiep/about/faculty/jshambaugh/data.cfm.

3 The Size of the Spending Multiplier

To estimate the size of the government spending multiplier, we follow the approach of Hall (2009). The key identifying assumption is that military-spending changes are mainly affected by the geopolitical situation (wars, global security issues, etc.), and not by the current economic activity. This assumption has been widely used in the literature for developed countries not involved in any military activity on domestic soil, such as the United States (Barro 1981, Hall 1986, and, more recently, Barro and Redlick 2011, Ramey 2011b). Since we apply the methodology to developing countries, we account for the effects of wars on output by using war data from the COW project.

Given the identifying assumption, the simplest way to estimate the multiplier is to regress the real GDP growth rate on the change in military expenditure normalized by the GDP lag, so that the coefficient can be interpreted as a change in real GDP, in dollars, due to a one-dollar increase in government spending (a classic definition of the multiplier). This approach also converts data from multiple countries and periods to comparable units. Extending the methodology to a multicountry panel, we include time and country dummies, as well as other controls that may affect the size of the multiplier. The exact specification is as follows:

$$\frac{\Delta y_{it}}{y_{i,t-1}} = c + \alpha_i + \beta_t + m\,\frac{\Delta g_{it}}{y_{i,t-1}} + \boldsymbol{\gamma}' \boldsymbol{X}_{it} + \epsilon_{it}, \tag{1}$$

where y_{it} is country i's real GDP in year t, g_{it} is the corresponding military spending, $\boldsymbol{X}_{it}$ is a vector of controls with coefficients $\boldsymbol{\gamma}$, c is a constant, α_i and β_t are country and year fixed effects, respectively, and ϵ_{it} is the error term. The estimate $\hat{m}$ is the government spending multiplier. Equation (1) is estimated by the usual panel-data techniques based on OLS with fixed effects.

Besides wars,[19] our control variables ($\boldsymbol{X}$) include monetary policy interest rates (i) from Haver Analytics and IFS, and marginal tax rates (τ) from OECD and KPMG. By including policy and tax rates in the specification, we essentially estimate different multipliers. Without these controls, $\hat{m}$ measures the output response to government spending when monetary policy follows the cross-country and period average Taylor rule and and when fiscal authorities use the average mix of debt- and tax-financing. When we control for i, $\hat{m}$ measures the output response when monetary policy is completely accommodating (the central bank keeps the policy rate fixed). This can be the case, for example, under the zero lower bound. When we control for τ, $\hat{m}$ represents the multiplier for purely debt-financed spending. Finally, when we control both for i and for τ, we measure the "rescue" multiplier, that is, the output response to debt-financed spending when the economy is stuck at the zero lower bound or when fiscal expansion is fully accommodated by monetary authorities (similar to the 2009 ARRA program in the United States).

As the policy rate changes in response to GDP at frequencies higher than annual, it is instru-

[19] When controlling for wars, we include both the war dummy and the interaction term between wars and military spending. Hence, our baseline estimates can be interpreted as the spending multiplier in countries not directly affected by wars.

mented with a two-year lag to avoid the "smear" effect.[20] Central banks often rely on GDP forecasts up to two years ahead, so the assumption that i_t is unlikely to respond to y_{t+2} is reasonable. We also believe that our tax-rate measure is more likely to change for political reasons than as a result of contemporaneous changes in GDP. This, together with the long implementation lag, suggests that using marginal tax rates of top income earners as a control is unlikely to pose a problem. Our estimated coefficients are statistically significant and have the expected sign. Moreover, as expected, controlling for monetary and tax policy measures significantly raises the spending multiplier estimates. Hence, we believe that these assumptions are largely satisfied.[21]

To measure the multiplier in recessions, we define recession at an annual frequency as a decrease in real GDP relative to the previous year; since we do not have quarterly data, we treat the subsequent year as recession, too ($\rho_t \equiv \max[\mathbb{I}\{\Delta y_t/y_{t-1} < 0\}, \mathbb{I}\{\Delta y_{t-1}/y_{t-2} < 0\}]$). We then include ρ_t and the interaction term $\rho_t\ (\Delta g_t/y_{t-1})$ in Equation (1). The coefficient on the interaction term tells us the difference between the multipliers in recession and in expansion. As it is hard to define recessions more precisely at an annual frequency, we experiment with alternative definitions of recessions (a fall in GDP relative to the previous year, that plus a fall in GDP in the next year, etc.), and reach qualitatively similar results.

Finally, to evaluate the effect of the exchange-rate regime on the multiplier's size, we enhance Equation (1) with a dummy variable indicating whether country i pegged its currency in year t (ε_{it}) and with the interaction term $\varepsilon_t\ (\Delta g_t/y_{t-1})$; the coefficient on the latter indicates the size of the spending multiplier relative to that in countries with flexible exchange rates. Countries with a fixed exchange rate and no capital controls have to give up monetary policy independence and therefore cannot offset fiscal expansion with rising policy rates. Thus, comparing countries with fixed and floating exchange rates can serve as another way of controlling for monetary accommodation, as it is not common for a country to regularly switch between the regimes as a countercyclical policy tool.

Spending Multipliers The results summarized in Table 3 suggest that, depending on the sample of countries and controls, the average government spending multiplier is likely to be in the range of 0.15–0.62, but can be well above 1 if monetary policy or tax rates are controlled for. In particular, Panel A of Table 3 presents the results for the entire pool of countries. When no controls other than country and time fixed effects are used (Column 1), a one-dollar increase in military spending by the government is associated with a 19-cent increase in GDP, consistent with previous studies. Although the effect is quantitatively small, the estimate is identified with a higher degree of precision (significant at a 1 percent level).

When we control for wars using the dummy for a military involvement on domestic or foreign soil (Column 2), the multiplier remains qualitatively similar; however, the standard errors rise

[20]That is, when the inclusion of an endogenous variable in a multiple regression makes the estimate of an exogenous variable's effect inconsistent.

[21]To the extent that any endogenous correlations with GDP remain, our estimates can be interpreted as the spending multiplier's lower bound. However, when controlling for monetary and tax policy, the multiplier is large, and therefore it is unlikely that the bias has a strong impact on our estimates.

Table 3. How Big is the Military Spending Multiplier?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Panel A: Entire Sample					
Spending multiplier	0.19***	0.15**	0.98***	0.57***	1.26***	0.26**	0.39**	0.24	0.34
	(0.06)	(0.08)	(0.18)	(0.21)	(0.45)	(0.12)	(0.19)	(0.27)	(0.60)
Recession interaction						−0.20	1.15**	0.76	1.28
						(0.14)	(0.47)	(0.91)	(1.70)
Policy rate			−0.01**		−0.15*		−0.00		−0.10
			(0.00)		(0.08)		(0.00)		(0.09)
Tax rate				−0.07*	−0.08			−0.05	−0.01
				(0.04)	(0.05)			(0.05)	(0.06)
War dummy	N	Y	N	N	N	N	N	N	N
R^2	0.21	0.21	0.43	0.64	0.69	0.34	0.45	0.49	0.52
N	3,001	1,339	1,466	583	428	3,001	1,466	583	428
				Panel B: Advanced Economies					
Spending multiplier	0.62***	0.59**	0.76***	2.33***	2.17***	0.47**	0.64**	0.84	1.00
	(0.22)	(0.24)	(0.26)	(0.51)	(0.51)	(0.23)	(0.29)	(0.67)	(0.68)
Recession interaction						1.09	1.69*	3.04***	2.39**
						(0.93)	(0.97)	(1.17)	(1.18)
Policy rate			−0.07**		−0.04		0.05**		0.04*
			(0.03)		(0.04)		(0.02)		(0.02)
Tax rate				−0.06*	−0.05*			−0.04	−0.01
				(0.03)	(0.03)			(0.03)	(0.03)
War dummy	N	Y	N	N	N	N	N	N	N
R^2	0.48	0.32	0.55	0.55	0.57	0.44	0.47	0.45	0.47
N	882	361	739	736	642	882	739	736	642
				Panel C: Developing Countries					
Spending multiplier	0.17**	0.15*	0.95***	0.49**	1.05*	0.21	0.25	0.21	0.21
	(0.07)	(0.09)	(0.24)	(0.25)	(0.57)	(0.15)	(0.26)	(0.29)	(0.66)
Recession interaction						−0.18	1.02*	0.27	−1.43
						(0.16)	(0.60)	(1.03)	(2.69)
Policy rate			−0.00		−0.14		−0.00		0.01
			(0.00)		(0.11)		(0.00)		(0.11)
Tax rate				−0.04	−0.01			−0.05	0.03
				(0.06)	(0.08)			(0.06)	(0.09)
War dummy	N	Y	N	N	N	N	N	N	N
R^2	0.19	0.21	0.34	0.55	0.57	0.32	0.36	0.44	0.45
N	2,119	978	727	333	189	2,119	727	333	189

Notes: This table presents the benchmark estimates of government spending's effect on output. See Table 1 for the list of data sources. Country and time fixed effects are included in all specifications. Column (1) provides pooled estimates, Column (2) controls for the war dummy, Column (3) instruments policy rates with the two-year lag, Column (4) controls for marginal tax rates, and Column (5) for both policy and tax rates. Columns (6)–(9) do the same, in addition, including the recession dummy and the interaction term of recession and spending. While Panel A pools all 129 countries together, Panels B and C focus on advanced and developing economies separately.

somewhat due to a decrease in the number of countries and years for which the data on wars are available.[22] As controlling for wars does not affect the results quantitatively but reduces the sample size, we present the results for the other controls without controlling for wars.

Columns (3)–(5) of Table 3 show that the spending multiplier can be much larger if the effect of government spending is not offset by a countercyclical monetary policy and/or if government spending is financed by debt. The multiplier goes up from 0.19 to 0.57 if government spending is debt-financed, to 0.98 if there is no change in the central bank's policy rate, and to 1.26 if both tax rate and policy rate are held constant.[23] As we increase the number of controls, we are left with fewer observations (with data for all the variables), which results in lower-precision estimates. However, the multiplier remains significant at, at least, a 5 percent level.

[22] Table C1 in the appendix controls for battle deaths instead of using the war dummy. The results are similar.

[23] We use end-of-year interest rates as a benchmark measure. Table C2 in the appendix shows that the results remain similar when we use the average rate instead.

Table 4. Spending Multiplier and Exchange-Rate Regime

	Entire sample		Advanced economies		Developing countries	
	(1)	(2)	(3)	(4)	(5)	(6)
Spending multiplier	0.13**	0.12	0.48*	0.73**	0.13*	0.12
	(0.06)	(0.08)	(0.28)	(0.31)	(0.07)	(0.09)
Fixed exchange-rate interaction	0.46**	0.60*	0.36	−0.32	0.38	0.68
	(0.21)	(0.34)	(0.46)	(0.51)	(0.25)	(0.42)
War dummy	N	Y	N	Y	N	Y
R^2	0.21	0.21	0.48	0.32	0.19	0.22
N	2,911	1,272	882	361	2,029	911

Notes: This table measures the exchange-rate regime's effect on the spending multiplier. See Table 1 for the list of data sources. Country and time fixed effects are included in all the specifications. Even-numbered columns control for the war dummy.

In support of Auerbach and Gorodnichenko (2012), Columns (6)–(9) of Table 3 suggest that in recessions the multiplier can be significantly larger than in expansion if we control for monetary policy. In particular, if the central bank keeps the policy rate unchanged, a dollar spent by the government during recessions can lead to an increase in GDP that is $1.15 larger than during expansions (Column 7). However, with a typical response of policy rates (Column 6), there is no significant difference between the multipliers, supporting Ramey and Zubairy (2014). Although the difference between the multipliers is not statistically significant when we control for both policy rates and taxes, it remains large (1.28). The lack of statistical significance is most likely due to a drastic drop (from 1,466 to 428) in the number of observations once we use the tax series. Hence, we confirm that the effect of government spending on output depends largely on how spending is financed and on the central bank's response.

Panels B and C of Table 3 split the sample into developed and developing countries.[24] In developed countries, the multiplier is consistently larger than in developing countries, across a wide range of specifications. For instance, without controls, the multiplier is 0.62 in the panel of developed economies and 0.17 in less developed countries. When both monetary policy and tax rates are controlled for, the multiplier is 2.17 in the richer countries and 1.05 in the poorer. The only instance when the multiplier is higher in developing countries is when we control for monetary policy but not for taxes (Column 3). We conjecture that developing countries are more likely to finance spending by debt, as tax collection is often problematic, but are also more likely to raise rates for balance-of-payments or government-bonds issuance reasons. The difference between the multipliers in recession and in expansion is also larger in developed countries (Columns 6–9 of Panels B and C). Overall, although the multiplier in developing countries is smaller and more stable across expansions and contractions, qualitative conclusions are similar across the samples.

Table 4 presents estimates of the multiplier when controlling for exchange-rate regimes, based on the Klein and Shambaugh (2008) classification. The textbook model (for example, Mundell 1963) suggests that fiscal policy should be more effective under the fixed exchange-rate regime,

[24]The sample of developed countries includes OECD members and the IMF's advanced economies, for which the data are available: Australia, Austria, Belgium, Canada, Chile, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Malta, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Singapore, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. All other countries in the sample are considered developing.

since the central bank's policy rate is used to maintain the peg rather than to respond to domestic economic activity. We find strong confirmation of this theory, except for the sample of developed countries (most likely because most of them allow their currency to float).[25] Column (1) of Table 4 suggests that under a fixed exchange-rate regime a dollar spent by the government leads to a 46-cent larger response in output than under a floating exchange rate. This difference becomes even larger (60 cents) when controlling for wars (Column 2). This result is driven primarily by developing countries (see Columns 5 and 6); in the sample of advanced economies, however, the difference between the multipliers under the two regimes is insignificant.[26]

To summarize, the pooled multiplier is found to be small; nevertheless, when monetary policy is accommodative and spending is financed by debt, the multipliers are likely to be close to or above 1. The multipliers are particularly large when there is pronounced slack in the economy; in recessions, we found estimates as large as 2, and we believe that slack may drive the difference in multipliers between developed and developing countries. In comparison to the previous literature, our estimates are larger than those obtained for the United States in the period after the Korean War, but are consistent with historical estimates that include World War II (Hall 2009, Barro and Redlick 2011). Our findings also support a theoretical and empirical literature that shows that the spending multiplier in recessions is larger than in expansions (Auerbach and Gorodnichenko 2012).

Persistence of Output Response to Government Spending Next, we look at the effect of fiscal policy over a longer time horizon. Theory suggests that any stimulating effect of government spending on output will eventually be reversed once, in response to GDP growth, the government raises taxes and the central bank raises its policy rate. As we use data at an annual frequency, we are somewhat limited in the ability to measure the timing of the response. However, our empirical strategy makes it easy to apply the direct projections method (Jordà 2005), which was previously used in the context of fiscal multipliers (Auerbach and Gorodnichenko 2013).

Specifically, we regress the cumulative change in real GDP up to five years ahead on the current change in total military spending:

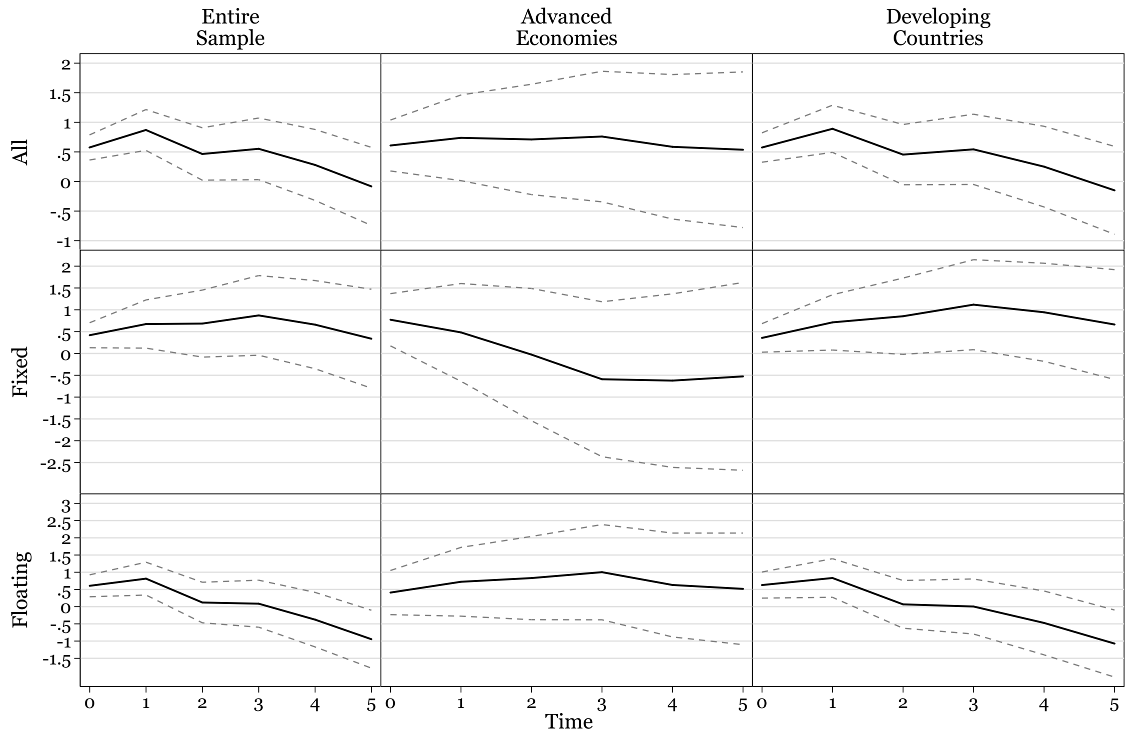
$$\frac{y_{i,t+h}-y_{i,t-1}}{y_{i,t-1}} = c + \alpha_i + \beta_t + m_h \frac{\Delta g_{it}}{y_{i,t-1}} + \delta_1 \frac{\Delta y_{i,t-1}}{y_{i,t-2}} + \delta_2 \frac{\Delta g_{i,t-1}}{y_{i,t-2}} + \epsilon_{it}, \tag{2}$$

where $h = 0, ..., 5$ is the time horizon, δ_1 and δ_2 are the lags' loadings, and other variables are defined as before. Equation (2) allows us to estimate the impulse-response function based on direct projections. The lags of GDP growth and normalized military expenditure control for the information available at period t, and the estimate $\hat{m}_h$ is the output response to a change in military

[25] Advanced economies that have maintained a floating exchange-rate regime throughout our sample are Australia, Chile, Germany, Japan, Poland, Turkey, and the United States. All other countries have at least one year when the exchange rate was fixed. Overall, there are 517 country-year observations with a floating exchange-rate regime and 365 observations with a fixed exchange-rate regime.

[26] Table C3 in the appendix shows that the results are qualitatively similar across a range of exchange-rate regime classifications. The only exceptions are the IMF classification, for which the result is the opposite, and the IRR, for which it is insignificant once we control for wars.

Figure 1. Impulse-Response Functions of Output to Government Spending Shock



Notes: The graph presents the impulse-response function of output to government spending over the five-year period, estimated using the direct projections method (Jordà 2005). The top row shows results for the entire sample, the middle row for countries with fixed exchange rates, and the last row for countries with floating exchange rates. The column panels split the sample by countries' level of development. The dashed lines represent 95 percent confidence bands. See Table 1 for the list of data sources.

spending at horizon h.

Figure 1 shows the impulse-response function obtained from Equation (2), where the dashed lines represent 95 percent confidence intervals. As in the previous section, we obtain results separately for the entire sample, advanced economies, and developing countries. In addition, we split our sample into countries under fixed and floating exchange rates.

The effect of government spending on output lasts for about two years in the entire sample and in the sample of developing countries. For advanced economies, the confidence bands are wide and thus the effect is statistically significant only on impact. This result is generally independent of the exchange-rate regime and holds both for fixers and for floaters. The effect of government spending on output is especially pronounced in developing countries on a fixed exchange rate, where the multiplier remains above 1 three years after the initial shock.

The finding that the output response lasts for about two to three years is generally consistent with previous studies (Barro and Redlick 2011). Hence, using the data at annual frequencies is informative and leads to qualitatively similar results. As the quality of military spending data collected by international organizations improves over time, it would be interesting to measure the impulse response function at a quarterly frequency, which may shed new light on the function's shape.

4 The Multiplier for Durables and Nondurables

New Keynesian and neoclassical models alike suggest that the effect of government spending on output does not depend on what the spending is for, except in the case of productive government spending, that is, spending that affects total factor productivity (for example, public investment in infrastructure or communication). As a rare exception, in a two-sector model with costly capital reallocation, Ramey and Shapiro (1998) show that the composition of government spending may indeed have aggregate effects.[27] Empirically, Auerbach and Gorodnichenko (2012) estimate the multipliers for more disaggregated spending and find that military spending has the largest multiplier. Nonetheless, there is still little understanding of whether the multipliers differ across sectors and of the determinants and the magnitude of sectoral multipliers.

We shed new light on this question by comparing the multipliers for durables and nondurables/services. If capital (and labor) reallocation is costly—as emphasized by Ramey and Shapiro (1998)—then, in recessions, spending on durables may be more effective, as output and employment decline more in the durables sector than in the nondurables sector. Barsky, House, and Kimball (2007) note that the intertemporal elasticity of substitution is higher for durables than for nondurables, which, in turn, implies a higher degree of consumption smoothing. They further show that this property means that in a two-sector New Keynesian model, the effectiveness of monetary policy is disproportionately determined by the degree of price flexibility in the durables sector, while the price flexibility of nondurables does not play a role. This channel may also be important for the effectiveness of fiscal policy.

Following our hypothesis that the multiplier of spending on durables might be larger than that on nondurables and services, we consider a specification that allows for heterogeneity in the size of the fiscal multiplier:

$$\frac{\Delta y_{it}}{y_{i,t-1}} = c + \alpha_i + \beta_t + m_n \frac{\Delta g^n_{it}}{y_{i,t-1}} + m_d \frac{\Delta g^d_{it}}{y_{i,t-1}} + \boldsymbol{\gamma}' \boldsymbol{X}_{it} + \epsilon_{it}, \tag{3}$$

where g^n and g^d are spending on nondurables/services and durables, respectively, and other variables are defined as before. In this framework, m_n is the government spending multiplier associated with spending on nondurables and services, and m_d is the multiplier for durables. The key question is whether $m_n = m_d$ and, if not, how great is the difference between them? To make the specification easier to interpret, we rewrite it in the following form:

$$\frac{\Delta y_{it}}{y_{i,t-1}} = c + \alpha_i + \beta_t + m_n \frac{\Delta g_{it}}{y_{i,t-1}} + \underbrace{(m_d - m_n)}_{m_c} \frac{\Delta g^d_{it}}{y_{i,t-1}} + \boldsymbol{\gamma}' \boldsymbol{X}_{it} + \epsilon_{it}. \tag{4}$$

There are a few practical reasons for this specification. First, it allows testing the hypothesis $m_d =$

[27] Nekarda and Ramey (2011) study industry-level government spending to shed light on the spending's transition mechanism.

Table 5. Multiplier for Durables and Nondurables/Services

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Spending multiplier	1.41***	2.77**	2.79***	1.91***	1.86**	1.31	1.35	1.37	1.48
	(0.54)	(1.25)	(0.79)	(0.72)	(0.72)	(1.00)	(1.04)	(0.96)	(0.95)
Recession interaction						−0.82	2.13	0.32	−0.77
						(1.21)	(2.12)	(1.92)	(1.93)
Durables	2.70**	0.05	1.89	1.29	1.47	0.92	0.44	−1.07	−1.15
	(1.13)	(1.75)	(1.42)	(1.35)	(1.35)	(1.78)	(2.06)	(1.96)	(2.01)
Recession interaction, durables						4.75*	6.31*	5.38	6.24*
						(2.46)	(3.45)	(3.27)	(3.23)
Policy rate			−0.10**		−0.05		0.05		0.07**
			(0.04)		(0.04)		(0.03)		(0.03)
Tax rate				−0.06**	−0.05*			−0.04	−0.02
				(0.03)	(0.03)			(0.04)	(0.04)
War dummy	N	Y	N	N	N	N	N	N	N
R^2	0.53	0.30	0.62	0.60	0.63	0.46	0.45	0.42	0.45
N	548	272	452	456	408	548	452	456	408

Notes: This table presents estimates of the output response to spending on durables and on nondurables/services, using the specification in Equation (4). See Table 1 for the list of data sources. Country and time fixed effects are included in all the specifications. The set of control variables mimics that of Table 3. As the data are available mostly for advanced economies (NATO members), we do not have enough observations for developing countries to split the sample by development level.

m_n by simply testing $m_c = 0$. Second, it nests Equation (1), the specification used to estimate the standard fiscal multiplier. If there is no statistical difference between the multipliers for durables and nondurables ($m_d = m_n$)—that is, if m_c is indistinguishable from zero—then the coefficient on total spending can be interpreted as the standard government spending multiplier ($m_n = m$).

Table 5 shows the estimates of Equation (4) for the entire sample.[28] The multipliers are larger than those obtained from Equation (1). Our benchmark estimate indicates that a one-dollar increase in government military spending on nondurables and services is associated with a $1.41 increase in real GDP (Column 1). We find a statistically and economically significant difference between the durables and nondurables spending multipliers: one dollar of spending on durables raises real GDP by an additional $2.70. When we control for wars, the difference becomes small and insignificant (Column 2). When we add additional controls (Columns 3–5), the standard errors become too wide to assess the difference between m_n and m_d quantitatively. However, these results still lead to a few interesting conjectures. First, our benchmark estimates are driven mostly by variation in spending on nondurables and services. If we focus only on this kind of spending, the multipliers are consistently greater than 1 when monetary policy or tax rates are controlled for. Second, m_c is likely to be positive, but is estimated imprecisely. Looking at the data and results, we observe that there is little variation in spending on durables except for a few large buildup programs. Those programs tend to have expansionary effects, but there are too few of them to estimate these effects with precision.

Columns (6)–(9) of Table 5 show the estimates of the multiplier once the recession dummy and interaction terms are included. Acknowledging the lack of precision once again, we point out that m_c is positive and larger in recessions than in expansions. Interestingly, unlike the other results in Columns (1)–(5), here most of the variation comes from spending on durables.

Although the confidence bands are rather wide, there is a robust pattern showing that the

[28] We do not provide results for advanced and developing countries separately, as there are not enough observations for the developing countries.

durables multiplier is larger than the nondurables multiplier, and that the difference is especially pronounced in recessions. The confidence bands are likely wide because, despite the high degree of variability in military spending overall, there is less variability in the composition of spending. Nevertheless, our empirical findings provide motivation for more theoretical work to understand the channels through which the multipliers may differ across sectors.

5 Concluding Remarks

Government purchases as an instrument of activist fiscal policy have been widely used across the world to stabilize output and achieve full employment. Yet, such policies are often practiced as an art rather than as science. Both theoretical and empirical literatures disagree on the size of the effect of government spending on output, and on appropriate techniques to estimate the magnitude. Although exploiting variation in military spending is often viewed as a way to go, previous studies have struggled to estimate the government spending multiplier precisely, due to insufficient variation in the data they used. As a result, the point estimates found were small and confidence bands were wide.

Using unique data on military spending for more than 100 countries, we find that these conclusions no longer stand when there is enough variation in military spending. Although the pooled multiplier is likely below 0.5, the multipliers are found to be larger—often close to or above 1—when monetary policy and taxes are controlled for. We also find that the spending multiplier is larger in developed than in developing countries, under fixed than under floating exchange-rate regimes, in recessions than in expansions, and for spending on durables than on nondurables and services. Hence, there is a wide range of economic conditions for which expansionary fiscal policy can be an effective stabilization tool.

These findings have a number of implications for policymakers. First, countercyclical fiscal measures should be employed only when economic conditions are appropriate and when there is pronounced slack in the economy. Second, effective fiscal policy requires cooperation between the government and the central bank; without monetary accommodation, government spending is unlikely to have a sufficiently strong effect on output. Third, policymakers designing a particular stimulus program should pay close attention to implementation details: how spending is financed and to what sectors it is directed.

We hope that more theoretical research will spring up to support and explain our empirical findings. Standard New Keynesian and neoclassical models are inept at explaining time-varying spending multipliers along the business cycle, which seems to be a feature of the data. Those models also do not do enough to incorporate the exchange-rate regime into the design of policy, and most of the insights on this topic still go back to the old Keynesian literature. Finally, theoretical models imply that what the government spends on matters only to the extent that the spending raises productivity (that is, investing in infrastructure or communication leads to a larger effect on output than digging trenches because of supply-side effects). However, it seems unlikely that spending on military durables has a larger effect on total factor productivity than spending on nondurables. We believe that our findings hint at a demand-side channel overlooked by current models.

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Appendix

A Data Compilation

Annual data on real GDP growth and military spending are available for 160 countries during 1988–2013, 3,298 observations in total. We use the number of years for which these two variables are available to proxy for the reliability of the data for a particular country. For this reason, we exclude 30 countries that have fewer than 15 observations with both real GDP growth and military spending.[1] In addition, we also exclude Kuwait, as the country exhibited unusually large swings in real GDP and military spending growth during and after the Gulf War. These inclusion criteria also weed out countries that had significant wars on domestic soil, such as Afghanistan and Iraq, leaving us with a sample of relatively stable countries without drastic fluctuations in economic activity and military spending. Our final sample contains 129 countries (36 advanced and 93 developing), and 3,001 observations in total. Table A1 contains information on the countries available in the entire sample, as well as the number of observations available per country for our main variables and some control variables. In what follows, we provide a detailed summary of the data and sources we use in our analysis.

Real GDP We obtain annual data on GDP and its breakdown at constant 2005 prices in U.S. dollars from the National Accounts Main Aggregates Database provided by the United Nations Statistics Division.[2] The dataset contains time-series from 1970 onwards for more than 200 countries, which report to the U.N. Statistics Division in the form of the U.N. National Accounts Questionnaires.[3] We use the December 2014 version of the dataset, which has data available until 2013.[4]

Total Military Spending The Stockholm International Peace Research Institute (SIPRI) collects data on total military expenditure at constant 2011 prices in U.S. dollars for 171 countries in 1988–2013, and extends the series back to 1949 for NATO countries. We calculate total military spending by using SIPRI's military spending-to-GDP ratio. More specifically, we multiply this ratio by real GDP obtained from the U.N. to obtain total military spending series at constant 2005 prices in U.S. dollars. The SIPRI calculates the ratio of military expenditure to GDP in domestic currency at current prices and for calendar years, where GDP in national current prices is collected from the IMF Economic Outlook.[5]

Disaggregated Military Spending Data on the composition of military spending come from Gartzke (2001) and NATO. Gartzke's data are available from 1950 to 1997 for 99 countries, although the coverage is incomplete. The data are split into capital and operating costs in constant U.S. dollars, which proxy for durable and nondurable spending. The data come from several sources: NATO Press Releases, U.N. Military Expenditure Data, SIPRI Yearbooks, and Ball (1988). For several countries, there are two observations for the same year. In such cases, our preferred source is SIPRI and NATO, and our second preferred source is the U.N. We use the composition and total military spending levels to construct durable and nondurable spending as a percentage of total military spending.

As the data provided by Gartzke (2001) end in 1997, we supplement these data with data from NATO[6] for the period 1998–2013. The NATO data are split into spending on equipment, infrastructure, personnel,

[1] The countries excluded are Afghanistan, Benin, Bosnia and Herzegovina, Central African Republic, Congo, Democratic Republic of Congo, Equatorial Guinea, Eritrea, Gabon, Gambia, Guinea, Guinea-Bissau, Haiti, Honduras, Iceland, Iraq, Liberia, Libya, Montenegro, Niger, Panama, Qatar, South Sudan, Tajikistan, Timor Leste, Togo, Trinidad and Tobago, Turkmenistan, Uzbekistan, and Zimbabwe.

[2] See http://unstats.un.org/unsd/nationalaccount/.

[3] For additional information and detailed methodology, see http://unstats.un.org/unsd/snaama/methodology.pdf.

[4] We also consider inferring real GDP using total military spending and the military spending-to-GDP ratio from SIPRI. However, this real GDP proxy suffers from large outliers and observations that appear to be data entry errors.

[5] See http://www.sipri.org/research/armaments/milex/milex_database/copy_of_sources_methods and Table 1, footnote a) at http://books.sipri.org/files/FS/SIPRIFS1404.pdf.

[6] See http://www.nato.int/cps/en/natohq/topics_49198.htm.

and other, as a percentage of total military expenditure. "Equipment expenditures" include major equipment purchases and R&D devoted to major equipment. "Infrastructure" includes NATO common infrastructure and national military constructions. "Personnel" includes military and civilian personnel expenditures and pensions. "Other" includes operations and maintenance expenditures, other R&D expenditures, and expenditures not allocated among the other categories. Following Gartzke (2001), we combine "Equipment" and "Infrastructure" spending into durable spending, while "Personnel" and "Other" spending form nondurable spending. To calculate durable and nondurable spending in constant 2005 prices in U.S. dollars, we multiply the durable and nondurable spending shares by total military spending calculated as described above.

Monetary Policy Rates We collect end-of-period interest rate data for 80 countries, 38 of which are advanced and 42 are developing countries, dating back as far as 1960 for some countries. The data were obtained from HAVER Analytics, which collects interest rate data from the IMF International Financial Statistics (IFS) and national central banks. More specifically, we use the datasets INTDAILY, G10, and IFS to obtain daily, monthly, and quarterly interest rates, respectively. We convert the daily and monthly series to quarterly series by keeping the last nonmissing observation in each quarter. Due to real GDP and military spending data availability, we end up using interest rate data on 75 countries: 36 advanced and 39 developing countries.[7]

INTDAILY and G10 provide official policy rate data for many countries. IFS provides discount rate data, which may or may not be the official policy rate data. Since our intention is to incorporate monetary policy changes in our analysis, our preferred interest rate measure is the official monetary policy rate data from INTDAILY and G10. The countries that have policy rates available from G10 are Australia, Canada, Denmark, Iceland, Sweden, Norway, New Zealand, the United Kingdom, and the United States, as well as the countries that belong to the euro area. We use INTDAILY policy rate data for Brazil, Bulgaria, Chile, China, the Czech Republic, Lithuania, Mexico, the Philippines, Romania, Russia, Saudi Arabia, Singapore, Taiwan, Thailand, and Turkey. In addition, we use INTDAILY data for Bangladesh, Botswana, Ghana, Hong Kong, Hungary, Mauritius, Nigeria, Poland, and Sri Lanka, and we splice these with data from the IFS database.[8] For all other countries—including Austria, Germany, India, Indonesia, Korea, Morocco, Switzerland, Uruguay, and Venezuela—we use the IFS data.

Marginal Tax Rates The OECD Central Government Personal Income Tax Rates and Thresholds dataset provides annual data on marginal income tax rates for 33 OECD member countries in 1981–2014.[9] We choose the top marginal income tax rate as our tax variable. In addition, we use marginal income tax rates provided by KPMG.[10] KMPG provides data on both advanced and developing countries in 2006–2014.

Exchange-Rate Regimes Classification Exchange-rate regime classifications are available from several sources: the IMF, Shambaugh (2004), Levy-Yeyati and Sturzenegger (2005), Klein and Shambaugh (2008), and Ilzetzki, Reinhart, and Rogoff (2009). In our analysis, we use the specification by Klein and Shambaugh (2008), whose dataset includes a dummy variable indicating whether a country's exchange-rate regime is considered pegged or not. The data at an annual frequency are available for 177 countries for the 1960–2004 period. We use data on 127 countries: 36 advanced and 91 developing. A country is considered to have a fixed exchange rate if the end-of-month exchange rate stays within the 2 percent bands for the entire year.

Levy-Yeyati and Sturzenegger (2005) provide an unbalanced panel dataset covering 150 countries in 1974–2004, which includes dummies for three- and five-way exchange-rate classifications. We use data on 126 countries: 35 advanced and 91 developing. The three-way classification indicates whether the exchange rate is floating, fixed, or something in between. The five-way classification distinguishes between exchange rates that are floating, fixed, dirty, dirty/crawling peg, and inconclusive. In our robustness analysis, we construct a fixed exchange-rate regime dummy using different combinations of the three- and five-way classifications.

[7] As a result, Taiwan and Iceland are excluded from the sample of advanced economies, while Niger, Togo, and Trinidad and Tobago are excluded from the sample of developing countries.

[8] When splicing, we check that the overlapping observations are the same. There are six observations for which the INTDAILY and IFS data are very similar but not exactly identical.

[9] See http://www.oecd.org/tax/tax-policy/tax-database.htm.

[10] See http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/Pages/individual-income-tax-rates-table.aspx.

The appendix to Klein and Shambaugh (2008) provides a detailed discussion of the different exchange-rate regime classifications.

Wars The Correlates of War (COW) Project provides data on wars up to 2007. The dataset contains information on participating countries, start and end dates, and the number of battle deaths for each conflict. Wars are classified as interstate, intrastate, or extrastate. Intrastate wars are wars that predominantly take place within the recognized territory of the state. Extrastate wars take place between a state and a nonstate entity outside the borders of the state, while interstate wars are fought between or among states. We use war data for 76 countries in 1988–2013, and 16 countries in the 1970–2013 sample of NATO members (Appendix B).

Table A1. List of Countries and Available Data

Country	Y, G (1)	Y, G, i (2)	Y, G, τ (3)	Y, G, i, τ (4)	Y, G, ε (5)	Y, G, ω (6)	$\#\rho$ (7)
Albania	21		6		21		5
Algeria	25				25	19	5
Angola	20		7		20	14	2
Argentina	25		7		25		10
Armenia	19		7		19	13	3
Australia	25	25	25	25	25	19	2
Austria	25	25	25	25	25		2
Azerbaijan	21				21	15	6
Bahrain	25		7		25		2
Bangladesh	25	25	7	7	25		0
Belarus	21				21		4
Belgium	25	25	25	25	25		8
Belize	23				23		0
Bolivia	24	18			24		0
Botswana	25	25	7	7	25		2
Brazil	25	16	7	7	25		6
Brunei	25				25		7
Bulgaria	24	23	7	7	24		12
Burkina Faso	25	25			25		2
Burundi	21				21	19	12
Cambodia	25					19	2
Cameroon	25				25		7
Canada	25	22	25	22	25	19	6
Cape Verde	19				19		2
Chad	16				16	12	3
Chile	25	16	13	13	25		4
China	24	24	7	7	24		0
Colombia	25	19	7	7	25	19	2
Cote d'Ivoire	16				16		7
Croatia	21		7		21	15	9
Cyprus	25	25			25		4
Czech Republic	20	20	20	20	20		7
Denmark	25	25	25	25	25		15
Djibouti	20				20		10
Dominican Republic	25				25		4
Ecuador	25	25	7	7		19	2
Egypt	25		7		25	19	0
El Salvador	25				25	19	2
Estonia	21	15	13	13	21		8
Ethiopia	23				22	17	7
Fiji	25	15	7	5	25		10
Finland	25	25	25	25	25		8
France	25	16	25	16	25	19	6
Georgia	17		7		17	11	2
Germany	25	25	25	25	25	19	10
Ghana	25	25			25	19	0
Greece	25	25	25	25	25		16
Guatemala	25		7		25		0
Guyana	21	21			21		7
Hungary	25	25	24	24	25		9
India	25	24	7	6	25	19	0
Indonesia	23	22	7	7	23	17	2
Iran	24	2			24	19	3
Ireland	25	25	25	25	25		6
Israel	25	19	13	13	25	19	3
Italy	25	25	25	25	25	19	9
Jamaica	24		7		24		9
Japan	25	25	25	25	25		8
Jordan	25	25	7	7	25		3
Kazakhstan	20		7		20		5
Kenya	25		1		25		4
Korea	25	25	13	13	25		2
Kyrgyzstan	21				20		12
Laos	20				20		0

Notes: This table reports the number of observations available for each country in our dataset. Y stands for real GDP growth (UNMAD); G stands for the change in military spending (SIPRI); i stands for end-of-period monetary policy rates; τ is the highest marginal income tax rate for developing countries (KMPG) or the top marginal income tax rate for advanced economies (OECD); ε stands for the exchange-rate regime indicator of Klein and Shambaugh (2008); ω stands for the indicator for wars (COW); ρ indicates recessions, defined as years with negative real GDP growth in that year and the subsequent year.

Table A1. List of Countries and Available Data (*cont.*)

Country	Y,G (1)	Y,G,i (2)	Y,G,τ (3)	Y,G,i,τ (4)	Y,G,ε (5)	Y,G,ω (6)	$\#\rho$ (7)
Latvia	20	20	7	7	20		6
Lebanon	23	22			23	17	4
Lesotho	25				25		0
Lithuania	20	15	7	7	20		6
Luxembourg	25	15	25	15	25		8
Macedonia	17				17		6
Madagascar	25				25		8
Malawi	23		5		23		6
Malaysia	25	10	7	7	25		4
Mali	22				22		2
Malta	25	25			25		2
Mauritania	19				19		8
Mauritius	25	19	7	7	25		0
Mexico	25	6	25	6	25		6
Moldova	20				20	14	11
Mongolia	22				22		6
Morocco	25	20			25	19	7
Mozambique	22		4		22	19	2
Namibia	23	22			23	17	4
Nepal	25				25	19	0
Netherlands	25	20	25	20	25	19	9
New Zealand	25	15	25	15	25		5
Nicaragua	23		4		23	17	6
Nigeria	25	25	2	2	25	19	0
Norway	25	25	25	25	25		4
Oman	25		7		25	19	5
Pakistan	25	25	7	7	25	19	0
Papua New Guinea	25	13	7	7	25	19	10
Paraguay	24				24		7
Peru	24	24	7	7	24	18	6
Philippines	25	7	7	7	25	19	4
Poland	25	16	19	14	25	19	3
Portugal	25	25	25	25	25		14
Romania	25	10	7	7	25	19	12
Russia	21	11	7	7	21	15	9
Rwanda	25				25	19	7
Saudi Arabia	25	22	6	6	25	19	2
Senegal	22	22			22	19	6
Serbia	16		7			10	6
Seychelles	25				25		12
Sierra Leone	22				22	16	6
Singapore	25	25			25		6
Slovak Republic	20	15	20	15	20		4
Slovenia	21	21	13	13	21		4
South Africa	25	25	7	7	25	19	6
Spain	25	25	25	25	25	19	7
Sri Lanka	25	25			25	19	2
Swaziland	25				25		0
Sweden	25	25	25	25	25		9
Switzerland	25	25	25	25	25		6
Syria	22		4			19	5
Tanzania	25	22	7	6	25	19	0
Thailand	25	14	7	7	25		5
Tunisia	25		7		25		2
Turkey	25	4	13	4	25	19	11
UAE	15		6		15	10	2
Uganda	25	24	4	3	25	19	0
Ukraine	20		7		20	14	9
United Kingdom	25	25	25	25	25	19	11
United States	25	25	25	25	25	19	12
Uruguay	25	25	7	7	25		7
Venezuela	22	22	7	7	22		12
Vietnam	16		7		16	10	0
Yemen	20		4		20	17	0
Zambia	18				18		6

Notes: This table reports the number of observations available for each country in our dataset. Y stands for real GDP growth (UNMAD); G stands for the change in military spending (SIPRI); i stands for end-of-period monetary policy rates; τ is the highest marginal income tax rate for developing countries (KMPG) or the top marginal income tax rate for advanced economies (OECD); ε stands for the exchange-rate regime indicator of Klein and Shambaugh (2008); ω stands for the indicator for wars (COW); ρ indicates recessions, defined as years with negative real GDP growth in that year and the subsequent year.

B Results for NATO, 1970–2013 Sample

In addition to providing military spending data for the 1988–2013 period, SIPRI also provides military spending data on NATO member countries in 1949–2013. There are 27 NATO members with available data: Albania, Belgium, Bulgaria, Canada, Croatia, the Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Turkey, the United Kingdom, and the United States. We calculate real GDP growth and military spending in the fashion described in Appendix A. Since the real GDP data from the U.N. start in 1970, we focus on the 1970–2013 period, a sample that has almost 900 observations. Table B1 provides descriptive statistics for this sample: average real GDP growth is 2.5 percent, and the standard deviation is 3.6, while the average change in military spending and its components is close to zero. The statistics for the NATO sample are very similar to those for advanced economies (Table 2).

In what follows, we repeat the analysis from Sections 3 and 4 for the NATO sample. Table B2 summarizes the benchmark results with controls for the two-year lag of the end-of-period monetary policy rate, tax rate, and a recession dummy. The multiplier ranges between 1.5 and 2.93, a slightly higher range than the one presented in Table 3. The pooled multiplier is 1.72, significant at 1 percent (Column 1). Controlling for wars yields a highly significant spending coefficient of 1.50, but this specification drops many of our benchmark observations (Column 2). The coefficients presented in Columns (3)–(5) show that, as in Table 3, the multiplier is larger once we control for monetary and tax policy. For instance, a one dollar increase in military expenditures increases real GDP by $2.35 once we control for monetary policy. Controlling for tax rates yields an even higher coefficient, implying a $2.59 increase in real GDP for a one dollar increase in government military spending. Finally, once we control for both monetary and tax policy, the multiplier is 2.93. In all cases, the spending coefficients are significant at 1 percent.

Columns (6)–(9) repeat the regressions with a recession dummy. The results imply that the multiplier is much larger in recessions. For instance, if monetary policy rates stay constant, a one dollar increase in military spending increases real GDP by $1.62 more than does an equivalent spending increase during expansions. If monetary policy and tax rates remain unchanged, one dollar of spending increases real GDP by $3.13. The coefficients are significant at least at 10 percent, and are in line with the findings in Auerbach and Gorodnichenko (2012).

In Table B3, we account for the exchange-rate regime, as defined in Klein and Shambaugh (2008). The multiplier is highly significant and is in the range 1.56–1.75 under a floating exchange-rate regime, whether we control for wars or not. Pegging the exchange rate has no significant effect on the multiplier, a finding similar to our findings for developed countries (see Column 3 of Table 4). As NATO countries predominantly allow their currencies to float, we have too little variation in the exchange-rate regime to pin down the effect.

In addition, we look at the differences in the multiplier due to spending composition. Table B4 shows that the multiplier is highly significant in most specifications, ranging from 2.03 to 2.85 (Columns 1–5). Our benchmark estimate implies an increase of $2.41 in real GDP in response to an additional dollar of government military spending. As long as monetary policy rates remain constant, real GDP increases by $2.85 for each dollar spent, while the multiplier is 2.17 if monetary policy does not change and government spending is financed by debt. While the estimate for total government spending is highly significant, there is no significant difference between the durable and nondurable spending multipliers. Columns (6)–(9) show that, in recessions, a one dollar increase in spending on durables increases real GDP by about $5.00–$7.50 more than does a one dollar increase in spending on nondurables and services. Moreover, the multiplier during expansions is also significant and ranges between 1.61 and 1.84. In contrast, the results presented in Columns (6)–(9) of Table 5 imply that the estimate of the multiplier during expansions is not significant. We do not put much weight on the results in Table B4, as spending composition does not vary much in this sample, making identification difficult—except for large, one-time buildups, which may drive these results. Hence, this table is mostly included for completeness, and we urge the reader to focus on the results in Table 5 instead, which are obtained for the sample with higher variation in the composition of spending.

Figure B1 shows the impulse response function of output to government spending shocks, estimated using the direct projections method described in the paper's main part. When considering both fixed and floating country-year observations, the multiplier on impact is 1.68; it peaks at 2.9 after three years and decreases to 1.6 after five years. It remains highly statistically significant up to four years from the initial government spending shock. When restricting the NATO sample to include only country-year pairs under fixed exchange-rate regimes, the multiplier on impact is 1.27 and significant, but it turns negative and loses significance in the long run. When considering floating exchange-rate regimes, the multiplier ranges between 1.48 on impact and 3.33 after three years. It remains statistically significant at 1 percent up to four years after the initial spending shock.

Table B1. Descriptive Statistics, NATO 1970–2013 Sample

	Obs. (1)	Mean (2)	SD (3)
Real GDP growth	897	2.5	3.6
Military spending change	897	0.0	0.3
durables	595	−0.0	0.1
nondurables and services	596	0.0	0.2

Notes: See Appendix A for the list of data sources. The sample includes NATO members during 1970–2013.

Table B2. Spending Multiplier in the NATO 1970–2013 Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Spending multiplier	1.72***	1.50***	2.35***	2.59***	2.93***	0.85*	1.13*	1.06	1.16*
	(0.34)	(0.43)	(0.42)	(0.52)	(0.54)	(0.46)	(0.63)	(0.66)	(0.65)
Recession interaction						0.86	1.62*	2.06*	3.13**
						(0.66)	(0.90)	(1.16)	(1.22)
Policy rate			−0.03***		−0.02		0.02		0.07***
			(0.01)		(0.03)		(0.01)		(0.02)
Tax rate				−0.02	−0.05*			−0.04	−0.04
				(0.03)	(0.03)			(0.03)	(0.03)
War dummy	N	Y	N	N	N	N	N	N	N
R^2	0.42	0.35	0.56	0.56	0.57	0.39	0.40	0.43	0.47
N	897	502	662	567	493	897	662	567	493

Notes: See Appendix A for the list of data sources. This table reproduces Table 3 for the NATO 1970–2013 sample.

Table B3. Multiplier and Exchange Rates, NATO 1970–2013

	(1)	(2)
Spending multiplier	1.56***	1.75***
	(0.39)	(0.46)
Fixed exchange-rate interaction	0.68	−1.02
	(0.74)	(0.79)
War dummy	N	Y
R^2	0.43	0.35
N	894	502

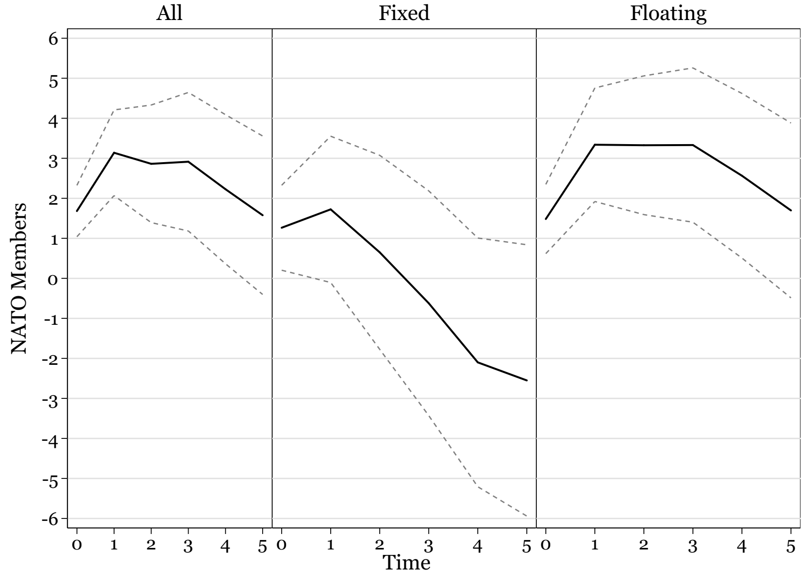
Notes: See Appendix A for the list of data sources, Table 4 for main sample results.

Table B4. Disaggregated Spending Multipliers, NATO 1979–2013

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Spending multiplier	2.41***	1.27	2.85***	2.03***	2.17***	1.74**	1.58*	1.84**	1.61**
	(0.70)	(1.02)	(0.69)	(0.63)	(0.63)	(0.82)	(0.85)	(0.80)	(0.77)
Recession interaction						−0.35	1.79	−1.97	−0.61
						(1.54)	(1.78)	(1.53)	(1.62)
Durables	1.03	−0.22	0.95	0.28	0.43	−0.43	−0.49	−2.11	−1.57
	(1.03)	(1.17)	(1.12)	(1.07)	(1.04)	(1.30)	(1.40)	(1.38)	(1.33)
Recession interaction, durables						4.96**	6.62**	7.47***	6.32**
						(2.12)	(2.67)	(2.53)	(2.46)
Policy rate			−0.06		−0.02		0.06***		0.08***
			(0.04)		(0.03)		(0.02)		(0.02)
Tax rate				−0.03	−0.05*			−0.04	−0.04
				(0.03)	(0.03)			(0.03)	(0.03)
War dummy	N	Y	N	N	N	N	N	N	N
R^2	0.52	0.29	0.61	0.59	0.61	0.41	0.43	0.41	0.45
N	595	329	500	508	452	595	500	508	452

Notes: See Appendix A for the list of data sources. This table reproduces Table 5 for the NATO 1979–2013 sample. Note that the sample starts in 1979 due to the data availability of the spending-composition series.

Figure B1. Impulse Responses for NATO 1970–2013 Sample



Notes: See Appendix A for the list of data sources. This figure reproduces the three left panels of Figure 1 for the NATO 1970–2013 sample.

C Additional Results

Table C1. Robustness to the Measure of Wars

	Entire Sample (1)	Advanced Economies (2)	Developing Countries (3)	NATO Members (4)
Panel A: War Dummies				
Spending multiplier	0.15**	0.59**	0.15*	1.50***
	(0.08)	(0.24)	(0.09)	(0.43)
R^2	0.21	0.32	0.21	0.35
N	1,339	361	978	502
Panel B: Battle Deaths				
Spending multiplier	0.15**	0.56**	0.15*	1.03***
	(0.07)	(0.24)	(0.08)	(0.34)
R^2	0.19	0.32	0.19	0.34
N	1,339	361	978	502

Notes: See Appendix A for the list of data sources. This table reproduces Columns (2) of Tables 3 and B2 for two different measures of wars. Panel A uses a war dummy indicating whether the country participated in a military activity (benchmark). Panel B uses battle deaths instead.

Table C2. Robustness to Interest Rate Measure

	(1)	(2)	(3)	(4)
Panel A: Entire Sample				
Spending multiplier	0.98***	1.26***	0.39**	0.24
	(0.18)	(0.45)	(0.19)	(0.60)
Recession interaction			1.20**	1.31
			(0.47)	(1.71)
Policy rate	−0.00***	−0.13	−0.00	0.03
	(0.00)	(0.11)	(0.00)	(0.10)
Tax rate		−0.08		−0.00
		(0.05)		(0.06)
R^2	0.43	0.69	0.45	0.52
N	1,466	428	1,466	428
Panel B: Advanced Economies				
Spending multiplier	0.76***	2.11***	0.63**	1.00
	(0.27)	(0.52)	(0.29)	(0.67)
Recession interaction			1.62*	2.29*
			(0.97)	(1.18)
Policy rate	−0.04	−0.01	0.08***	0.07***
	(0.03)	(0.04)	(0.02)	(0.02)
Tax rate		−0.05*		−0.01
		(0.03)		(0.03)
R^2	0.55	0.57	0.48	0.47
N	739	642	739	642
Panel C: Developing Countries				
Spending multiplier	0.97***	1.04*	0.25	0.18
	(0.24)	(0.58)	(0.26)	(0.66)
Recession interaction			1.07*	−1.34
			(0.60)	(2.69)
Policy rate	−0.00**	−0.10	−0.00	0.05
	(0.00)	(0.14)	(0.00)	(0.14)
Tax rate		−0.01		0.03
		(0.08)		(0.09)
R^2	0.35	0.57	0.36	0.45
N	727	189	727	189

Notes: See Appendix A for the list of data sources. This table reproduces Columns (3), (5), (7), and (9) of Table 3 using average policy rates instead of end-of-year rates.

Table C3. Robustness to Exchange-Rate Regime Classification

	KS		JS		LYS		IRR		IMF	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Spending multiplier	0.13**	0.12	0.13**	0.12	0.06	0.07	1.11***	0.59	0.97***	0.85***
	(0.06)	(0.08)	(0.06)	(0.08)	(0.06)	(0.07)	(0.27)	(0.41)	(0.22)	(0.32)
Fixed exchange-rate interaction	0.46**	0.60*	0.53**	0.70*	0.81***	0.82***	−0.98***	−0.48	−0.87***	−0.76**
	(0.21)	(0.34)	(0.22)	(0.36)	(0.19)	(0.25)	(0.27)	(0.41)	(0.23)	(0.33)
War dummy	N	Y	N	Y	N	Y	N	Y	N	Y
R^2	0.21	0.21	0.21	0.21	0.20	0.22	0.29	0.27	0.28	0.28
N	2,911	1,272	2,911	1,272	1,614	918	2,470	1,166	2,369	1,141

Notes: See Appendix A for the list of data sources. This table replicates Table 4 for the entire sample using classifications from Klein and Shambaugh (2008) in Columns (1) and (2), Shambaugh (2004) in Columns (3) and (4), Levy-Yeyati and Sturzenegger (2005) in Columns (5) and (6), Ilzetzki, Reinhart, and Rogoff (2009) in Columns (7) and (8), and the IMF in Columns (9) and (10).