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Coups d'état and defense spending: a counterfactual analysis

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Abstract We explore how institutional set-ups, in particular changes in political institutions through coups d'état, can affect the way military expenditures are determined. We use a counterfactual approach, the synthetic control method, and compare the evolution of the military burden for 40 countries affected by coups with the evolution of a synthetic counterfactual that replicates the initial conditions and the potential outcomes of the countries of interest before exposure to coups. Our case studies suggest that successful coups result in a large increase in the military burden. However, when no effects or a decrease in the defense burden are found, it is often the consequence of a democratization process triggered by the coup. These results are in keeping with recent theoretical developments on the bargaining power of the military in authoritarian regimes. Failed coups, by contrast, produce a smaller, and mostly positive, effect on the military burden, possibly as a result of the incumbent's strategy to avert further challenges to the stability of the regime by buying off the military.

Keywords Military expenditure · Coups d'état · Synthetic control method

JEL Classification H11 · H56

1 Introduction

Every year countries allocate considerable resources to their armed forces, a global $1,700 billion in 2011, or around 2.5 % of world gross domestic product (GDP), according to the

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Stockholm International Peace Research Institute. The military budget pays the salaries and training of personnel, maintains and buys equipment and facilities, and funds military operations. Military spending has important implications for regional and global stability, as well as for a number of economic variables, including economic growth, development, corruption, and public spending in other civilian sectors of the economy.[1] In particular, the global financial crisis in 2008 and the ensuing austerity measures have made nations aware of the guns-versus-butter trade-off. As many countries try to reduce the share of the GDP devoted to the government, keeping or enhancing existing military budgets comes at the expenses of other sectors, such as health and education. With limited budgets and rising military input costs (e.g. the unit costs of new weapon systems), policymakers face very difficult choices. In this study we explore how institutional set-ups, in particular changes in military institutions, can affect the way military expenditures are determined.

We focus on coups d'état, the unconstitutional and violent overthrown of the head of government. Coups are more frequent than generally assumed. Between 1950 and 2010, 457 coup attempts happened in 94 states, half of which were successful (Powell and Thyne 2011). Since 2010, successful coups have taken place in Thailand in 2014, in Egypt in 2013, in Mali in 2012 and in Niger and Guinea-Bissau in 2010. Failed attempts by the military to unseat the incumbent government include Ecuador and Madagascar in 2010, Democratic Republic of Congo (DRC) and Bangladesh in 2011, Malawi and Sudan in 2012, Benin, Libya and Chad in 2013.

We ask whether coups, successful and failed, are a determinant of the share of output allocated to the armed forces. We claim that coups affect the level of military burden in two ways. First, when coups are successful, they can directly increase the influence of military actors within the government; in fact, the majority of coups are materially executed by the armed forces and involve alliances between military leaders and other actors from within the ruling elite who are dissatisfied with the incumbent leader. We expect coups followed by the installation of a military regime to be conducive to increasing the defense burden. Yet, history shows that post-coup governments are very heterogeneous across countries. The Chilean coup in 1973 and the Argentinian one in 1976, brought military juntas to power and led to higher military spending. By contrast, in Portugal in 1974 and in Bangladesh in 2007 the military took power from a corrupt and inept administration and reformed the system (Marinov and Goemans 2013). When this is the case, the allocation of resources to the military may decline as a consequence of a democratization process, which places the military under strict civilian control.

Second, following a successful or a failed coup, governments might try to reduce further challenges arising from the armed forces. The incumbent may enact "coup-proofing" strategies either through higher military spending, to buy the military off, or through a reduction in the size of the regular armed forces, and the diversion of resources away from them, to punish the plotters and counterbalance any threat from within the armed forces.

As such, the role of the military establishment after the coup, the level of civilian control of the military and the type of "coup-proofing strategy" is country-specific and would be very difficult to gauge in the aggregate. We therefore implement a set of comparative case studies and investigate the effect of coups on paths of defense spending as a share of the GDP in a number of eligible countries. In establishing a counterfactual - e.g., what would the military burden in Chile have been like after 1973 had General Augusto Pinochet not seized power - many judgments are required about which part of the change in

[1] See, e.g. Landau (1993), Dunne et al. (2005), Aizenman and Glick (2006), Pieroni (2009), Dunne and Smith (2010), Alptekin and Levine (2011) and Kollias and Paleologou (2013).

defense burden is a consequence of the coup and which would have occurred in any case without the coup. Building on an idea in Abadie and Gardeazabal (2003) and extended by Abadie et al. (2010), we use the synthetic control method and compare the post-coup military burden trajectory of coup-ridden countries with the trajectory of a combination of similar but untreated countries. This method makes use of a transparent construction of the estimated counterfactual, which safeguards against the risk of drawing inferences from hidden parametric extrapolation and deals with the presence of time-varying unobservable confounders, thus tackling the endogeneity from omitted variables (see Nannicini and Ricciuti 2010 for recent applications). Overall, we find that both successful and failed coups affect the military burden, although the magnitude and the direction of the impact are country-specific and depend on the type of coup.

We begin Sect. 2 with a short discussion on how coups may account for the power of the military to extract budgetary resources from the state. Section 3 describes the synthetic control method and its main advantages in this exercise. Section 4 discusses the data and Sect. 5 presents the implemented experiments by region. Section 6 provides concluding remarks.

2 Political determinants of military spending

Countries vary considerably in the amount of resources they devote to their armed forces and a key issue revolves around the determinants of military spending.[2] The international security environment, such as regional and global conflicts, an ongoing arms race and superpower alliances have been shown to matter the most (Maizels and Nissanke 1986; Looney and Frederiksen 1990; Smith 1995; Dunne and Perlo-Freeman 2003; Goldsmith 2003; Dunne et al. 2008; Nordhaus et al. 2012).

Perhaps because most of the above literature considers military expenditures to be determined by external factors, little analysis has been undertaken to determine whether and to what extent institutional changes affect the amount of resources a country allocates to defense. Whitten and Williams (2011) bridge the divide between domestic and external pressures and suggest that government ideology, i.e. social welfare programs and international positions affects defense spending when interacted with international security priorities. Albalate et al. (2012) show that presidential democracies spend more than parliamentary systems on defense, whereas its interaction with a majoritarian electoral rule reduces the defense burden. Bove and Nisticò (2014) focus on the institutional context within which the armed forces pursue their corporate interests and find that the level of military involvement in politics, measured on a six-point scale, affects the chances of manipulating the defense burden. Finally, Leon (2014) analyzes the relation between coups and military spending, and he finds that successful coups increase military spending more than failed attempts do, while low military spending increases the chances of coups. Yet, his study ignores the counterfactual trend of military spending, i.e., what would have happened in the absence of the coup. We compare the observed post-coup level of military burden with an hypothetical counterfactual in which the same country did not experience a coup. Moreover, the economic studies mentioned above are all-country all-year estimations, which conceal the considerable heterogeneity in countries' response to institutional

[2] The military burden in times of peace varies from zero (e.g. Costa Rica) to less than 0.2 % (e.g. Haiti, Panama or Iceland) to more than 14 % of the GDP (e.g. Saudi Arabia). In times of war the military burden can exceed a nation's entire GDP (e.g. Kuwait).

changes. We focus on 40 case studies, 20 successful and 20 failed coups, to identify particular responses that are averaged out in large-*N* quantitative studies, where the variable of interest is assumed to produce the same outcome in very different countries.

We put forward two mechanisms that can explain the extent to which coups have consequences for the level of budgetary support acquired by the military: they can affect the military influence over the decision-making process and they can prompt the government to implement "coup-proofing strategies". The first mechanism is intuitive. The allocation of the government budget across its various agencies or functions is the result of a complex interaction among policymakers, the state bureaucracy and lobbies that have access to the decision-making process and try to influence the allocation of scarce resources (e.g. Dixit et al. 1997). The military must also compete in this complex budget game. Mbaku (1991) examines the influence of the military as a rent-seeking interest group on the activities of other groups in the rent-seeking game. He suggests that both in democratic societies and in dictatorships, the role of the military as guardian of national security puts it in a unique position to affect resource allocations, hence military expenditure.

The degree of military influence in policy-making can affect its relative bargaining power, and shape the apportionment of public resources between military and non-military interests. Most coups d'état are a clear-cut form of militarization of the political process, as they are followed by a military regime, wherein a group of officers controls the access to political office, deciding who rules (see, e.g. Geddes et al. 2012). Numerous examples exist of military dictatorships that have emerged either as a result of a coup against a non-democratic regime or against the subsequent democratic government (e.g., Argentina 1976).

In some countries, the post-coup period is sometimes accompanied by the repression of the opposition, which is consistent with rising militarization of the political process. In fact, the military-backed regimes have a comparative advantage in repression with respect to civilian regimes because they have full access to troops and weaponry (Bratton and Van de Walle 1994). Moreover, the lack of institutions for efficient co-option, such as political parties, increases reliance on repression to stay in power. Yet, a number of coups have also overthrown autocratic regimes and directly or indirectly installed a new democratic government (e.g. Portugal 1974). In any form of democracy, civil-military relations are characterized by what Huntington (1995) defines as "objective civilian control". Marinov and Goemans (2013) show how many coups, in particular those after 1991, opened the door to democracy and placed the military under strong civilian control. This has profound consequences for military spending. In fact, democracies devote less of their economic resources to military spending than autocratic systems do (see, e.g. Hewitt 1992; Goldsmith 2003). Furthermore, evidence from Latin America suggests that a transition from authoritarian to democratic regimes is accompanied by a reduction in military spending (Russet and Oneal 2001). Accordingly, democratic rulers seeking re-election have stronger incentives to increase social spending - and reduce military budgets - than dictators have. Coups are not homogeneous and the degree soldiers remain under civilian control varies enormously across countries. Therefore, we compare different transitions to investigate whether the newly installed leader implements policies more or less favorable to the military.

The second mechanism builds on recent theoretical models by Acemoglu et al. (2010) and Besley and Robinson (2010), which suggest that "efficiency wages" in the form of spending on the military can be used by the elite to prevent military intervention in politics and subsequent regime changes. This is the so-called "moral hazard problem" posed by the military when used as repressive agents in an attempt to prevent a transition to democracy

(see Acemoglu et al. 2010): the military is capable of taking direct control of the government to redistribute resources to its own members. Therefore the elite needs to pay higher wages for high-level officers as well as to increase defense spending in line with the preferences of the military to prevent further regime changes.[3]

Consequently, we expect that regimes brought into power as a result of military coups or regimes recently threatened by a failed coup should increase the share of output devoted to the armed forces to reduce the challenges to their political survival. Not surprisingly, empirical studies lend support to Huntington's suggestion to give the military "toys" and larger benefits, as they reduce the military's willingness to undertake a coup d'état, and they find a negative relationship between a country's military spending and the probability that it experiences a coup (Nordlinger 1977; Powell 2012; Leon 2014; Brauner 2012). This mechanism hinges crucially on how the resources provided to the military actually are distributed within the armed forces. For example, in ethnically fractionalized countries, when senior officers of the military and the elite do not belong to the same ethnic group as the bulk of lower-ranking troops (such as in Nigeria in 1966 and Liberia in 1980), allocating more resources to the military may not stop junior officers and foot-soldiers from staging a coup if they believe they are being marginalized.[4]

However, we cannot exclude the possibility that the opposite strategy can be implemented. Leon (2014), for example, speculates on the possibility that military spending falls following a failed coup because the military is being punished. In principle, governments that survive a coup can also decide to punish the armed forces by diverting resources away from them. This should allow the surviving regime to counterbalance any potential threat from within the security apparatus.

In both mechanisms, the direction of the effect on the defense burden is not unambiguous. A coup can *increase* the military's bargaining power when the generals have direct access to policy-making and can redistribute more resources toward its own members and/or when the newly installed regime buys the military off to prevent further challenges from the armed forces. However, coups also may *decrease* the military burden when a more democratic institutional framework is set up and/or when the ruler punishes the defectors by reducing the defense budget. This last mechanism applies particularly to attempted (and thus failed) coups. The possibility of heterogeneous responses to coups calls for an in-depth analysis of single units. Given the existing consensus among political methodologists about the necessity of integrating and exploiting complementarities between qualitative and quantitative tools, we offer a systematic set of country studies. By doing so, we follow the insights of Przeworski and Limongi (1993) and recent event studies on political transitions and economic growth (see, e.g. Nannicini and Ricciuti 2010).

3 Synthetic control approach

Let Y denote our outcome of interest, i.e., military spending as a percentage of GDP, and suppose that its realization depends on whether a military coup d'état has taken place.

[3] Acemoglu et al's study joins traditional theories of the incentives and constraints faced by all dictators who wish to remain in power (see, e.g. Kurrild-Klitgaard 2000; Crespo Cuaresma et al. 2011; Wintrobe 2012). Tullock (2005) offers a seminal and masterful scientific analysis of dictatorships and individual behaviour under autocracy by means of a rational choice model.

[4] We thank an anonymous referee for suggesting this caveat.

Also, let M_t be a dummy variable taking value 1 if there is a coup in year t and 0 otherwise. So we have that:

$$Y_t = M_t Y_t^1 + (1 - M_t) Y_t^0,$$

where Y_t^1 (Y_t^0) is the outcome realization for a given country in year t in the presence (absence) of a coup. The identification issue is that the treatment effect of a coup, $\beta_t = Y_t^1 - Y_t^0$, depends on the potential outcome in both states ($M_t = 0$ and $M_t = 1$). Yet, in any period we either observe a coup or not, never both, and specifying a plausible scenario for what would have happened in the absence of the coup requires very delicate choices.[5]

To establish our counterfactuals, we use a novel and transparent methodology for case studies, the synthetic control method, developed by Abadie and Gardeazabal (2003) and extended by Abadie et al. (2010). To estimate our outcome of interest in the absence of the treatment, this method compares the actual outcome in the treated country with the weighted average of the outcome for all units in an untreated control group I, i.e. all countries wherein no coup happens in the period of interest. Thus, we have that:

$$\hat{\beta}_t = Y_t - \sum_{i \in I} \lambda_i Y_{it},$$

where λ_i is the weight attached to country i in the control group. The weights are non-negative and sum to 1 to prevent extrapolation outside the support of the data. Since we observe treated and control countries in different states after the coup year T (in the presence and absence of coups, respectively), we have that:

$$\hat{\beta}_t = Y_t^1 - \sum_{i \in I} \lambda_i Y_{it}^0 = \beta_t + \left(Y_t^0 - \sum_{i \in I} \lambda_i Y_{it}^0 \right), \quad \forall t > T,$$

where the weights are chosen to make the control group resemble the treated unit prior to the treatment. In other terms, the estimation problem consists in choosing the vector of weights that minimizes the difference between treated and control countries over the period in which none of them experienced a coup (i.e., $Y_t^0 \text{and} \sum_{i \in I} \lambda_i Y_{it}^0$). We use group level covariates and annual observations of the pre-treatment military burden as separate control variables to determine the weights and improve the pre-treatment fit (see recent applications by Abadie et al. 2010). In fact, as in Abadie and Gardeazabal (2003), we use a two-step procedure that minimizes the distance both in terms of pre-treatment *outcomes* and *predictors* for post-treatment outcomes. Let X and X_i^0 be the (K x 1) vectors of predictors for the treated country and for each i-th country in the control group, respectively; also, let V be a (K x K) diagonal matrix with non-negative entries that measure the relative importance of each predictor. The optimal vector of weights, $W^*(V)$, must solve, conditional on V, the following problem:

$$min \left(X - \sum_{i \in I} \lambda_i X_i^0 \right)' V \left(X - \sum_{i \in I} \lambda_i X_i^0 \right),$$

[5] Imbens and Wooldridge (2009) survey the literature on program evaluation and provide the potential outcomes formulation, while Pesaran and Smith (2012) discuss *ex ante* and *ex post* counterfactual analyses in the case of macroeconometric applications.

subject to $\lambda_i \geq 0$ and $\sum_i \lambda_i = 1$. Then the optimal V^* is chosen to minimize the mean squared error of pre-treatment outcomes, which is given by:

$$\frac{1}{T^0}\sum_{t \leq T}\left(Y_t - \sum_{i \in I}\lambda_i^* Y_{it}\right)^2, \quad \forall T^0 < T.$$

When the number of pre-intervention periods in the data is large, as in our case, matching on pre-intervention outcomes help control for the *unobserved* factors affecting the outcome of interest and for the *heterogeneity* of the effect of the observed and unobserved factors on the outcome of interest. In fact, by restricting the *donor pool* (i.e. the control group) to countries with similar pre-coup military burden paths, we are controlling for the possibility that other omitted factors are biasing our results (i.e. unobservable time-varying factors affecting the likelihood of a coup and the size of the military budget such as institutional features). Matching pre-coup variables, in particular several confounding factors (described in Sect. 4) as well as the outcome variable for a significant pre-coup period, increases our confidence that we are attributing changes in military burden to the coup; in fact, the artificial counterfactual replicates the initial conditions and the military burden *potential* of the coup-ridden countries before the coup. Once it has been established that the unit representing the case of interest and the synthetic control unit exhibit similar behavior over *extended* periods of time prior to the coup d'état, a discrepancy in the outcome variable following the coup d'état is interpreted as produced by the military takeover itself. The idea is that the future path of the synthetic control unit, consisting of the λ-weighted average of all control units, mimics the path that would have been observed in the treatment unit in the absence of treatment.

We assume that the coup in the focus country has no effect on the control countries. This is plausible given that the countries used to build the synthetic counterfactual do not necessarily belong to the same region and are very rarely neighboring.[6] In the unfortunate cases in which the algorithm selects control countries somewhat affected in the same direction by the coup in the treated unit, the gap between treated and untreated would tend to be downwards biased. This means that, if anything, the estimated coup effect would be mitigated.[7]

While the synthetic control method handles endogeneity due to (time-varying) omitted bias, a remaining limitation is that it would still suffer from reverse causation if the *timing* of coups were decided by expectations about the growth prospects of the future military burden. If these expectations are not captured by pre-coup variables, the findings of the synthetic control approach would still be biased downwards. However, note that this particular instance of reverse causality is far from obvious: if anything, we would expect a *negative* impact of military burdens on coups d'état. In fact, as we have seen in Sect. 2, military spending is an important tool that leaders can manipulate to control and get support from the armed forces.[8] This means that, if a reverse causality exists, and we expect a positive effect of coups on the military burden, then the estimate

[6] In those cases, the weight is often negligible (e.g. in constructing Pakistan's counterfactual, the algorithm assigned a weight of 0.001 to India).

[7] Note that existing connections between countries, such as ethnic or political ties, may also cause military spending in one country to be affected by a coup in a non-neighboring country. Yet, links between countries may be multiple and often difficult to measure.

[8] See Leon (2014) for a survey of the literature on the economic causes of coups.

will be biased downward because of the reverse negative effect that the latter has on the former. Moreover, the articles summarized above suggest that military coups happen at the same time as declines in military budgets. By looking at the trajectories of the outcome variable over extended time horizons, we try to rule out any short-run bias in the results.

Another important question is whether the estimated effects are statistically significant. This needs to be addressed, as large sample inferential techniques are not appropriate for comparative case studies with a small number of treated and control units (Abadie et al. 2010). The synthetic control method enables us to conduct falsification exercises, the so-called "placebo studies", an alternative model of quantitative inference. This model is based on the premise that confidence that a particular synthetic control estimate reflects the actual impact of a military takeover would be undermined if we obtained similar or larger estimated impacts in cases for which the coup did not take place. The idea is to apply the synthetic method to every potential control in our sample in order to assess whether the estimated effect for the country affected by the coup is large relative to the distribution of the effects estimated for countries chosen at random and not exposed to the coup. As an additional inferential exercise, we run a number of Chow tests on the differences between the actual and synthetic military burden time series before and after the coup. The placebo experiments and the Chow tests are discussed in Sect. 5, in the context of the individual results, grouped by geographical regions.

4 Data

Our study covers the period 1960–2007. Data on military spending are assembled from two sources. Following Nordhaus et al. (2012), we use the Correlates of War (COW) National Material Capabilities up to 1987 and SIPRI data from 1988 to 2000 (they are available only from 1988). COW data are in current USD. We transform them into percentages of GDP using GDP figures (in current USD) from the World Development Indicators to get a measure of military burdens.

To anchor our results in the existing literature on the determinants of military spending, we use GDP per capita, population, trade and natural resource rents. Data are from the World Development Indicators and we transform them into logs to scale down the variance and reduce the effects of outliers. GDP per capita is a measure of wealth and is expected to be positive as a state's capacity to tax and borrow increases with the level of development (see, e.g. Albalate et al. 2012). We control for population as larger countries tend to be regional or global powers and require larger defense forces (see, e.g. Hewitt 1992). The log of trade (sum of imports and exports) in percentage of GDP is a proxy for economic integration: the more open a country is, the more peaceful will be its relationships with other countries and, therefore, the less need it has for defense spending. Several recent studies have found that in some countries proceeds from oil and gas exploitation have boosted government revenues and freed up funds for military spending (see, e.g. Cotet and Tsui 2013 on oil discoveries and military spending). Therefore, we use natural resource rents (as a percentage of GDP), which is the sum of oil rents, natural gas rents, coal rents, mineral rents, and forest rents.

We also use information on a country's level of democracy, the polity2 index, which captures the regime authority spectrum on a 21-point scale ranging from hereditary monarchy (−10) to consolidated democracy (+10), and is expected to be positive. Data are

from the Polity IV Project.[9] Finally, we enter a dummy for war which includes both interstate and intrastate conflicts, since the perceived threat—i.e. any involvement in interstate and intrastate wars, and any enduring hostility with an associated arms race—as well as foreign policy goals are usually associated with heavy military burdens (Smith 2009). Data on wars are from the Uppsala Conflict Data Program (UCDP)/ Peace Research Institute Oslo (PRIO) Armed Conflict Dataset.[10]

Our treatment is a military coup and the data are taken from Powell and Thyne (2011). This dataset allows us to distinguish between successful coups and failed coup attempts. In the in case of successful coups, the sitting head of government is effectively removed from office using unconstitutional means, but coup attempts fail to unseat the head of government.

5 Case studies

We now identify a pool of feasible experiments. We select the countries meeting the following conditions: (i) the treated country and the control group must have no missing information on the outcome variable in the 17-year-long sample period as we require 10-year pre-coup observations to calibrate the synthetic control and seven-year post-coup observations to have a reasonably large span of plausible prediction of the effect of a coup;[11] (ii) as for some experiments, the pre-treatment fit can be poor, thus undermining the credibility of our analysis, we include only countries with root mean squared prediction errors (RMSPE) smaller than 0.5;[12] (iii) because this analysis covers the period 1960–2007 period, the treated country must experience a coup at the earliest in 1970 and at the latest in 2000, as we need a ten-year period before a coup and a 7-year period after a coup.[13] In case of multiple coups, we select the coup that occurs more than ten years after the previous one; moreover the country must not experience a new coup within eight years from the selected one.

Our first and second conditions are very important because the credibility of the synthetic control approach hinges crucially on its ability to match the military burden with its predictors, between the matching period (in which the distance between the two series is minimized by construction) and the treatment period. Despite our generalization, this is exactly the case. Table 1 highlights the strengths of the synthetic control estimator and shows the pre-treatment characteristics in one of the case studies, Chile, and in the synthetic control. The table confirms that the synthetic control replicates the treated country

[9] http://www.systemicpeace.org.

[10] http://www.prio.no/Data/Armed-Conflict/UCDP-PRIO/.

[11] According to our dataset, the average duration of a military regime is less than eight years. Marinov and Goemans (2013) combine two datasets to cover 249 distinct coup spells in 164 countries between 1945 and 2004 and find that the average duration of a spell is around eight years. Seven years is a safer choice for two reasons: first, the accuracy of this method in predicting the counterfactual level of military burden declines as we move away from the coup year; second, the longer the duration of a spell, the more likely a new regime change will occur. The military burden may then be affected by expectations of a soon-to-come regime change.

[12] The root mean square predicted error (RMSPE) measures the pre-treatment fit between the path of the outcome variable for any particular country and its synthetic counterpart. The lower is the RMSPE the better is the fit.

[13] We make an exception to this rule and consider the attempted coup in Venezuela in 2002, as we deem it an informative case.

very closely in terms of initial military burden and its main predictors. In fact, there is a remarkable fit between our treated unit and its artificial counterpart. Table 1 also displays the weights of each control state in the synthetics. All other states in the *donor pool* are assigned zero weights.[14]

Given the potential of heterogeneity across regions, we divide our treated countries into four groups, i.e., Sub-Saharan Africa, Asia, Latin America and Europe/Middle East and North Africa (MENA), and discuss the estimates of the coup effect in each country. We start with successful coups, and then move to failed coups. Drawing the correct inferences from comparative studies is not straightforward. The difficulties are not merely technical, but involve a comprehensive knowledge of the cases under scrutiny. A full overview of the selected cases is outside the scope of this article. Moreover, given the large number of cases, and the difficulties in getting accurate information about failed coups, we will cover only successful coups in more detail, and briefly summarize the results from the failed coups.

5.1 Successful coups

5.1.1 Sub-Saharan Africa

The analysis focuses on Burundi (coups in 1976 and 1987), Chad, Côte d'Ivoire, Liberia, Mali, Niger and Rwanda (Figs. 1, 2). To give a preliminary summary of the results, in Table 2 we calculate, for each case study, the effect of the coup by averaging the distance between the treated unit and its counterpart in each year from year 0 (i.e. the coup year) to year 7: out of the eight cases, five display an average positive effect of a coup on the military burden and three a negative effect.

In both coups Burundi experienced quite a large increase in the military burden, yet a visual inspection of Fig. 1a, c) suggests that the coup in 1987 had a larger effect. In fact, in the 1976 coup, Colonel Jean-Baptiste Bagaza took power in a bloodless coup, encouraged a number of reforms and promulgated a new constitution; in 1987 Major Pierre Buyoya overthrew Bagaza in a violent coup which dissolved opposition parties, suspended the 1981 constitution, and instituted a ruling military committee. Table 2 shows that the military burden in Burundi increased on average by 0.7 % points over the 7 years after the 1976 coup, and by around 0.9 % points after the 1987 coup. In the same table we report the p-values of the Chow test on the significance of the gap between treated and synthetic-control military-burden trajectories after the coup. The test suggests that, in only three out of years, the 1976 coup in Burundi had a significant effect, while the 1987 coup had a statistically significant effect on subsequent levels of defense burden in all but the first two years.

To evaluate the significance of our estimates in greater depth, we use placebo experiments, whose results are reported in Fig. 1b, d.[15] The grey lines represent the gap associated with each of the runs of the test, i.e. the gap in the military burden between each country in the *donor pool* and its respective synthetic version. The superimposed black line shows the gap estimated for the treated country (e.g. Burundi). As the figure makes apparent, the placebo experiments create gaps of magnitudes smaller than the ones

[14] Given the limits on the length of the article, we do not include the tables for the remaining cases, but make them available in the online appendix on the authors' webpages (www2.warwick.ac.uk/fac/soc/pais/people/bove/ and https://sites.google.com/site/rnistico/home).

[15] To avoid cluttering the figures, we do not show experiments with a pre-treatment Root Mean Squared Prediction Error (RMSPE) twice that of the treated country.

Table 1 Covariates means and RMSPE: Chile 1973

Variable	Treated Chile	Synthetic Chile
Pre-coup defense burden	2.070	2.068
Log GDP per capita	7.962	7.993
Log population	9.108	9.300
Log trade openness	3.319	3.896
Polity2 index	5.900	4.100
War	0.000	0.116
Natural resources	9.053	5.909
RMSPE		0.128

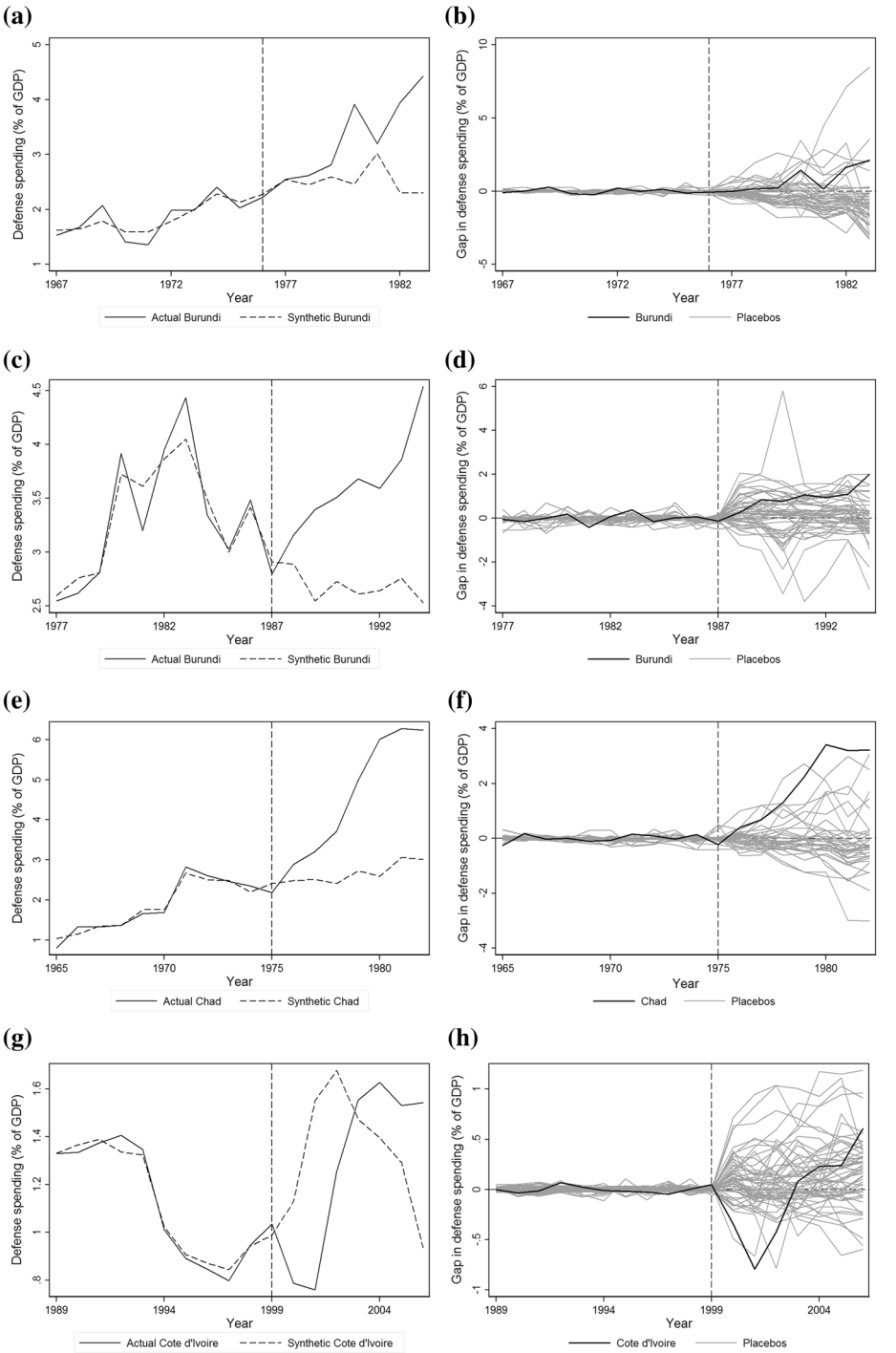
The table reports the mean values of the covariates used in the algorithm. The value of each predictor is averaged over the pre-treatment period. RMSPE stands for Root Mean Squared Prediction Error. The countries (with the relative weights) included in the synthetic control are: Canada (0.275), Egypt (0.005), Gabon (0.105), Malaysia (0.233), Nicaragua (0.006), Spain (0.159), Sri Lanka (0.217). Other potential controls are: Australia, Austria, Belgium, Cameroon, China, Colombia, Costa Rica, Cote d'Ivoire, Denmark, Finland, France, India, Ireland, Israel, Italy, Japan, Kenya, Korea Rep., Madagascar, Mexico, Morocco, Nepal, Netherlands, New Zealand, Norway, Philippines, Senegal, South Africa, Sweden, Switzerland, Trinidad and Tobago, Tunisia, United Kingdom, United States, Venezuela

estimated for Burundi in most of the post-coup years. In particular, five of the 53 fake experiments in the potential controls are above the effect in the treated Burundi (1976) over the last four post-coup years, while the great majority of the 67 placebo studies are below the treated Burundi (1987) over the last five post-coup years, in line with the Chow test which reports the same patterns.

In Chad after 1975 the military burden increased continuously for the first five years after the coup and then declined slightly. In fact, in 1979, Chad experienced a new authoritarian breakdown, though not because of a coup, and this opened the door to democracy. Not surprisingly, in the same year the new democratic government stopped increasing the military burden. Table 2 confirms that the annual effect of a coup is significant while its magnitude is quite substantial: almost 1.8 percentage points per year on average, with a peak of 3.4 percentage points five years after the coup took place. Accordingly, the placebo experiment in Fig. 1f shows that the post-treatment difference between Chad and its synthetic control group is the upper bound of all the differences in the (false) 44 placebo experiments.

The coup in Côte d'Ivoire in 1999 was the first military takeover in its history. The military junta remained in place one year only, and in 2000 the country returned to democratic rule. As we can see from Fig. 2a, the coup produced an initial decline in the military burden, followed by a quick recovery in the allocation of resources to the military. Both the placebo experiments and the Chow test suggest that in most of the years the effect is significant, while the average effect over the seven-year window is negligible.

In the military coup in Liberia in 1980, Master Sergeant Samuel Doe overthrew and killed President Tolbert. This was followed by a shift in the defense burden, an average annual increase by 1.6 % points, significant in the Chow test and in the placebo experiments. Note that from 1985, the military burden is nearly twice as much as the corresponding counterfactual. The coup in Mali in 1991 also had a positive, albeit much smaller, effect on the military burden, although the Chow test fails to reject the null hypothesis of no treatment effect of coup in the first, third and fourth post-coup years. This is partially mirrored by the placebo experiments. Finally the coups in Niger and Rwanda were both


(a)
Defense spending (% of GDP)
Year
Actual Burundi
Synthetic Burundi
(b)
Gap in defense spending (% of GDP)
Year
Burundi
Placebos
(c)
Defense spending (% of GDP)
Year
Actual Burundi
Synthetic Burundi
(d)
Gap in defense spending (% of GDP)
Year
Burundi
Placebos
(e)
Defense spending (% of GDP)
Year
Actual Chad
Synthetic Chad
(f)
Gap in defense spending (% of GDP)
Year
Chad
Placebos
(g)
Defense spending (% of GDP)
Year
Actual Cote d'Ivoire
Synthetic Cote d'Ivoire
(h)
Gap in defense spending (% of GDP)
Year
Cote d'Ivoire
Placebos

◀**Fig. 1** Successful coups and trends in military burdens—Sub-Saharan Africa. **a** Burundi 76. **b** Burundi 76—Placebo test. **c** Burundi 87. **d** Burundi 87—Placebo test. **e** Chad. **f** Chad—Placebo test. **g** Côte d'Ivoire. **h** Côte d'Ivoire—Placebo test

bloodless military takeovers, which did not result in the installation of a military junta, but rather a hybrid regime. They were both followed by a reduction in the relative amounts of resources devoted to the military, an average of −0.4 % points in Niger and of −0.8 % points in Rwanda. The Chow test and the placebo experiments support the significance of the baseline negative results from the third post-coup year on.

Note that the actual effect is not only the gap between the solid and the dotted line (i.e. the counterfactual) but also the cumulative stream of gaps, i.e., the sum of the distances in military burden between each exposed country and its counterfactual. This cumulative increase over the period under analysis can be obtained by multiplying the average effect by seven and ranges from −5.8 in Rwanda to +12.5 % points in Chad.

5.1.2 Asia

We analyze the coups in Fiji, Pakistan, and Thailand (see Fig. 3). In the Fiji islands the military burden in 1987 takes off and is about twice that of the estimated counterfactual three years after the coup. The 1999 Pakistani coup was a bloodless coup wherein General Pervez Musharraf, Chief of the Army Staff, overthrew elected Prime Minister Nawaz Sharif. Interestingly the Supreme Court of Pakistan declared the coup to be legal, but ordered that the army rule be limited to three years. Following the coup, the military burden continued its decline and even was accelerated by the coup, which is a quite unexpected result. In Thailand the military burden increased initially, but caught up with its counterfactual at the end of our window, where the two lines can be seen to overlap. The military dictatorship in Thailand was short lived and gave way to a period of democratization.

In Fig. 3 the placebo experiments confirm and reinforce the evidence for the countries in the Asian sample. The gaps estimated seem to reflect the impact of the treatment and not a potential lack of predictive power of the synthetic control. This is confirmed by the Chow test. The average (cumulative) effect of a military takeover in Asia is also quite substantial and idiosyncratic, from −0.5 (−3.4) % points in Pakistan to +0.9 (+6.2) in the Fiji islands.

5.1.3 Latin America

We focus on coups in Argentina, Chile, Ecuador, El Salvador and Peru (Figs. 4, 5). Four of those episodes produced a significant, substantial and lasting increase in military burdens. The coups in Argentina, Chile and El Salvador brought a military junta to power and, unsurprisingly, the military burden in each of these countries has increased. Argentina is an interesting case: the 1976 coup overthrew Isabel Perón and installed a military junta, headed by three senior commanders of the armed forces. The junta remained in power until 1983, after which the country started a period of democratization. the military burden reached its peak in 1982, during the Falklands War, and then declined steeply toward the end of the regime, almost touching its counterfactual the year of the regime change in 1983. Pinochet's coup in Chile, which overthrew President Salvador Allende, and the coup in El Salvador, likewise were accompanied by sharp increases in the defense burden. The annual effect in these three countries ranges from 0.6 to 4 % points. In Chile after 7 years the military burden is more than twice as high as its synthetic counterpart while the annual

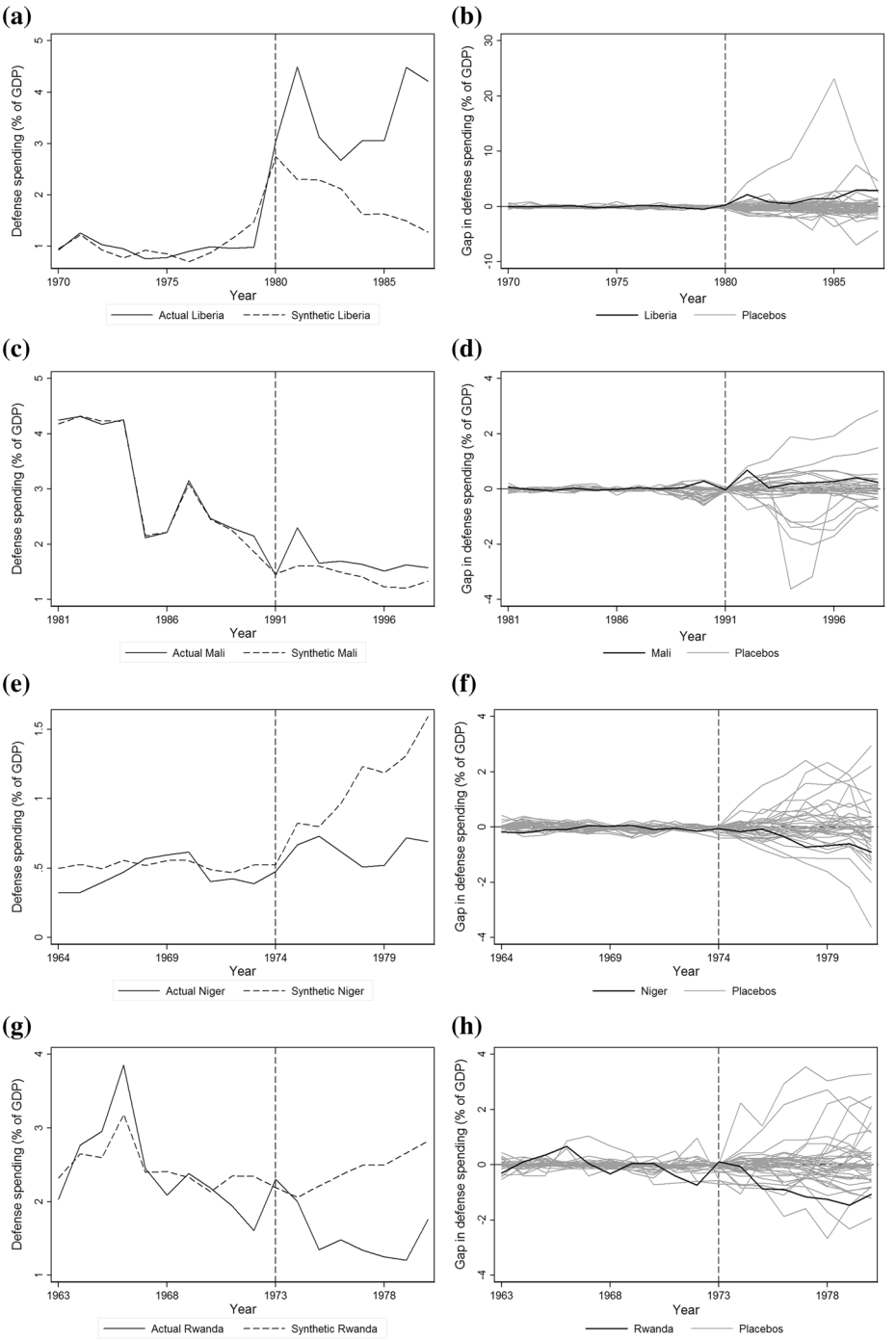


Fig. 2 Successful coups and trends in military burdens—Sub-Saharan Africa. **a** Liberia. **b** Liberia—Placebo test. **c** Mali. **d** Mali—Placebo test. **e** Niger. **f** Niger—Placebo test. **g** Rwanda. **h** Rwanda—Placebo test

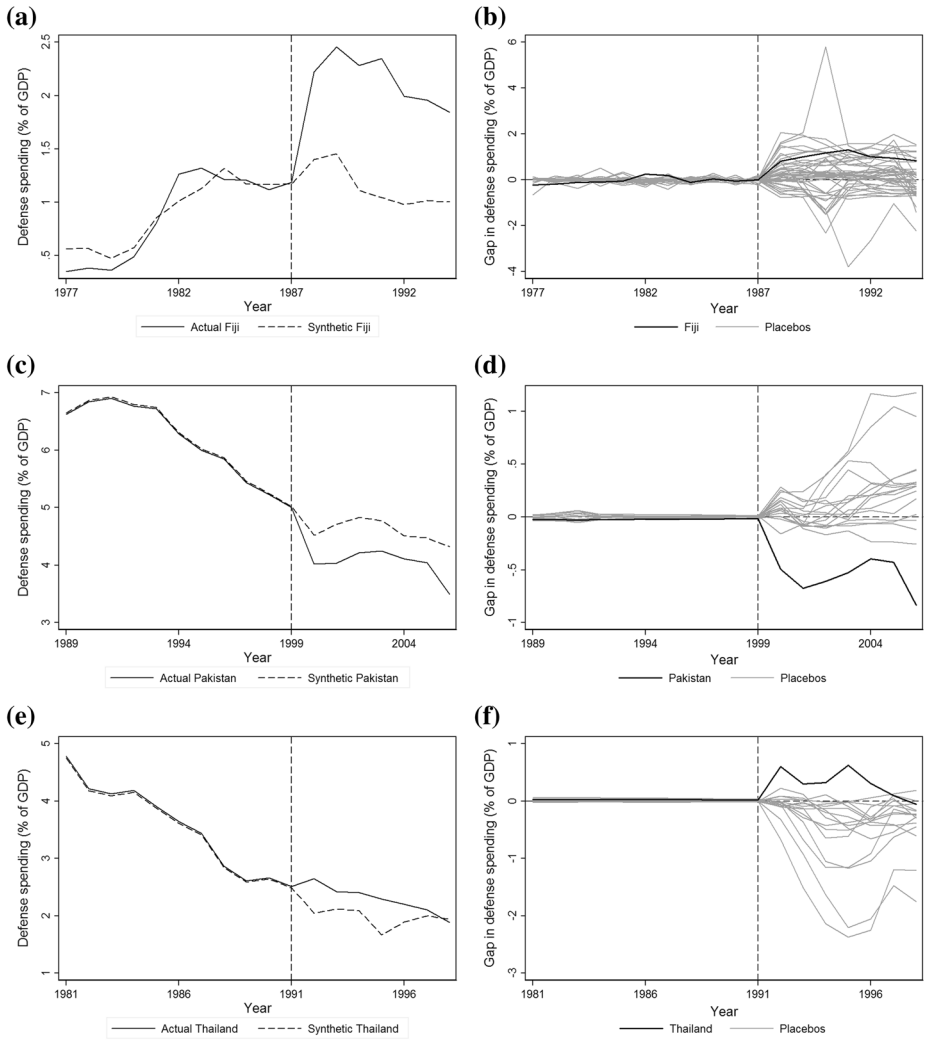


Fig. 3 Successful coups and trends in military burdens—Asia. **a** Fiji. **b** Fiji—Placebo test. **c** Pakistan. **d** Pakistan—Placebo test. **e** Thailand. **f** Thailand—Placebo test

average effect of the coup is around 1.7 % points, about the same magnitude as that of Argentina (1.8) and slightly higher than the average annual effect in El Salvador (1.4). Ecuador's military burden has a much smaller response to the coup (on average 0.7) while the coup in Paraguay caused an annual average reduction in the military burden of about 0.5 percentage points. That coup overthrew the dictator Alfredo Stroessner, who had been in office for more than three decades, and replaced him with General Andrés Rodríguez, who initiated a number of political, legal, and economic reforms. In 1992 the new constitution established a democratic system of government. In the same year military burden was curtailed sharply.

The placebo analysis undertaken on the Latin America countries reveals that the effect found in the initial assessment is not coincidental, as almost all fake experiments for the

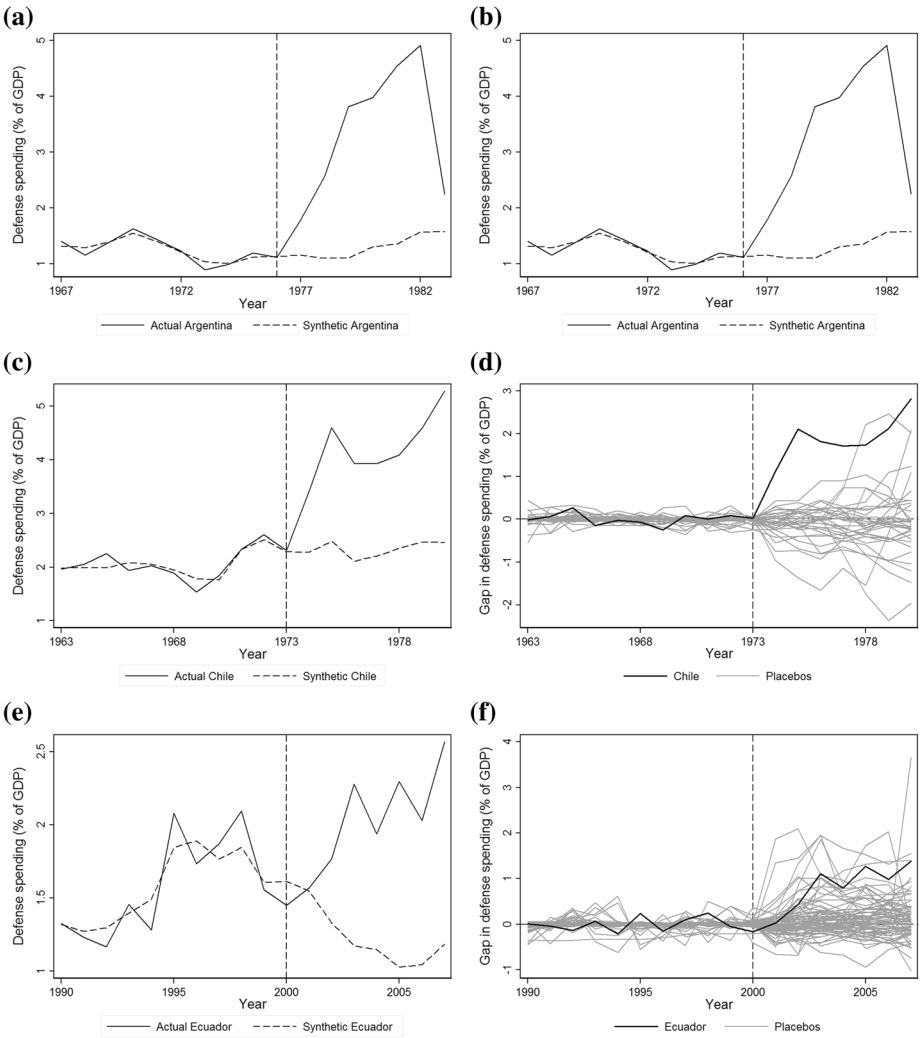


Fig. 4 Successful coups and trends in military burdens—Latin America. **a** Argentina. **b** Argentina—Placebo test. **c** Chile. **d** Chile—Placebo test. **e** Ecuador. **f** Ecuador—Placebo test

potential comparison countries show effects smaller than the baseline estimates. A notable exception is Ecuador during the first two post-coup years, wherein the coup does not seem to have produced a significant impact on the military burden trajectory. This is also confirmed by the *p* values of the Chow test.

5.1.4 Europe and MENA

Figure 6 shows the military burden in Portugal, Tunisia and Turkey, before and after the coups. Military spending in Portugal was undermined severely by the military takeover and the corresponding placebo tests lend strong support to this conclusion as no placebo

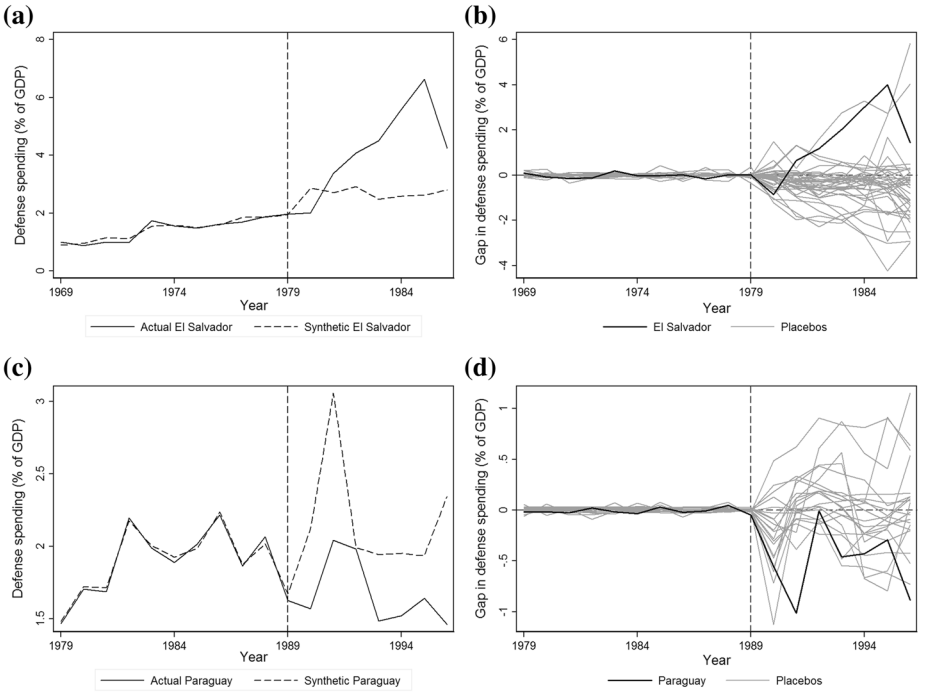


Fig. 5 Successful coups and trends in military burdens—Latin America. **a** El Salvador. **b** El Salvador—Placebo test. **c** Paraguay. **e** Paraguay—Placebo test

permutation is below Portugal over the entire 7-year period after the coup. Here again we need to contexualize the event. The "Carnation Revolution", on 25 April 1974, overthrew the regime of the Estado Novo. After a 2-year-long transition, that event profoundly changed the regime from an authoritarian dictatorship into a democracy, and produced enormous economic and social upheavals. Seven years after the coup, the military burden in Portugal is less than one-third of the corresponding counterfactual. The average and cumulative impact of the coup in the country is -2.9 and -20 % points, respectively.

In Tunisia in 1987 Ben Ali deposed Habib Bourguiba, who had ruled Tunisia since its independence from France in 1956, in a peaceful coup. In elections held in 1989, Ben Ali received more than 99 % of the votes. We can see a small average decline in military spending; yet, both the placebo experiments and the Chow test do not validate the robustness of this result. In fact, the only significant year is 1988, 1 year after the coup. We can also see the magnitude of the gap in Turkey after the coups in 1971 and 1980. In both cases, either no effect or a reduction in the military burden is evident. The 1971 Turkish coup was the second to take place in the country, after a wave of public disorder and political terrorism. In fact, one of the motivations behind the coup was the restoration of law and order. The coup in 1980 saw the armed forces ruling the country through the National Security Council, before democracy was restored. The political clout of the armed forces was strong, yet both coups seem to have caused modest reduction in the military burden, -0.4 and -0.9 % points on average, respectively. Yet, the gap is statistically significant only in a few years, as the placebo and the Chow tests indicate.

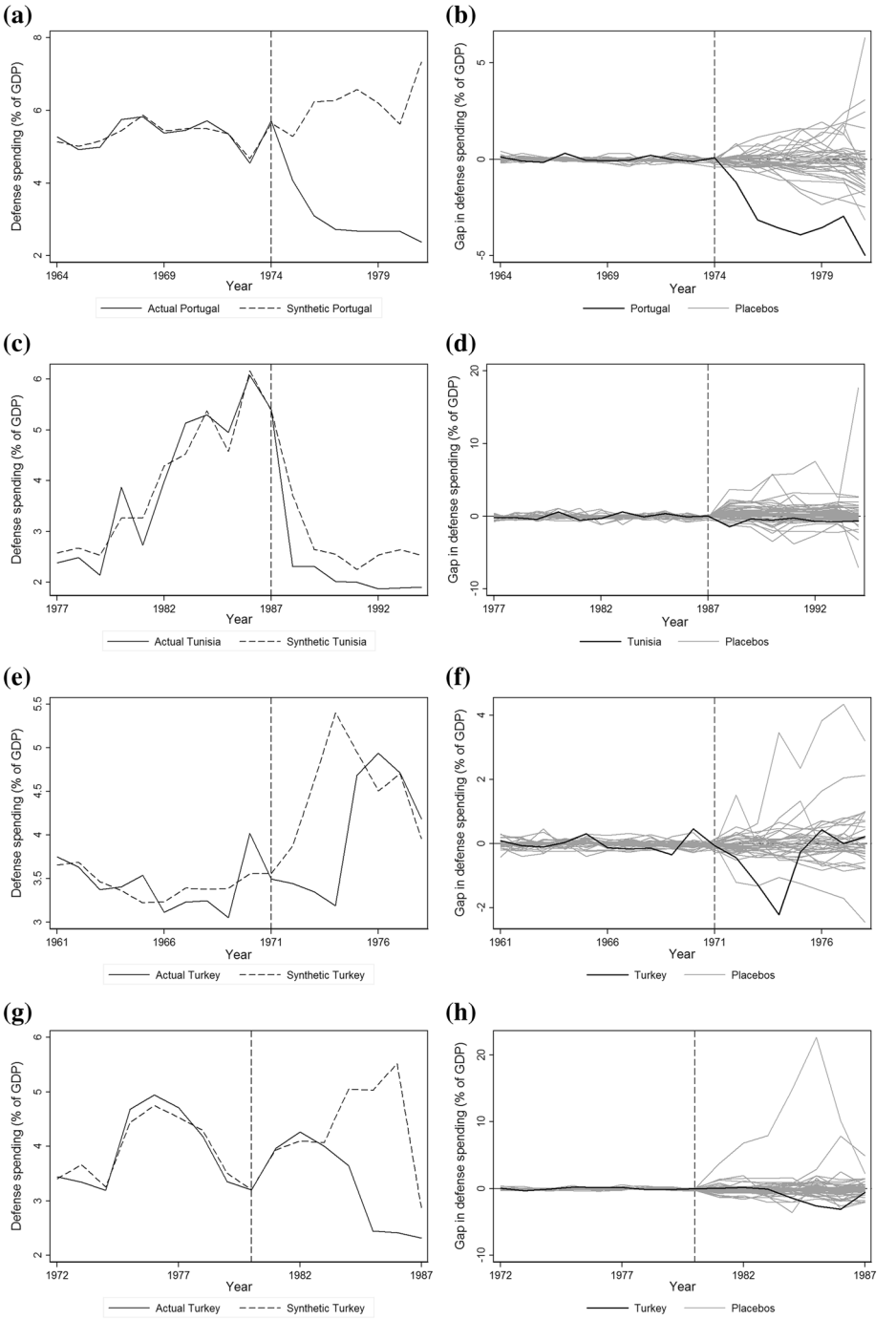


Fig. 6 Successful coups and trends in military burdens—Europe and MENA. **a** Portugal. **b** Portugal—Placebo test. **c** Tunisia. **d** Tunisia—Placebo test. **e** Turkey 71. **f** Turkey 71—Placebo test. **g** Turkey 80. **h** Turkey 80—Placebo test

Table 2 Coup effect on defense spending (as a percentage of GDP) in the post-treatment period: successful coups

SS AFRICA	Burundi 1976		Burundi 1987		Chad 1975		Côte d'Ivoire 1999		Liberia 1980		Mali 1991	
Year	Gap	*p* val	Gap	*p* val	Gap	*p* val	Gap	*p* val	Gap	*p* val	Gap	*p* val
0	−0.057	0.770	−0.115	0.561	−0.224	0.124	0.047	0.161	0.297	0.174	−0.019	0.582
1	0.005	0.983	0.269	0.189	0.404	0.021	−0.343	0.000	2.189	0.000	0.690	0.000
2	0.167	0.408	0.846	0.000	0.693	0.001	−0.792	0.000	0.831	0.004	0.056	0.875
3	0.216	0.286	0.777	0.001	1.298	0.000	−0.423	0.000	0.554	0.027	0.203	0.142
4	1.449	0.000	1.068	0.000	2.252	0.000	0.082	0.032	1.444	0.000	0.236	0.085
5	0.175	0.386	0.948	0.000	3.414	0.000	0.231	0.000	1.426	0.000	0.285	0.039
6	1.641	0.000	1.100	0.000	3.208	0.000	0.237	0.000	2.987	0.000	0.417	0.005
7	2.129	0.000	2.002	0.000	3.229	0.000	0.605	0.000	2.938	0.000	0.247	0.071
Avg effect	0.716		0.862		1.784		−0.044		1.583		0.264	

SS AFRICA/ASIA	Niger 1974		Rwanda 1973		Fiji 1987		Pakistan 1999		Thailand 1991	
Year	Gap	*p* val	Gap	*p* val	Gap	*p* val	Gap	*p* val	Gap	*p* val
0	−0.050	0.856	0.113	0.719	0.014	0.784	−0.015	0.023	0.023	0.174
1	−0.156	0.394	−0.056	0.980	0.822	0.000	−0.494	0.000	0.604	0.000
2	−0.069	0.987	−0.865	0.085	1.003	0.000	−0.674	0.000	0.302	0.000
3	−0.346	0.020	−0.880	0.081	1.172	0.000	−0.606	0.000	0.321	0.000
4	−0.725	0.000	−1.154	0.028	1.302	0.000	−0.525	0.000	0.623	0.000
5	−0.666	0.000	−1.247	0.020	1.015	0.000	−0.394	0.000	0.311	0.000
6	−0.592	0.000	−1.458	0.009	0.944	0.000	−0.429	0.000	0.101	0.000
7	−0.900	0.000	−1.063	0.040	0.842	0.000	−0.832	0.000	−0.053	0.000
Avg effect	−0.438		−0.826		0.889		−0.496		0.279	

Table 2 continued

EUROPE and MENA	Portugal 1974		Tunisia 1987		Turkey 1971		Turkey 1980	
Year	Gap	*p* val	Gap	*p* val	Gap	*p* val	Gap	*p* val
0	0.072	0.718	0.032	0.906	−0.059	0.788	−0.009	0.819
1	−1.207	0.000	−1.405	0.010	−0.437	0.062	0.025	0.771
2	−3.129	0.000	−0.335	0.484	−1.269	0.000	0.166	0.587
3	−3.555	0.000	−0.538	0.259	−2.210	0.000	−0.070	0.905
4	−3.893	0.000	−0.248	0.609	−0.266	0.240	−1.401	0.030
5	−3.532	0.000	−0.671	0.165	0.438	0.063	−2.579	0.000
6	−2.955	0.000	−0.755	0.122	0.007	0.978	−3.104	0.000
7	−4.959	0.000	−0.628	0.191	0.227	0.317	−0.564	0.445
Avg effect	−2.895		−0.569		−0.446		−0.942	

LATIN AMERICA	Argentina 1976		Chile 1973		Ecuador 2000		El Salvador 1979		Paraguay 1989	
Year	Gap	*p* val	Gap	*p* val	Gap	*p* val	Gap	*p* val	Gap	*p* val
0	−0.015	0.886	0.024	0.873	-0.163	0.333	0.010	0.773	−0.047	0.173
1	0.638	0.000	1.131	0.000	0.021	0.927	−0.860	0.000	−0.556	0.000
2	1.466	0.000	2.112	0.000	0.439	0.027	0.659	0.000	−1.013	0.000
3	2.706	0.000	1.822	0.000	1.104	0.000	1.174	0.000	−0.008	0.923
4	2.670	0.000	1.720	0.000	0.792	0.001	2.025	0.000	−0.458	0.000
5	3.186	0.000	1.736	0.000	1.271	0.000	3.013	0.000	−0.432	0.000
6	3.346	0.000	2.119	0.000	0.984	0.000	4.006	0.000	−0.293	0.000
7	0.674	0.000	2.821	0.000	1.385	0.000	1.437	0.000	−0.883	0.000
Avg effect	1.834		1.686		0.729		1.433		−0.461	

Gap measures the distance in defense spending (as % of GDP) between treated and synthetic unit; *p* val is the *p* value of the Chow tests (we test if post-coup year dummies are statistically significant in explaining the gap)

5.2 Failed coups

Failed coups are shown in the Online Appendix in Figs. A.1–A.8.[16] Out of 20 cases, half are in Sub-Saharan Africa, three in Asia, four in Latin America, and three in Europe and MENA. Failed coups have a positive impact on the military burden in 11 cases, and a negative impact in the remaining nine cases (see Table A.1). Of the negative effects though, four have an average size smaller than 0.1 percentage points.

We start with Africa, where Cameroon, Djibouti, Guinea, and Madagascar (1992), Mali, Morocco, Sierra Leone and Zambia display positive effects. Madagascar (1974) and Togo show negative effects. Yet, in Cameroon and Sierra Leone the effect of coup is mostly insignificant, as evidenced by the Chow test and the placebo studies. Table A.1 displays the average treatment effects in the range from -0.9 percentage points in Kenya to +2.6 in Zambia. In the latter case, however, the Chow test fails to reject the null hypothesis in 3 out of 7 years.

Asia includes Bangladesh, Fiji and Papua New Guinea. In all cases, the average impact of the failed coup on the military burden is negligible, very close to zero, and mostly insignificant.

In the Latin America sample, the military burden exhibits a positive response to coups in Ecuador and Venezuela, and an overall negative, albeit small, response in Panama and Paraguay. The annual post-coup gaps in Venezuela and Panama are generally insignificant at conventional levels in the Chow test, and this is supported by the placebo experiments. The average size of the effect across the significant countries is much smaller than with successful coups. In fact, the average increase in the military burden in Ecuador is only around 0.3 % points.

Finally, Figure A.8 includes Morocco, Spain and United Arab Emirates (UAE). The discrepancy between the two lines suggests a large positive effect of coups on the military burden in Morocco, where the end-of-the period value of the defense burden is more than twice the estimated counterfactual. In Spain and UAE the effect is less than 0.1 % points. The placebo analysis also gives evidence of a robust positive impact of coups on the military burden in Morocco, while the effect is largely insignificant in UAE. Interestingly, while the Chow test points to a significant effect of coups in Spain, the same placebo test suggests that the result is driven by random chance. This is an exception, though, as the great majority of Chow tests corroborate the placebo experiments, thus increasing our confidence in the validity of our findings.

Overall, the majority of failed coups show either insignificant or small effects on the military burden. Positive effects seem to prevail, although their size is generally smaller than for successful coups. In keeping with our first mechanism on the role of the military in the decision-making process, the sudden lack of civilian control of the military, which usually is the result of a successful coup, seems to lead to more substantial budgetary allocations to the armed forces. Naturally, failed coups may also push the incumbent to put in place strategies to protect against future coups and allocate more resources to the armed forces to avert further challenges to the stability of the regime.

To sum up, we find that successful coups lead to large (and sometimes long-lasting) increases in military burdens, in keeping with recent theoretical developments on the bargaining power of the military in authoritarian regimes. Failed coups produce a smaller, and mostly positive, effect on the military burden, possibly as a strategy to prevent

[16] See http://www2.warwick.ac.uk/fac/soc/pais/people/bove/ and https://sites.google.com/site/rnistico/home.

successful coups from occurring. In contrast, democratization processes triggered by the coup, or coup-proofing strategies, tend to reduce the defense burden.[17]

6 Conclusions

Coups are the archetypical form of the military having an impact on the policy process. We explore how they affect the military's chances of redistributing resources toward its members. Because the events that drive coup leaders to alter the defense burden are idiosyncratic and it is difficult to generalize about them, we undertake a case-study analysis and examine the extent to which military coups, either successful or failed, are responsible for changes in the defense burden.

We claim that a coup can increase the military's bargaining power when it affects civilian control of the military and the role of the military establishment in policy-making as well as when the newly installed regime buys the military off to prevent further challenges. However, coups also may reduce the military burden when a more democratic institutional framework is set up and/or when the ruler punishes the defectors by reducing the defense budget. This last mechanism is particularly relevant for attempted coups.

We use a counterfactual approach and show that successful coups, with some exceptions, tend to have a positive and large impact on the trajectory of the military burden on the public sector's budget. When no effect or even a reduction in the military budget materializes, those results frequently are consequences of consequence of a democratization process triggered by the coup. We also find that failed coups tend to have smaller effects, which are more often positive than negative.

Since 2011 the continuing effects of the Arab Spring have dominated regional defense and security concerns. These events have once again highlighted the importance of understanding the role of the armed forces in the process of democratization. Our findings suggest that the objective civilian control of the armed forces has profound consequences for military spending. This not only affects a number of economic outcomes, but it is also pivotal in determining the likelihood of conflict recurrence. There are still a number of open questions. One is whether an increase in the military budget in post-coup governments preserves or crowds-out resources allocated to civilian sectors of the economy (a guns-versus-butter trade-off). This is left to future research. Our comparative case study analysis can be regarded as a further step in bridging the gap between the quantitative and the qualitative approaches to research on the effects of regime changes.

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[17] To submit our results to a further robustness check, we have also run a panel data analysis, in particular a number of difference-in-difference estimations, and use three different types of treatments: successful coups, failed coups, and regime changes unrelated to coups. We look at the seven-year window following the coup. Results show that, on average, successful coups tend to increase the military burden, while both failed coups or other types of regime changes do not have any significant effect. This is consistent with most of our findings. Due to space limitations these data are not presented here, but are shown in the Online Appendix.

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