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How Mechanization Shapes Coups

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Abstract

Civil-military relations are characterized by a fundamental dilemma. To lower coup risk, leaders frequently empower the military, which satisfies the armed forces with the status quo and enables them to fight against threats challenging the civilian leadership. Simultaneously, a too powerful military itself constitutes a potential threat that is capable of overthrowing the government. Our research adds to this debate by examining the impact of mechanization, that is, the degree to which militaries rely on armored vehicles relative to manpower, on coup risk. We discuss several (opposing) mechanisms before developing the theoretical expectation that higher levels of mechanization should lower the likelihood of a coup due to the increased costs of coup execution. Empirical evidence strongly supports this claim and, thus, contributes to our understanding of the emergence of coups as an essential breakdown of civil-military relations, while adding to the debate surrounding the many trade-offs leaders face when coup-proofing their regimes.

Keywords

civil-military relations, coups, mechanization, quantitative analysis

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Introduction

Well into the 21st century, coups are still a persistent feature of political dynamics in many parts of the world. In this decade alone, the military have overthrown governments in Egypt (2013), Zimbabwe (2017), Sudan (2019, 2021), Mali (2020, 2021), and Myanmar (2021); and attempted (but failed) to do so in Burundi (2015), Burkina Faso (2015), Turkey (2016), Niger (2021), or Guinea-Bissau (2022), among others. These episodes underscore that a country's armed forces are still a central political actor and, importantly, a potential threat to incumbent governments and internal stability. Yet, the number of coups has markedly declined over the last few decades.[1] Scholars have related this decrease in coup incidence to global and political transformations such as an increased international opposition to coups as well as the emergence of multiparty politics and regular elections in non-democracies (e.g., Shannon et al., 2015; Bove & Rivera, 2015; Woo & Conrad, 2019).

Little attention, though, has been paid to other changes having directly to do with the *force structure* of military forces. To this end, we focus on mechanization—that is, the extent to which militaries rely on tanks and armored vehicles relative to manpower (Caverley & Sechser, 2017; Sechser & Saunders, 2010)—and contend that it likely is a crucial factor that helps explaining the dynamics in the global incidence of coups. We discuss several (opposing) mechanisms before developing the main argument suggesting that mechanization increases the costs of coordination failures during a coup, thereby deterring potential plotters. Despite substantial cross-national variation, modern national armies have undergone thorough structural transformation. This process, importantly, has been mainly driven by strategic factors relating to diffusion, countries' threat environment, or recent battlefield experiences, but not by institutional influences (Sechser & Saunders, 2010). As Lyall and Wilson (2009: 75) explain: "[m]echanization was not a one-time shock, however. Rather, the lessons learned by the Great Powers in World War I were codified in World War II and then gradually diffused throughout the international system during the Cold War. In particular, the practice of modeling client states' militaries in their patrons' image ensured that the modern system was emulated throughout Africa, Latin America, Asia, and the Middle East." Likewise, Sechser and Saunders (2010: 506) aver that "we can understand the broader global trend toward mechanization partly as a self-reinforcing spiral consistent with the classic logic of the security dilemma."

The cornerstone of civil-military relations is the so-called guardianship dilemma: the reliance on armed forces for protection against external and internal threats situates the military in a pivotal position they can use to take over power (Besley & Robinson, 2010; Svolik, 2013; McMahon & Slantchev, 2015). The dilemma thus entails that a stronger military should pose a bigger threat to the state. In Feaver's (1999: 214) words, the "civil-military

problematique is a simple paradox: the very institution created to protect the polity is given sufficient power to become a threat to the polity." Or, as Besley and Robinson (2010: 661) put it, "a strong army generates benefits, but the stronger it is, the easier it is for it to mount a coup and control the state."[2] Our research examines the practical implications of this dilemma and, under some circumstances, challenges the notion that more powerful militaries represent a bigger threat to incumbent governments. To do so, we focus on one characteristic of military organizations critically shaping their force structure and, hence, their fighting and operational power: mechanization. Specifically, we explore the impact of mechanization levels on the risk of coups d'état to assess whether force structure does in fact make the military more threatening to incumbent governments or not.

Tanks and armored vehicles entering the capital and taking control of strategic buildings have become iconic images of many modern coups. For example, in Zimbabwe in 2017, convoys of armored vehicles entered Harare and seized the state broadcaster, the airport, and blocked roads to the main government buildings. Similarly, during the 2016 coup in Turkey, dozens of tanks and armored vehicles moved into position in Ankara and Istanbul. Similar images are given for the 1973 coup in Chile that brought Pinochet to power and the 1967 coup in Greece. These episodes suggest that more mechanized forces may give rise to coup attempts because they increase the capacity of the military to establish dominance and seize government. Interestingly, however, mechanization has been found to undermine the military's ability to confront domestic insurgencies. Lyall and Wilson (2009) report that higher levels of mechanization reduce governments' ability to prevail in civil conflict, while Caverley and Sechser (2017) show that mechanization is associated with longer civil wars. Providing soldiers with such technology may have dampened their ability to confront internal insurgencies; but has it given them a higher ability to stage coups?

We present arguments relating mechanization to an increased material and operational capacity of the armed forces and, hence, a higher risk of coups; ultimately, though, we posit that more mechanized armies are less likely to attempt a coup. This claim is based on two key mechanisms. The first draws on Huntington's (1991: 252) suggestion that providing the military with "toys" (i.e., tanks, vehicles, and weaponry) helps keeping them content with the status quo and, therefore, relates mechanization to reduced incentives for staging coups. As this argument can be challenged on several grounds, we also outline a second mechanism that focuses on execution costs and coordination failures. Concretely, mechanization increases the cost estimations of potential inter-unit, fratricidal conflict resulting from failed coordination, which might deter officers and soldiers from attempting and joining an intervention in the first place. Using an updated global time-series cross-section data set on mechanization and coups d'état spanning four decades (1979–2019), we find

support for the expectation that more mechanized forces are linked to a lower likelihood of coups.

The article makes several contributions relevant to policymakers and the academic literature. First, we further our understanding of how coups emerge by shedding light on a previously unaccounted factor critically associated with the force structure of militaries. The degree of mechanization describes and characterizes many of the world's existing military organizations, but has not been connected to civil-military relations and the outbreak of coups before. Existing studies have focused on other organizational aspects such as counterbalancing, ethnic stacking, or professionalism (e.g., Powell, 2012; Böhmelt & Pilster, 2015; Harkness 2016; Böhmelt et al., 2019). Second, existing data on mechanization are limited to 2001. Using the instructions in Sechser and Saunders (2010; see also Caverley & Sechser, 2017), we coded new data on mechanization levels of all military organizations in the world until 2019. Third, some existing arguments suggest that more powerful armies are more capable of irregularly replacing incumbent governments. While we do not necessarily question the tenet that mechanization strengthens the military, we show that more powerful militaries do not necessarily represent a bigger threat to incumbent governments. Fourth, and derived from the last point, there may be implications for the literature on military involvement in politics falling short of an outright attempt to seize power—and, thus, our work informs processes in all countries in the world, including consolidated democracies (see Bove et al., 2020). For example, it is plausible that the military's influence on civilian governments increases with mechanization. Finally, this research speaks to the debate surrounding the many trade-offs associated with coup-proofing (e.g., Roessler, 2011). For example, dividing the military into a series of sub-units, that is, counterbalancing, may lower coup risk, but has a detrimental impact on their effectiveness (Pilster & Böhmelt, 2011). Considering research demonstrating that mechanization decreases militaries' counterinsurgency effectiveness (e.g., Lyall & Wilson, 2009; Sechser & Saunders, 2010; Caverley & Sechser, 2017), our work stressing that mechanization lowers the probability of military coups underlines that governments investing in mechanization may shift the risk from coups to insurgencies.

Mechanization and Coups: Theoretical Arguments

The consensus in the literature is that irregular attempts by the military to overthrow the government are influenced by military actors' incentives and opportunities, which in turn shape the expected utility of plotting a coup (e.g., Thyne, 2010; Powell, 2012). Several contextual and structural variables have been argued to influence these two factors. For instance, there is work focusing on governments' legitimacy, instability, ethnic rivalries, or military grievances (e.g., Londregan & Poole, 1990; Leon, 2014; Harkness 2016; Houle, 2016; Bell & Sudduth, 2017; Houle & Bodea, 2017; Johnson & Thyne,

2018). Others have analyzed structural and organizational factors shaping the military's ability to stage a coup (e.g., Belkin & Schofer, 2003; Powell, 2012; Böhmelt & Pilster, 2015; Albrecht & Eibl, 2018; De Bruin, 2018).

Somewhat surprisingly, and despite its seemingly central role, military organization, technology, and strength remain largely unexplored. Typically, relying on data from the Correlates of War, scholars have operationalized military capacity as military personnel per capita or military spending (Hendrix, 2010). These two common indicators of military strength have several limitations. At the theoretical level, size and spending variables are frequently interpreted as proxies for factors different from capacity. For example, Powell (2012) sees military size as an item for cohesion and argues that larger militaries hinder coordination and recruitment for a coup. Interestingly, both variables (size and spending) have been found to reduce the risk of coup attempts (e.g., Powell, 2012; Leon, 2014). At the empirical level, taking mechanization into consideration casts doubt on the appropriateness of employing military size or spending as measures of capacity. On one hand, mechanization makes it possible to boost military power while decreasing manpower and, hence, size (Lyall & Wilson, 2009). On the other hand, larger military expenditures do not necessarily entail better soldier quality or military capacity, since money can simply be used to fund salaries and allowances, not combat equipment or training.

Mechanization is arguably the material dimension of military organization most directly associated with fighting capacity. Per the guardianship dilemma (e.g., Besley & Robinson, 2010; Svolik, 2013; McMahon & Slantchev, 2015), a first argument might thus suggest that more mechanization induces a higher coup risk as the estimated likelihood that a coup will succeed is raised. Contrary to this view, there are arguments highlighting that mechanization affects other critical considerations of plotters, namely, their incentives as well as the costs of execution and failed coordination. Eventually, to derive our hypotheses, we examine how mechanization relates to the three explanations of *coup dynamics* suggested by Singh (2014): coups as battles, coups as elections, and coups as coordination games. This framework allows us to theoretically scrutinize different competing arguments about how mechanization might influence military's calculations and, hence, the likelihood of coups.

Mechanization, Military Power, and Prospects of Success

According to one view, coups can simply be seen as *internal* military operations designed to capture the state, which, in the event of facing resistance, are approached as a strict military confrontation. According to Luttwak (1979: 146), "the active phase of a coup is like a military operation." Singh (2014: 17) concludes consistently, "[i]f attempts are best understood as battles, then the goal of the challenger is to establish clear military dominance," which is a "task that is made easier by having more men with more powerful weapons"

(Singh, 2014: 16). In this context, mechanization, entailing precisely more powerful weapons and increased military power, might help establish such dominance if rebels have access to such equipment. As a result, the enhanced mobility and protection as well as the higher material and technical *capabilities* associated with more mechanization play a decisive role in plotters' initial decision to stage a coup by increasing the estimated probability of success and reducing the potential personal costs – and, hence, increase the expected utility of intervening in the planning stage. Much like Collier, Hoeffler, and Rohner's (2009) claims concerning the onset of civil war, it might be mostly feasibility what matters and triggers coups as well, with military feasibility, in this case, boosted by higher mechanization.

During military battles, tactical movements to capture enemy positions become central. Mechanized units, with the mobility and protection they provide as well as the overwhelming firepower they carry, might be better equipped to take on the operational steps necessary to effectively overthrow a government (Luttwak, 1979; Ferguson, 1987). According to Luttwak (1979: 138), coup execution requires "the application of force at the right place [...] by striking at the organization heart of the whole state." As highlighted above, popular images of coups typically feature tanks and other armored vehicles on the streets and outside government buildings. This suggests that mechanization can be useful in providing challengers with the relative strength to attain the operational goals of an internal intervention, namely, asserting control over the presidential palace, the parliament, headquarters of the armed forces, radio and TV stations, and the airport (Luttwak, 1979: 122, 157).

On one hand, armed forces with mechanized infantry and armor, thus benefitting from enhanced protection and mobility, could make it easier for troops to safely move from their bases and reach strategic sites in the capital. Protection helps reducing the potential personal costs of participating in a military operation, while improved mobility makes it possible for coup-makers to create an element of surprise. This allows for the opportunity to neutralize enemy forces and, by creating confusion, to hinder their ability to organize and occupy defensive positions to repel the attack. On the other hand, the overwhelming firepower that armored convoys typically carry facilitates tactical operations: it dissuades opponents from taking coordinated action against the attempt and it provides coup stagers with the strength to neutralize and defeat loyal forces protecting governmental buildings and mounting resistance to the attempt. Furthermore, once key buildings have been reached, armored vehicles could allow for a more effective takeover, subsequent control, and then hinder the potential mobilization and taking of positions by pro-government forces. For instance, during the 1973 Chilean coup, tanks shelled the La Moneda palace after Salvador Allende refused to surrender and the President's guard (Grupo de Amigos Personales) opened fire on the rebels. In the 1967 Greek coup d'état, the army's tanks occupied ministries and vital

infrastructure in the capital (Kassimeris, 2006). The coup was bloodless as no actor had the means to oppose the military's mechanized forces. Likewise, Thai coup-plotters used armored units in 2006 to occupy strategic buildings in Bangkok (Hewison, 2008: 199).

Thus, force mechanization may increase the tools that officers have at their disposal to stage a coup. These arguments yield the theoretical expectation that *higher mechanization increases coup risk*.

Mechanization, Corporate Interests, and Incentives for Intervention

A second set of arguments suggests military mechanization should actually lower the probability of observing a coup by influencing the military's *disposition* to intervene. This claim hinges on two distinct mechanisms, a direct and an indirect one. The direct mechanism is related to the interpretation of coups as elections (Singh, 2014: 17–21), which sees attempts as driven by officers' incentives or preferences and, in particular, by the military's dissatisfaction with the incumbent government or its policies. This approach points to a negative impact of mechanization on the military's willingness to move against the government.

Military interventions in domestic politics often seek to protect institutional interests and address existing grievances (e.g., Thompson, 1973). Nordlinger (1977: 78) famously posited that "the great majority of coups are partly, primarily, or entirely motivated by the defense or enactment of the military's corporate interests." Such interests can include wages, but also hardware: "soldiers should be reasonably well paid, well treated, and well equipped to help encourage and sustain their political subservience" (Slater et al., 2014: 368). Similarly, Geddes (1999: 126) argues that military officers care about generous funds that guarantee access to "state-of-the-art weapons," while Huntington (1991: 252) more explicitly advocates this perspective when suggesting that democratizers, to curb and professionalize the military, should: "[g]ive them toys. That is, provide them with new and fancy tanks, planes, armored cars, artillery, and sophisticated electronic equipment […]. New equipment will make them happy and keep them busy trying to learn how to operate it." This logic sees mechanization simply as spoils aimed at buying (or rewarding) the loyalty of the military and assumes that technology, weaponry, and equipment are a crucial component of the military's corporate interests. More mechanization would provide the military with the means to perform its institutional role (i.e., protecting the state) and gain social prestige. Besides, the procurement of this equipment, often involving arms imports, may induce opportunities for corruption (Gupta et al., 2001). Acquisition decisions are typically made by top defense elites and involve a large degree of secrecy and poor oversight (Ouédraogo, 2014). Commercial activities may facilitate the extraction of bribes and kickbacks, which increase the private benefits of officers and their content with the status quo. Accordingly, higher

levels of mechanization, viewed as a co-optation tool, would reduce the motivations to attempt a coup.[3]

A second, indirect mechanism contends that mechanization may reduce incentives for intervening, because it exerts a positive influence on military professionalism. Professionalism is often seen as entailing militaries that are more politically neutral and, hence, reluctant to intervene in politics (Huntington, 1959: 71–78). By bolstering professionalism, mechanization would then indirectly reduce coup risk. Nordlinger (1977), for example, considers expertise in the administration of violence as one of the three dimensions of military professionalism.[4] Force mechanization requires a higher level of specialization and of technical as well as tactical training to acquire the skills necessary to operate advanced equipment and carry out combined arms operations. The more soldiers train in separate locations, the more they isolate from political affairs and socialize with the military identity as well as the fundamental traits of the military profession (Janowitz, 1960; Finer, 1962; Moore, 2009). In line with Huntington's (1959) paradigm of objective civilian control, force mechanization thus creates a more professionalized military, which operates in its own professional sphere and is disconnected from politics, making them less likely to challenge civilian supremacy.

Although relevant for understanding the potential impact of mechanization on coup risk, incentive-based approaches suffer from several shortcomings. First, the incentive-based logic does not address the guardianship dilemma due to inherent commitment problems for both sides: giving the military toys still boosts their material capacities, making it less credible that they can commit not to intervene after having upgraded their power (Wang, 1998).[5] They might become (temporarily) satisfied with the status quo, but also more capable and threatening. Second, relatedly, studies of the impact of military expenditures cannot separate the effect of spending on wages and allowances from the purchase of hardware. Budgetary allocations include a number of items, which existing data do not allow distinguishing.[6] The dilemma above might be addressed if military spending reduces the disposition to plan a coup, but does not actually increase the power of the army.[7] Henk and Rupiya (2001), for example, note that an overwhelming proportion of defense spending in Sub-Saharan countries actually goes to salaries and personnel allowances (see also Powell, 2014; Powell et al., 2018). Yet, Huntington and other scholars seem to place the same weight to payments and equipment in the military's utility function. Mechanization is linked to the military's fighting capabilities, but not soldiers' living conditions, which arguably makes them less important in shaping their motivations.

The mechanisms relating mechanization to professionalism and, in turn, to lower coup risk are incomplete too. As pointed out above, mechanization may lead to increased corruption via arms procurements, which undermines professionalism (Ouédraogo, 2014). In addition, professionalism is not

incompatible with coup incidence. Some scholars suggest that military professionalism in fact drives officers to intervene in politics (Finer, 1962).[8] Indeed, some dimensions of professionalism such as the presence of military academies for the training of officers have been recently shown to be positively associated with coup occurrence (Böhmelt et al., 2019).

Mechanization, Execution Costs, and Coordination

Next to co-optation, we suggest another mechanism through which mechanization might reduce coup risk. This approach considers the expected costs of coup execution caused by potential intra-military confrontation and violence (De Bruin, 2019). The underlying argument draws on perspectives that see coups as coordination games in which expectations of others' behavior and the consequences of their joint actions for the military play the critical role (Geddes, 1999; Singh, 2014; Little, 2017).[9] Central to this mechanism are not so much the military's combat capacity or grievances, but the expectations that shape its ability for collective action. In particular, a primary concern in coup plotters' calculations pertains to the costs of executing a putsch and to avoiding bloodshed due to inter-factional, fratricidal confrontation within the military (Finer, 1962; Stepan, 1971; Luttwak, 1979; Casper & Tyson, 2014; Singh, 2014; De Bruin, 2019). According to Geddes' (1999: 126), "the worst possible outcome for the military as an institution is civil war in which one part of the armed forces fights another." Or, as Singh (2014: 23) puts it, "the leaders of both sides take the possibility of a civil war seriously and are constrained by the desire to avoid it."

Coordination games like the ones involved in a coup exhibit multiple equilibria: one where a coup occurs and one where it does not. Singh (2014: 23) emphasizes here that "the main reason for restraint and coordination during a coup attempt is to avoid escalation into fratricidal conflict." A first possibility is thus that access to mechanized equipment may spur coups as it allows coup stagers to "make a fact" and credibly present the overthrow as a fait-accompli (Singh, 2014). Under such a scenario, the view of the overwhelming fire power of armored convoys stationed around key targets in the capital would shape the expectations of other military factions and deter them from taking action against the attempt to avoid intense fighting between mechanized forces and escalation into civil war.

However, as an alternative, we suggest that mechanization makes it more likely that coordination leads to coups being less likely to occur. The "making a fact" argument rests on coup plotters' capacity to credibly signal durable control and, thus, manipulate the beliefs of other military actors. We claim that mechanization actually undermines that scenario making officers more likely to refrain from staging a coup in the first place. In other words, under such circumstances, not staging a coup is more likely to become the risk-dominant

outcome, that is, "the outcome that is chosen because it is safer in the event of a failure to coordinate" (Singh, 2014: 32). Mechanization makes such failure costlier for several reasons. First, in coups where actors often have opposing preferences and secrecy at the planning stage is necessary to avoid detection and denunciation, there is much uncertainty about other players' preferences and actions. As De Bruin (2019: 799) stresses, "[t]he need to plan in secret makes it difficult for coup plotters to estimate the depth of their support within the military and security forces at the outset of a coup." With *ex-ante* knowledge of ample support, plotters could expect that making a fact is feasible and would effectively dissuade other (smaller) factions from resisting. Yet, uncertainty impedes coup planners to estimate whether they will manage to mobilize sufficient forces and, in turn, increases risk aversion among those considering a first move especially when miscalculation can result in very costly outcomes. With higher mechanization, as we discuss below, those costs are expectedly higher and, hence, concerns about a coordination failure intensify.

Second, mechanization increases the estimated institutional, material, and human costs of intra-military conflict and, hence, the costs of a failure to coordinate. Several operational factors and limitations linked to mechanization contribute to increase the probability of bloodshed. This raises the expected execution costs of a coup.[10] On one hand, higher levels of mechanization increase the material destruction and casualties caused by direct conventional fighting during a coup attempt if loyal and opposing mechanized factions end up fighting for control over the capital.[11] The 2016 Turkish coup attempt, both sides suffered numerous casualties and material destruction was extensive as armored units clashed in several urban locations. In the 1990 Afghanistan coup, General Tanai's 15th tank brigade confronted the armored units of the Sarandoi paramilitary police force and heavy fighting ensued in the capital.[12] On the other hand, in addition to the direct costs associated with direct confrontation of armored units, the logistics of operations led by mechanized units in urban contexts also affects coup plotters' ability to capture symbolic targets and the risk that costly confrontation ensues. These features add uncertainty to the outcome of a coup-attempt, undermining the first-mover advantage of plotters and their ability to make a fact conveying credible information about control and success.[13] Mechanized units have operational advantages for conventional land warfare, but not for operations taking place in urban contexts.

Armored vehicles' movements are more easily detectable, which reveals to loyal security forces the intentions and location of rebels. With the involvement of armored units, perpetrators may undermine the element of surprise that is crucial to any coup attempt and to "making a fact" (Ferguson, 1987: 108; Singh, 2014). Furthermore, armored parts of the military are normally stationed outside capital cities, as tank units require spacious

facilities to store their equipment and carry out military exercise.[14] In the event of a coup, then, they would have to move from their bases to the capital and risk being detected, blocked, and confronted.

Therefore, despite their enhanced mobility, capturing strategic positions involves covering larger distances and operating in complex and densely populated urban centers, which allows loyal military units and even civilians to establish defensive positions and, in turn, weakens rebels' ability to seize key targets.[15] Large mechanized columns can be blocked more easily from entering specific areas and find it more difficult to maneuver in urban environments than infantry units. Crossing defensive lines (and other obstacles) by force would entail causing more fatalities among military personnel (and possibly civilians), a violence likely to signal weakness on the rebel side rather than power.[16] Consider again the case of Turkey: pro-AKP forces became alarmed of the coup attempt due to the presence of armored vehicles in key parts of Istanbul and were rapidly able to organize resistance. Esen and Gumuscu (2017: 64) note that many tanks of the Turkish coup forces were unable to even leave their military bases as civilians were blocking the gates. The perpetrators of the 1991 coup in the USSR faced a similar problem: anti-government tank columns advanced and took positions to attack the parliament and main government offices, but soon found themselves being confronted by civilians who erected barricades (Dunlop, 1993: 228). The rising probability of a bloody fight led challengers to renounce their goals.[17]

Lastly, mechanization influences officers' information and expectations about the likelihood and intensity of the violence that may potentially ensue. Information about the number of armored vehicles different units have is commonly known, especially among senior officers. Consequently, more accurate expectations can be formed not about other military members' views, but about the relative military strength of potential rival factions and, hence, the credibility of challengers' claims and the costs associated stemming from potential confrontation. The technical specialization that mechanization requires reinforces this. As Quinlivan (1999: 152–153) claims, "improving the technical skills of regular military officers increases not only their ability to deal with foreign regular armies, but also their sense of the military risks involved in a coup attempt." He consequently observes that "understanding these risks in turn renders them less likely to attempt a coup" (Quinlivan, 1999: 153). Under these conditions, manipulating the beliefs of other military actors to make the victory of a coup attempt seem inevitable becomes more difficult.

In sum, with increased costs of potential conflict, better information about the anticipated costs and risks of an intervention, and uncertainty about other officers' intentions and success prospects, mechanization undermines potential plotters' ability to convince the rest of the military that their victory is a fait accompli. As a result, not launching a coup becomes the safest course of

action.[18] These arguments lead us to formulate a second hypothesis that leads to a different empirical expectation: *higher mechanization lowers coup risk*.

Research Design

The theoretical argumentation led to the proposition of two, opposing expectations. To examine their validity, the empirical analysis is based on an updated global time-series cross-section data set on mechanization and coups d'état, which has the country-year as the unit of observation and covers the time period 1979–2019.[19]

Our main explanatory variable is the level of mechanization of a country's ground combat forces. To measure this, we use the number of armored vehicles per 100 ground combat soldiers as introduced in Sechser and Saunders (2010). The original mechanization-rate index is coded for 153 countries[20] using data on the number of motorized armored vehicles (including amphibious vehicles) and ground combat troops (army, naval infantry, and marines) from the Military Balance (International Institute for Strategic Studies, 2019). Sechser and Saunders (2010: 491) limit their data collection to odd-numbered years in 1979–2001 as "national mechanization rates tend to exhibit only gradual changes from year to year." Following their instructions, we compiled our own data and updated the mechanization-rate index for all odd-numbered years until 2019 using recent versions of the Military Balance.[21] We thus extend the temporal reach of the mechanization-rate index from 22 to 40 years, almost doubling it. To test the influence of mechanization on coup attempts, we interpolate its even-numbered years as the average of the mechanization rates in the preceding and succeeding country-years. In line with previous studies (Caverley & Sechser, 2017; Sechser & Saunders, 2010), we also log-transform this variable. Our main independent variable, *Mechanization*, is thus the logged, interpolated number of armored vehicles per 100 ground combat soldiers.[22]

Interestingly, mechanization trends vary across countries. Western states including France, Canada, or Italy as well as significant world powers such as India, Israel, and Saudi Arabia are in the process of de-mechanizing their armed forces after significant mechanization efforts in late 1990s and early 2000s. This de-mechanization trend observed in countries with a strong international presence can be potentially explained by the decreased threat of interstate warfare since the end of the Cold War and the increased importance of counter-insurgency capabilities (e.g., the case of French operations in West Africa). Similarly, the armed forces of Eastern European states like Russia, Ukraine, and Belarus experienced substantial de-mechanization following the collapse of the USSR, but their militaries have been increasingly re-mechanized post-2017. Conversely, wealthy medium-sized states like Norway, Sweden, Taiwan, United Arab Emirates, and Australia, but also Greece

and Pakistan have increased their force mechanization efforts. This trend can be attributed to the interest of medium-sized states to address regional security challenges and threats from (larger) neighboring states. Finally, the armed forces of the US, the UK, and China have significantly expanded their mechanized capabilities since 2017, which is likely linked to rising tensions at the global level involving these actors.

As this discussion suggests, mechanization levels generally rose over time, but this process is not uniform across countries. Previous conflict experience and the threat environment are core drivers of mechanization (Caverley, 2014; Sechser & Saunders, 2010). Wealthier countries can and do mechanize more (Gartzke, 2001; Sechser & Saunders, 2010). Existing research also suggests that regime type affects mechanization, as democracies should be casualty averse and, hence, invest in mechanization. And Gartzke (2001) shows that more populous countries invest in larger armies instead of equipment, pointing towards lower mechanization levels. Finally, countries' wealth does not automatically correspond to their military expenditures, meaning that higher total military expenditure should also be a non-negligible driver of mechanization.

Our dependent variable, *Coup Attempt*, is a binary item based on Powell and Thyne (2010: 252), which defines coups as "illegal and overt attempts by the military or other elites within the state apparatus to unseat the sitting executive." The outcome variable takes the value 1 if a country-year experienced at least one coup attempt in a given year and 0 otherwise. Our data set includes 6153 country-years and 155 of these experienced at least one coup attempt (2.52%). Figure 1 allows for an initial, albeit descriptive, inspection of the relationship between *Mechanization* and coup attempts. Coups are more likely to occur in countries with lower mechanization rates as indicated by lower median and 75th percentile values of *Mechanization*. To test this relationship more systematically, we use logistic regression models, as our dependent variable is dichotomous, and account for temporal dependence in the probability of coup attempts using cubic polynomials of time since the last putsch (see Carter & Signorino, 2010). In addition, we cluster standard errors at the country level to account for intragroup dependencies.

In light of the discussion above, we include a number of alternative determinants driving the degree of mechanization of the armed forces and of coup attempts (Caverley, 2014; Gartzke, 2001; Sechser & Saunders, 2010). At the same time, we attempt to avoid controls that may induce post-treatment bias, that is, whose values are the result of a country's military being more or less mechanized.[23] First, higher military expenditures have been argued to "buy loyalty" and, accordingly, may decrease the probability of coups, but they likely also shape mechanization levels. We control for logged military expenditures, as well as the year-to-year change in military spending using data from SIPRI (2019). Importantly, doing so also provides us with some

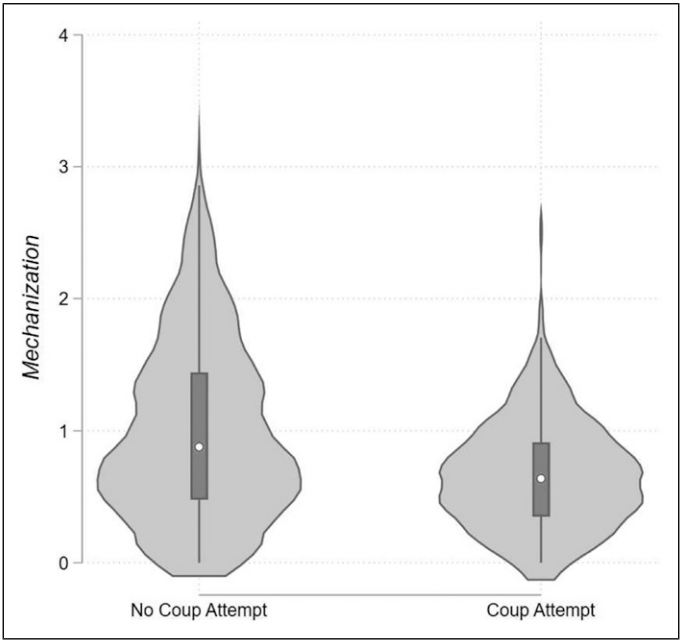

Figure 1. Mechanization and Coup Attempts. Note: Grey areas represent probability density, spikes denote adjacent values, boxes indicate interquartile ranges, and white dots give the medians.

leverage to distinguish between the incentive and coordination-based mechanisms linking mechanization to lower coup risk.

We also control for regime type by including democracy and autocracy dummies, which are based on the Polity IV data set (Marshall et al., 2019). We use the cut-off points of −6 and +6 to define autocracies (−10 to −7 on the *polity2* score), anocracies (−6 to +6), and full democracies (+7 to +10). Previous studies find that regime type influences coups (e.g., Bell, 2016; Powell et al., 2018) and it also affects mechanization levels: democracies are likely to be more casualty averse and, hence, invest in mechanization. Similarly, economic conditions and population size drive in how far states can and want to invest in mechanization (Gartzke, 2001) and may affect the popular support for regime overthrow (Londregan & Poole, 1990). We thus control for the logged GDP per capita, as well as for the yearly change in it, and for logged population size, taking this information from the World Bank Development Indicators.[24]

Finally, coups may be triggered by previous political instability and existing research shows that interstate and domestic conflict have the potential to affect coup risk (Arbatli & Arbatli, 2016; Johnson & Thyne, 2018; Roessler,

2011) as well as mechanization (Sechser & Saunders, 2010). Our models then consider indicators for the incidence of both violent inter- and intrastate conflict as well as non-violent campaigns in the previous year, using dichotomous variables from the Uppsala Data Program (Gleditsch et al., 2002) and NAVCO (Chenoweth & Lewis, 2013), respectively. We return to the domestic and international threat environment when discussing our robustness checks below.

Results

Table 1 reports five models. Model 1 focuses on our independent variable of interest, while excluding all controls except for the cubic polynomials that correct for temporal dependencies. Model 2 adds all controls except for the indicators of conflict and non-violent campaigns as these limit our temporal coverage to some degree. Model 3 adds these measures of political instability, while Model 4 accounts for further possible cross-sectional confounders via a random-effects logistic regression model.[25] Finally, Model 5 uses only non-interpolated values of *Mechanization*, thus dropping all even-numbered years from the sample. This last model is otherwise identical to Model 3. The entries in Table 1 are coefficients from logistic regression models, meaning that we can only interpret their signs and significance levels. However, this information already indicates that *Mechanization* has a negative effect on coup attempts, which is statistically distinguishable from 0 at conventional levels. Dropping or adding variables, employing random effects, changing the sample size, and altering the temporal scope does not affect this.

To supplement this first interpretation, we show the substantive effect of *Mechanization* in Figure 2, where the predicted probability of a coup attempt is plotted over the range of mechanization levels. Moving the variable from 0 to the third quartile (about 1.4) is associated with a 1.7%-point decrease in the probability of coup occurrence (from 3.5% to 1.8%). Shifting *Mechanization* to its maximum leads to a further decrease in coup probability of 1.2%. This total effect of 2.9%-points may appear small, but recall that coups are rare events and we only observe an attempt in 2.52% of the observations in our sample. The effect further compares favorably to other known predictors of coup attempts, such as regime type, defense expenditures, or military academies, which have been found to have similarly sized effects (see Böhmelt et al., 2019; Powell, 2012). We return to this issue in the Appendix.

Mechanization thus has a negative effect, which is both statistically und substantively significant. Our results support the argument leading to the second theoretical expectation that more mechanized militaries are less likely to stage coup attempts. This is the case while controlling for military spending, indicating that higher levels of mechanization decrease coup risk even when accounting for the budgetary resources being spent on the military. In other

Table 1. The Relationship between Mechanization and Coup Attempts.

	Model 1	Model 2	Model 3	Model 4	Model 5
Mechanization	−0.477***	−0.563**	−0.523**	−0.596*	−0.556*
	(0.114)	(0.193)	(0.202)	(0.232)	(0.248)
Anocracy		0.145	0.120	0.120	0.040
		(0.258)	(0.270)	(0.296)	(0.346)
Democracy		−0.739*	−0.705*	−0.856*	−1.162*
		(0.299)	(0.315)	(0.356)	(0.453)
Population		0.151	0.144	0.106	0.133
		(0.143)	(0.144)	(0.167)	(0.169)
GDP per capita		−0.137	−0.078	−0.172	−0.252
		(0.145)	(0.154)	(0.196)	(0.180)
Military Expenditures		−0.163	−0.204+	−0.198	−0.090
		(0.112)	(0.116)	(0.129)	(0.140)
Change: GDP per capita		−3.081**	−2.821**	−3.246**	−2.680
		(1.061)	(0.995)	(1.036)	(1.701)
Change: Military Expenditures		0.254	0.248	0.316	−0.872
		(0.543)	(0.526)	(0.540)	(0.704)
Non-Violent Campaign			0.529	0.658+	0.597
			(0.340)	(0.368)	(0.450)
Armed Conflict			−0.166	−0.105	−0.585
			(0.367)	(0.371)	(0.502)
Years since Coup	−0.183**	−0.168*	−0.220*	−0.160	−0.275**
	(0.067)	(0.083)	(0.103)	(0.115)	(0.106)
Years since Coup^2	0.005	0.006	0.012	0.009	0.010
	(0.004)	(0.006)	(0.009)	(0.009)	(0.009)
Years since Coup^3	−0.000	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	−1.719***	−2.366	−2.526	−1.833	−1.179
	(0.261)	(2.593)	(2.695)	(3.089)	(2.999)
Period	1979–2019	1979–2018	1979–2014	1979–2014	1979–2013
Interpolated *Mechanization*	Yes	Yes	Yes	Yes	No
Random Effects	No	No	No	Yes	No
Observations	6126	4959	4415	4415	2202
Log Pseudo Likelihood	−645.761	−454.373	−427.876	−425.612	−192.869
χ^2	121.29***	176.88***	161.92***	126.83***	121.59***

(continued)

Table 1. (continued)

	Model 1	Model 2	Model 3	Model 4	Model 5
Area Under ROC Curve	0.772	0.842	0.844	0.841	0.878
Area Under PR Curve	0.089	0.114	0.126	0.118	0.150

Note: Table entries are coefficients and standard errors clustered on the country in parentheses. GDP = gross domestic product; ROC = receiver operating characteristic; PR = precision-recall. ***$p<0.001$, ** $p<0.01$, * $p<0.05$, + $p<0.1$.

words, coup-risk dwindles as mechanization increases while holding military spending constant. This suggests that mechanization does not just represent a higher number of "toys" for the armed forces, but decreases coup risk by making anticipated costs higher and, hence, and cooperation failures costlier.

Mechanization also improves our ability to predict coups as the area under the ROC curve values reported in Table 1 show. Model 1, including only the mechanization item and the controls for time dependence, already achieves a value of 0.772 while adding further controls (Models 2–4) only adds little to improve this value. Similarly, the area under the PR curve only increases marginally from Model 1 to Models 2–4. This suggests that *Mechanization* makes a substantial contribution to in-sample predictive power. We also examine its relevance for out-of-sample forecasting by conducting a fourfold cross-validation exercise (Ward et al., 2010). That is, we randomly divide our sample into four groups, three of which are used to re-estimate Model 3, while one is set aside and used to test whether the model correctly forecasts coup attempts. We repeat this process ten times. The results are presented in Table 2 and indicate that omitting *Mechanization* from Model 3 decreases the average area under the ROC curve. In other words, dropping *Mechanization* lowers the estimations' out-of-sample predictive performance. This provides further evidence that taking a military's level of mechanization into account contributes to our understanding of when coups emerge, also from a prediction and forecasting perspective. In the appendix, we employ a Random Forest to compare the substantive influence of *Mechanization* with the other variables included in Model 3. The results presented there reiterate that *Mechanization* improves our ability to predict coup attempts and show that it is more influential than, for example, regime type, the incidence of armed conflict, or of non-violent campaigns.

To further assess the robustness of our main result, we conduct a number of robustness tests, which we summarize here and report at length in the appendix. First, we do not log-transform *Mechanization*. Second, next to dropping interpolated values of mechanization as done for Model 5 above, we

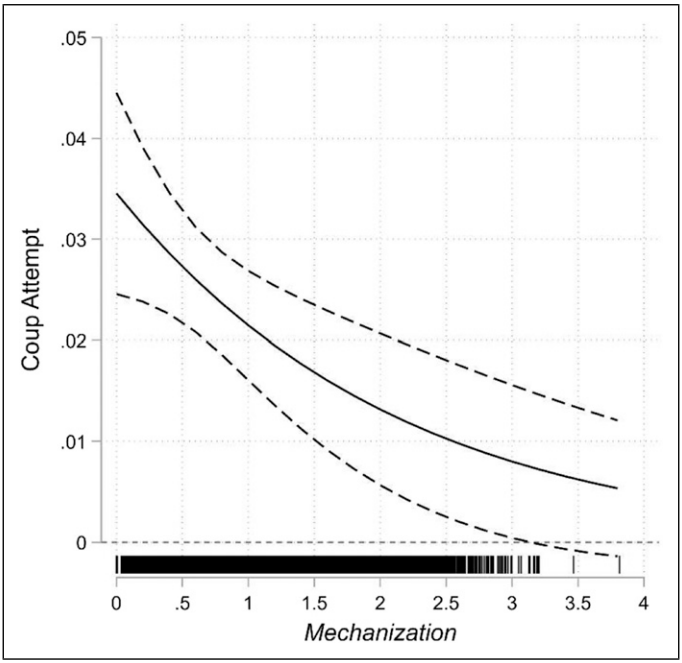

Figure 2. Mechanization and the Probability of a Coup Attempt. Note: Graph shows average marginal effect of *Mechanization* on the probability of a coup based on Model 3; black line gives point estimates, while grey dashed lines represent 95% confidence intervals; rug plot at the bottom illustrates the distribution of *Mechanization*; average marginal effect of 0 represented by dotted horizontal line.

Table 2. Mechanization and Forecasting Coup Attempts.

	Model 3	Model w/o *Mechanization*
1st Run	0.8234	0.8176
2nd Run	0.8206	0.8222
3rd Run	0.8217	0.8216
4th Run	0.8233	0.8107
5th Run	0.8183	0.8171
6th Run	0.8237	0.8139
7th Run	0.8261	0.8120
8th Run	0.8167	0.8224
9th Run	0.8175	0.8254
10th run	0.8298	0.8106
Average ROC Value	0.8221	0.8174

Note: Table entries denote Area under the ROC curve where higher values are preferred.

also omit potential outliers at the top of the mechanization distribution and examine whether our results are driven by countries such as the US, which combine high mechanization with very low coup risk. Third, we employ penalized maximum-likelihood regression, since coups are characterized by a rare-events data generating process. Fourth, we also estimate a two-stage selection model, which jointly analyzes coup attempts and coup outcomes. Interestingly, we find that mechanization does not affect the likelihood of coup success.[26] Fifth, we further take into account institutional coup-proofing (Pilster & Böhmelt, 2011), as coup-proofing can decrease coup-risk (Böhmelt & Pilster, 2015; De Bruin, 2018). Sixth, we control for total military personnel (logged) and total military spending divided by military personnel. While both items are partially included in *Mechanization* (due to the personnel component) and, thus, liable to post-treatment bias, this robustness check also shows that the estimated effect of *Mechanization* does not change in substance. The impact of *Mechanization* is thus not driven by more spending per soldier (as the incentive-based argument suggests) or by less personnel. Seventh, we include the Banks (Banks & Wilson, 2016) conflict index, which accounts for assassinations, purges of governmental officials, guerrilla activity, protests, riots, and strikes instead of the variables on armed conflict and non-violent campaigns (see Powell, 2012). Eighth, next to examining an interaction effect of *Mechanization* with regime type (in particular, democracies), we also disaggregate coups by the rank of the perpetrators (Albrecht & Eibl, 2018). Ninth, we control for the possibility that governments concentrate mechanized equipment in pro-government units or in units closer to the capital. Tenth, we include arms imports as an additional control because they are often necessary for mechanization but also associated with more inefficient militaries, we control for economic inequality as it drives mechanization (Caverley, 2014) as well as coup attempts (Svolik, 2013), we add alliance membership as a control, and we account for global trends in mechanization levels and coup propensity.

Along these lines, we also further investigate whether our results are driven by mechanization picking up on organizational or cultural attributes that affect putsch activity: as French and British colonial origins affect how post-colonial militaries are organized (Asal et al., 2017; Mehrl & Choulis, 2021), we control for a country's main colonial ruler. And to ensure that the armed forces professionalism or culture do not influence our main effect, we control for several proxies of these nonmaterial phenomena. We further ensure that the domestic and international threat environment, which affects the military's threat orientation, does not drive our results. Some studies find that international conflict reduces coup risk (Arbatli & Arbatli, 2016; Piplani & Talmadge, 2016) and mechanization often occurs in response to international threats. At the same time, mechanization is associated with the outcome and duration of civil conflicts (Lyall & Wilson, 2009; Caverley & Sechser, 2017; Sechser & Saunders, 2010), while civil conflicts may also influence

coup risk (Bell & Sudduth, 2017; Eibl et al., 2021). We begin by separately controlling for contemporaneous interstate and civil conflict. Next, we control for different lags of these two variables. Focusing on civil conflict, we then follow Eibl et al. (2019) by distinguishing regional from center-seeking rebellions and accounting not only for their incidence but also duration and time elapsed since termination, while still controlling for interstate conflict occurrence. We also control for militarized interstate disputes instead of interstate conflict, distinguish between being the target and initiator of them, and account for their duration (Piplani & Talmadge, 2016). Because "chronic" regime threats, especially territorial disputes, may matter just as much as acute armed conflict (Florea, 2018; Kim, 2018), we report specifications where we control for interstate rivalries as well as being the challenger or target of territorial claims, the duration of these, and their salience. Finally, we address endogeneity concerns about the relationship between mechanization and coup risk by estimating a simultaneous equations model, thus explicitly allowing an effect in in both directions. The substantive result that increased mechanization is associated with a reduced probability of coup attempts holds across all additional specifications.

Conclusion

How is a country's degree of military mechanization related to coup attempts? While previous work has seemingly overlooked this crucial factor, anecdotal evidence and some qualitative accounts may suggest that mechanization increases coup risk via, among other mechanisms, its enhancing impact on military power. Contrary to this view, we show that the level of mechanization is a significant and substantively important predictor of coup attempts: the higher mechanization in a country's armed forces, the lower coup risk. This conclusion is based on a quantitative analysis of updated data on all countries until 2019, prediction and forecasting techniques, as well as a series of robustness checks reported in the Appendix. Our research supports the view that mechanization is likely linked to the mechanisms of expected execution costs and coordination: the former increase in light of a higher degree of mechanization, the latter becomes more difficult in a more mechanized military organization.

Our research is relevant and important for the scholarly literature on civil-military relations. First, we add to our understanding of how coup attempts develop. Mechanization is a key aspect of any military organization. It was thus far unclear where and how it may influence coup risk, but our study is one of the first in theoretically and empirically establishing a link to civil-military relations. Second, by updating the mechanization data in Sechser and Saunders (2010; see also Caverley & Sechser, 2017), future work can rely on these new data to investigate other questions related to mechanization. Third,

the logic of the guardianship dilemma and anecdotal evidence suggest that more powerful armies may be more capable (and, hence, likely) to overthrow the government; and mechanization is a factor boosting military strength. By demonstrating that more powerful militaries may not always represent a bigger threat to the incumbent, we challenge these established views. Derived from this, there are important implications for the wider debate on the trade-offs associated with coup-proofing. Mechanization actually lowers coup risk according to our research, while it also decreases militaries' counterinsurgency effectiveness (Lyall & Wilson, 2009; Sechser & Saunders, 2010; Caverley & Sechser, 2017). Hence, investing in mechanization means that governments shift risk from coups to insurgencies.

Several interesting avenues for further research emerge from our work. We outline three of them. First, our focus lies on coups, but there may be consequences for the general involvement of the military in politics short of governmental overthrows (see Bove et al., 2020). It would be an effort worth making to examine how mechanization relates to other aspects of a country's civil-military relations. Second, we concentrate on the mechanization of ground-combat forces as, in most cases, these troops are ultimately the ones executing a coup. However, examining the mechanization of naval (see Böhmelt et al., 2017) and perhaps even air forces could also be interesting in order to explore more thoroughly latent coup dynamics. Third, our research shows, in line with earlier findings, that coup-proofing efforts (and mechanization may be one of them) may produce negative, second-order consequences. Mechanization illustrates this nicely: it is helpful to lower coup risk, but may have detrimental consequences for a state's counterinsurgency capabilities. Against this background, assessing in an all-encompassing study the various trade-offs of diverse coup-proofing strategies seems like an important avenue for future work—as this would not only shed light on the determinants of different coup-proofing strategies, but also on how coups as well as coup outcomes emerge.

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Supplementary Material

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Notes

1. According to Powell and Thyne's (2011) data, there were 123 coup attempts in the 1960s and 102 during the 1970s. The number of attempts dropped to 30 in the 2000s, and to just 22 in the 2010s.
2. Recent work challenges some of the theoretical underpinnings of this tenet. McMahon and Slantchev (2015: 297), for example, posit that while the dilemma "predicts that governments are at greatest risk of a coup when some threat forces them to strengthen their militaries," it is precisely the presence of serious threats that can induce military loyalty to the incumbent government.
3. Existing analyses have typically relied on military expenditures to examine these arguments, viewing budgets as a key instrument for increasing the military's organizational resources. As discussed above, this misses central aspects associated with mechanization. That said, consistent (at least partially) with these arguments, most scholars report a negative relationship between military spending and coup risk (e.g., Powell, 2012; Leon, 2014; Albrecht & Eibl, 2018; Powell et al., 2018). These findings are interpreted that budgetary allocations appease officers' disposition to intervene in politics to protect their corporate interests (Collier & Hoeffler, 2007). The military's strong interest in resource allocations is also manifested, as recent work shows, in the fact that successful (and also failed) coups lead to increases in military expenditures (e.g., Bove & Nisticò, 2014).
4. The other two are organizational autonomy from civilian interference and exclusiveness as the sole armed institution in the country.
5. Similarly, the government might be unable to commit to increase funding (Besley & Robinson, 2010).
6. One notable exception is Sabaté, Espuelas, and Herranz-Loncán's (2020) study of 19th century Spain, which finds that increased officers' remunerations (without increasing total military expenditures) reduced the coup risk.
7. As Powell (2014: 177) underscores, a part of military budgets can also be used as symbolic spending, that is, the purchase of sophisticated weaponry that remains mostly toothless "due to a lack of adequate training or a lack of upkeep."
8. There are three reasons behind this claim. First, professionalism makes the military develop a stronger corporate identity separate from the incumbent government and, hence, perceive itself as serving (and protecting) the state—not necessarily the government (Bellin, 2012). Second, professionalism increases awareness of institutional autonomy, thereby increasing the likelihood of disagreements with the incumbent over recruitment, promotion, or budgetary issues. Third, professionalism instills a strong preference among the military of not being used in oppressing domestic opponents (Pion-Berlin et al., 2014).
9. "As a result, the most important consideration in an actor's decision calculus is to support the side he believes everybody else will support, and military strength flows accordingly to that side" (Singh, 2014: 22).

10. Note that the costs of execution differ from the costs of a failed coup (De Bruin, 2019).
11. An implication of this argument may be that mechanized equipment is concentrated in the hands of pro-government units, which acts as a deterrence to the coordination of other military units. However, it is unlikely that an army's mechanized forces are limited to one (loyal) unit. Instead, mechanized equipment is typically distributed across various military units strategically positioned in different parts of the country. Even if a ruler concentrates the best equipment in loyal units, there still are important reasons to mechanize other parts of the armed forces. For example, conventional militaries need mechanized equipment to confront potential foreign threats. Additionally, a relatively even distribution of mechanized units is necessary to maintain balance between rival military organizations, since force units may become a threat if left unchecked. Consider the Baathist regimes, which employed highly mechanized conventional armies despite the Republican Guard's preferential access to equipment. Finally, if only one loyalist unit has access to mechanized equipment, the military's overall mechanization level is likely low. Although data on the distribution of mechanized equipment across units and their location is not available, we return to this issue in the Appendix with additional controls such as the presence of highly armed counterweights and country size.
12. See online at: https://www.nytimes.com/1990/05/10/world/kabul-journal-in-power-still-afghan-can-thank-his-4-star-aide.html.
13. Lack of credibility may also emerge after the attempt is seemingly over and successful. Even after the fact has apparently been made, with mechanization, the mobilization and taking of positions by pro-government forces can led to stalemate or siege scenarios and, in turn, induce challengers to flee or surrender in order to avoid direct, violent confrontation.
14. For instance, in 1975, the Greek Armor Training Unit was moved from Athens to a facility in rural Attica to meet the unit's operational demands. Some units are also likely to be stationed in border areas for security reasons related to foreign threats.
15. The examples reveal that even in ongoing coups, mechanization is likely to foster the emergence of stalemate or siege situations that both loyal and rebel units often seek to de-escalate and that result in rebels surrendering or retreating. Indeed, results reported in the Appendix show that mechanization is unrelated to coup outcomes.
16. An implication of this argument is that an infantry-based army might be better suited to carry out a coup: they are more capable of clandestine operations and their barracks are more likely to be located in urban centers, thus closer to the seat of political power. For instance, in the Japanese February incident, when the Kokutai attacked General Watanabe's residence two hours after the coup had started, the government was still completely unaware of the on-going plot (Shillony, 1973: 137). In the 1965 coup against President Sukarno, the Indonesian army used para-commandos to take over the presidential palace and neutralize his supporters

(Ra'anan, 1969: 60–61). In the 1966 coup in Ghana, the plotters attacked the presidential residence with infantry brigades instead of mechanized ones to avoid detection (Kraus, 1969: 114–15). Mechanized units could attempt to emulate the operations of their infantry-based counterparts, but since their training is focused around mechanized equipment, it is unlikely that they would employ unfamiliar tactics in such a risky operation. Mechanized units have their own standard operating procedures and their personnel would not abandon their training and expertise during a coup and adopt unfamiliar, infantry-oriented tactics.

17. See online at: https://www.themoscowtimes.com/2016/08/19/the-forgotten-coup-a55030.
18. These mechanisms may have implications for coup agency. First, if it is principally senior officers who hold better information about units' endowments, have a more accurate risk-assessment, and have a stronger preference for unity and avoiding inter-factional conflict, then mechanization should particularly have a negative effect on coups led by senior officers. Second, mechanization may especially deter coups led by junior officers. Such coups are typically executed by minority factions within the military, which increases the risk that the attempt is opposed by higher rank officers and fails to make a (credible) fact. Junior officers have more difficulty in credibly claiming effective control over the capital (Singh, 2014). As De Bruin (2019) and Singh (2014) note, these coups, when launched, normally entail higher levels of violence, yet violence in this case may signal weakness. We explore this possibility in the Appendix using Albrecht et al. (2021) data distinguishing between coups led by elite officers and combat officers.
19. Replication materials and code can be found in Choulis et al. (2022).
20. Sechser and Saunders (2010) focus on states with more than 750,000 inhabitants.
21. Caverley and Sechser (2017) provide an update, but their data only encompass countries that experience armed conflict.
22. Because the mechanization rate includes values of 0, we add unity before the log-transformation. In the Appendix, we also present models without log-transforming the mechanization rate.
23. Most prominently, the extent of counterbalancing should be a reaction to the perceived coup risk posed by the military and, hence, might be affected by mechanization. We return to this in the Appendix.
24. Where World Bank data are unavailable, we use values from the Penn World Table, version 9.1.
25. Although *Mechanization* is time-variant, it only changes slowly over time. This makes estimation rather inefficient when using unit-level fixed effects. For this reason, we opt for a random-effects estimator here.
26. This suggests that mechanization does not increase a first-mover advantage that could encourage coordination. The confrontation and stalemate situations described above and related to mechanization make success uncertain.

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References

Albrecht, H. & Eibl, F. (2018). How to keep ofcers in the barracks: Causes, agents, and types of military Coups. *International Studies Quarterly*, *62*(2), 315–328.

Albrecht, H., Koehler, K., & Schutz, A. (2021). Coup agency and prospects for democracy. *International Studies Quarterly*, *65*(4), 1052–1063. https://doi.org/10.1093/isq/sqab079

Arbatli, C. E. & Arbatli, E. (2016). External threats and political survival: can dispute involvement deter coup attempts? *Conflict Management and Peace Science*, *33*(2), 115–152. https://doi.org/10.1177/0738894214545956

Asal, V., Conrad, J., & Toronto, N. (2017). I want you! The determinants of military conscription Toronto N. Amp; Toronto, N. *Journal of Conflict Resolution*, *61*(7), 1456–1481. https://doi.org/10.1177/0022002715606217

Banks, A. S. & Wilson, K. A. (2016). *Cross-national time-series data archive*. http://www.databanksinternational.com.

Belkin, A. & Schofer, E. (2003). Toward a structural understanding of coup risk. *Journal of Conflict Resolution*, *47*(5), 594-620. https://doi.org/10.1177/0022002703258197

Bell, C. (2016). Coup d'état and democracy. *Comparative Political Studies*, *49*(9), 1167–1200. https://doi.org/10.1177/0010414015621081

Bellin, E. (2012). Reconsidering the robustness of authoritarianism in the Middle East: Lessons from the Arab spring. *Comparative Politics*, *44*(2), 127–149. https://doi.org/10.5129/001041512798838021

Bell, C. & Sudduth, J. K. (2017). The causes and outcomes of coup during civil war. *Journal of Conflict Resolution*, *61*(7), 1432–1455. https://doi.org/10.1177/0022002715603098

Besley, T. & Robinson, J. (2010). Quis custodiet ipsos custodes? Civilian control over the military. *Journal of the European Economic Association*, *8*(2–3), 655–663. https://doi.org/10.1111/j.1542-4774.2010.tb00535.x

Böhmelt, T., Escribà-Folch, A., & Pilster, U. (2019). Pitfalls of professionalism? Military academies and coup risk. *Journal of Conflict Resolution*, *63*(5), 1111–1139. https://doi.org/10.1177/0022002718789744

Böhmelt, T. & Pilster, U. (2015). The impact of institutional coup-proofing on coup attempts and coup outcomes. *International Interactions*, *41*(1), 158–182. https://doi.org/10.1080/03050629.2014.906411

Böhmelt, T., Pilster, U., & Tago, A. (2017). Naval forces and civil-military relations. *Journal of Global Security Studies*, *2*(4), 346–363. https://doi.org/10.1093/jogss/ogx012

Bove, V. & Nisticò, R. (2014). Coups d'état and defense spending: a counterfactual analysis. *Public Choice*, *161*(3), 321–344. https://doi.org/10.1007/s11127-014-0202-2

Bove, V. & Rivera, M. (2015). Elite Co-optation, repression, and Coups in autocracies. *International Interactions*, *41*(3), 453–479. https://doi.org/10.1080/03050629.2015.1006727

Bove, V., Rivera, M., & Ruffa, C. (2020). Beyond coups: terrorism and military involvement in politics. *European Journal of International Relations*, *26*(1), 263–288. https://doi.org/10.1177/1354066119866499

Carter, D. B. & Signorino, C. S. (2010). Back to the future: modeling time dependence in binary data. *Political Analysis*, *18*(3), 271–292. https://doi.org/10.1093/pan/mpq013

Casper, B. A. & Tyson, S. A. (2014). Popular protest and elite Coordination in a Coup D'état. *Journal of Politics*, *76*(2), 548–564. https://doi.org/10.1017/s0022381613001485

Caverley, J. D. (2014). *Democratic militarism: Voting, wealth, and war*. Cambridge University Press.

Caverley, J. D. & Sechser, T. S. (2017). Military technology and the duration of Civil Conflict. *International Studies Quarterly*, *61*(3), 704–720. https://doi.org/10.1093/isq/sqx023

Chenoweth, E. & Lewis, O. A. (2013). Unpacking nonviolent campaigns: Introducing the NAVCO 2.0 dataset. *Journal of Peace Research*, *50*(3), 415–423. https://doi.org/10.1177/0022343312471551

Choulis, I., Mehrl, M., Escribà-Folch, A., & Böhmelt, T. (2022). *Replication data for: How mechanization shapes coups*. https://doi.org/10.7910/DVN/PDQ4AG

Collier, P. & Hoeffler, A. (2007). *Military expenditure and the risks of coups d'État*. : Oxford University.

Collier, P., Hoeffler, A., & Rohner, D. (2009). Beyond greed and grievance: feasibility and civil war. *Oxford Economic Papers*, *61*(1), 1–27. https://doi.org/10.1093/oep/gpn029

De Bruin, E. (2018). Preventing coups d'état: How counterbalancing works. *Journal of Conflict Resolution*, *62*(7), 1433–1458. https://doi.org/10.1177/0022002717692652

De Bruin, E. (2019). Will there Be blood? Explaining violence during Coups D'État. *Journal of Peace Research*, *56*(6), 797–811. https://doi.org/10.1177/0022343319839449

Dunlop, J. B. (1993). *The rise of Russia and the fall of the soviet empire*. : Princeton University Press.

Eibl, F., Hertog, S., & Slater, D. (2021). War makes the regime: Regional rebellions and political militarization worldwide. *British Journal of Political Science*, *51*(3), 1002–1023. https://doi.org/10.1017/s0007123419000528

Esen, B. & Gumuscu, S. (2017). Turkey: How the coup failed. *Journal of Democracy*, *28*(1), 59–73. https://doi.org/10.1353/jod.2017.0006

Feaver, P. D. (1999). Civil-military relations. *Annual Review of Political Science*, *2*(1), 211–241. https://doi.org/10.1146/annurev.polisci.2.1.211

Ferguson, G. (1987). *Coup d'Etat: A practical manual*. : Arms & Armour.

Finer, S. (1962). *The man on horseback: The role of the military in politics*. : Praeger.

Florea, A. (2018). Spatial rivalry and coups against dictators. *Security Studies*, *27*(1), 1–26. https://doi.org/10.1080/09636412.2017.1360072

Gartzke, E. (2001). Democracy and the preparation for war: does regime type Affect states' anticipation of Casualties? *International Studies Quarterly*, *45*(3), 467–484. https://doi.org/10.1111/0020-8833.00210

Geddes, B. (1999). What do we know about democratization after twenty years? *Annual Review of Political Science*, *2*(1), 115–144. https://doi.org/10.1146/annurev.polisci.2.1.115

Gleditsch, N. P., Wallensteen, P., Eriksson, M., Sollenberg, M., & Strand, H. (2002). Armed Conflict 1946-2001: a new dataset. *Journal of Peace Research*, *39*(5), 615–637. https://doi.org/10.1177/0022343302039005007

Gupta, S., de Mello, L., & Sharan, R. (2001). Corruption and military spending. *European Journal of Political Economy*, *17*(4), 749–777. https://doi.org/10.1016/s0176-2680(01)00054-4

Hendrix, C. S. (2010). Measuring state capacity: Theoretical and empirical implications for the study of civil conflict. *Journal of Peace Research*, *47*(3), 273–285. https://doi.org/10.1177/0022343310361838

Henk, D. W. & Rupiya, M. R. (2001). *Funding defense: Challenges of buying military capability in sub-saharan Africa*. Strategic Studies Institute, US Army War College.

Hewison, K. (2008). A book, the king and the 2006 Coup. *Journal of Contemporary Asia*, *38*(1), 190–211. https://doi.org/10.1080/00472330701652026

Houle, C. (2016). Why class inequality breeds coups but not civil wars. *Journal of Peace Research*, *53*(5), 680–695. https://doi.org/10.1177/0022343316652187

Houle, C. & Bodea, C. (2017). Ethnic inequality and Coups in sub-Saharan Africa. *Journal of Peace Research*, *54*(3), 382–396. https://doi.org/10.1177/0022343316685140

Huntington, S. P. (1959). *The soldier and the state*. : Harvard University Press.

Huntington, S. P. (1962). *Changing patterns of military politics*. : Free Press of Glencoe.

Huntington, S. P. (1991). *The third wave: Democratization in the late twentieth century*. : University of Oklahoma Press.

International Institute for Strategic Studies (2019). *The military balance*. : International Institute for Strategic Studies.

Janowitz, M. (1960). *The professional soldier: A social and political portrait*. : Free Press.

Johnson, J. & Thyne, C. L. (2018). Squeaky wheels and troop loyalty: How domestic protests influence coups d'état, 1952-2005. *Journal of Conflict Resolution*, *62*(3), 597–625. https://doi.org/10.1177/0022002716654742

Kassimeris, C. (2006). Causes of the 1967 Greek Coup. *Democracy and Security*, *2*(1), 61–72. https://doi.org/10.1080/17419160600623459

Kim, N. K. (2018). International conflict, international security environment, and military coups. *International Interactions*, *44*(5), 936–952. https://doi.org/10.1080/03050629.2018.1466288

Kraus, J. (1969). Ghana, 1966. In W. Andrews, & U. Ra'anan, (Eds), *The Politics of the Coup d'Etat. Five Case Studies* (pp. 89–131). : Van Nostrand Reinhold Company.

Leon, G. (2014). Loyalty for sale? Military spending and Coups D'état. *Public Choice*, *159*(3–4), 363–383. https://doi.org/10.1007/s11127-013-0124-4

Little, A. T. (2017). Coordination, Learning, and Coups. *Journal of Conflict Resolution*, *61*(1), 204–234. https://doi.org/10.1177/0022002714567953

Londregan, J. B. & Poole, K. T. (1990). Poverty, the Coup trap, and the seizure of executive power. *World Politics*, *42*(2), 151–183. https://doi.org/10.2307/2010462

Luttwak, E. N. (1979). *Coup d'État: A practical handbook*. : Allen Lane.

Lyall, J. & Wilson, I. III. (2009). Rage against the machines: explaining outcomes in Counterinsurgency wars. *International Organization*, *63*(1), 67–106. https://doi.org/10.1017/s0020818309090031

Marshall, M. G., Gurr, T. R., & Jaggers, K. (2019). *Polity IV project: Political regime characteristics and transitions, 1800-2018*. Dataset Users' Manual.

McMahon, R. B. & Slantchev, B. L. (2015). The guardianship dilemma: regime security through and from the armed forces. *American Political Science Review*, *109*(2), 297–313. https://doi.org/10.1017/s0003055415000131

Mehrl, M. & Choulis, I. (2021). The colonial roots of structural coup-proofing. *International Interactions*, *47*(4), 750–776. https://doi.org/10.1080/03050629.2021.1898958

Moore, D. (2009). *The soldier: A history of courage, sacrifice and brotherhood*. : Icon Books.

Ouédraogo, E. (2014). *Advancing military professionalism in Africa*. Africa Center for Strategic Studies Research. Paper No. 6.

Pilster, U. & Böhmelt, T. (2011). Coup-proofing and military effectiveness in interstate wars, 1967-99. *Conflict Management and Peace Science*, *28*(4), 331–350. https://doi.org/10.1177/0738894211413062

Pion-Berlin, D., Esparza, D., & Grisham, K. (2014). Staying quartered: civilian uprisings and military disobedience in the twenty-first century. *Comparative Political Studies*, *47*(2), 230–259. https://doi.org/10.1177/0010414012450566

Piplani, V. & Talmadge, C. (2016). When war helps civil–military relations: Prolonged interstate conflict and the reduced risk of coups. *Journal of Conflict Resolution*, *60*(8), 1368–1394. https://doi.org/10.1177/0022002714567950

Powell, J. (2012). Determinants of attempting and outcome of coups d'état. *Journal of Conflict Resolution*, *56*(6), 1017–1040. https://doi.org/10.1177/0022002712445732

Powell, J. M. (2014). Regime vulnerability and the diversionary threat of force. *Journal of Conflict Resolution*, *58*(1), 169–196. https://doi.org/10.1177/0022002712467938

Powell, J., Faulkner, C., Dean, W., & Romano, K. (2018). Give them toys? Military allocations and regime stability in transitional democracies. *Democratization*, *25*(7), 1153–1172. https://doi.org/10.1080/13510347.2018.1450389

Powell, J. M. & Thyne, C. L. (2011). Global instances of Coups from 1950 to 2010: a new dataset. *Journal of Peace Research*, *48*(2), 249–259. https://doi.org/10.1177/0022343310397436

Quinlivan, J. T. (1999). Coup-proofing: Its practice and consequences in the middle East. *International Security*, *24*(2), 131–165. https://doi.org/10.7249/rp844

Ra'anan, U. (1969). Indonesia. In W. Andrews, & U. Ra'anan, (Eds), *The Politics of the Coup d'Etat. Five Case Studies* (pp. 43–64). : Van Nostrand Reinhold Company.

Roessler, P. (2011). The enemy within: Personal rule, coups, and civil war in Africa. *World Politics*, *63*(2), 300–346. https://doi.org/10.1017/s0043887111000049

Sabaté, O., Espuelas, S., & Herranz-Loncán, A. (2020). Military wages and Coups D'État in Spain (1850-1915): the use of public spending as a Coup-proofing strategy. *Journal of Iberian and Latin American Economic History, First View*, *1*(1), 1–37. https://doi.org/10.1017/s0212610920000270

Sechser, T. S. & Saunders, E. N. (2010). The army you have: the determinants of military mechanization, 1979-2001. *International Studies Quarterly*, *54*(2), 481–511. https://doi.org/10.1111/j.1468-2478.2010.00596.x

Shannon, M., Thyne, C., Hayden, S., & Dugan, A. (2015). The international community's reaction to Coups. *Foreign Policy Analysis*, *11*(4), 363–376. https://doi.org/10.1111/fpa.12043

Shillony, B. A. (1973). *Revolt in Japan: The young officers and the february 26, 1936 incident*. : Princeton University Press.

Singh, N. (2014). *Seizing power: The strategic logic of military coups*. : Johns Hopkins University Press.

SIPRI (2019). *SIPRI military expenditure database*. https://www.sipri.org/databases/milex (accessed December 12, 2019).

Slater, D., Smith, B., & Nair, G. (2014). Economic origins of democratic breakdown? The redistributive model and the postcolonial state. *Perspectives on Politics*, *12*(2), 353–374. https://doi.org/10.1017/s1537592714000875

Stepan, A. (1971). *The military in politics: Changing patterns in Brazil*. : Princeton University Press.

Svolik, M. W. (2013). Contracting on violence: the moral hazard in authoritarian repression and military intervention in politics. *Journal of Conflict Resolution*, *57*(5), 765–794. https://doi.org/10.1177/0022002712449327

Thompson, W. (1973). *Grievances of military coup-makers*. : Sage.

Thyne, C. L. (2010). Supporter of stability or agent of agitation? The effect of US foreign policy on Coups in Latin America, 1960-99. *Journal of Peace Research*, *47*(4), 449–461. https://doi.org/10.1177/0022343310368350

Wang, T. Y. (1998). Arms transfers and coups d'État: a study on sub-saharan Africa. *Journal of Peace Research*, *35*(6), 659–675. https://doi.org/10.1177/0022343398035006001

Ward, M. D., Greenhill, B. D., & Bakke, K. M. (2010). The perils of policy by p-value: predicting civil conflicts. *Journal of Peace Research*, *47*(4), 363–375. https://doi.org/10.1177/0022343309356491

Woo, A. S. & Conrad, C. R. (2019). The differential effects of "democratic" institutions on dissent in dictatorships. *Journal of Politics*, *81*(2), 456–470. https://doi.org/10.1086/701496

World Bank (2019). *GDP, PPP (constant 2011 international $)*. https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.KD (accessed December 12, 2019).