Coup Risk and Autocratic Succession Rules: Evidence from Sub-Saharan Africa

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Abstract

Why does a minority of autocracies fail to formalize succession rules in the constitution? According to recent research, weak dictators have succession rules to reduce the threat of coups. In contrast, I argue that dictators have succession rules when they are already secure. Succession rules reduce the threat of succession crises but create potential threats by empowering successors and angering elites. Given the potential threats created by succession rules, dictators will create them when they have sufficiently consolidated power. I use Random Forest, a machine learning algorithm, to predict the probability of successful coups. Using original data on succession rules for all 48 sub-Saharan African countries from 1966–2005 and dynamic probit models, I show that dictators are less likely to introduce and retain succession rules when coups have higher probabilities. Contrary to prevailing approaches to autocratic institutions, succession rules are tools of stable and secure dictators, not threatened ones.

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Why does a minority of autocracies fail to formally prepare for political succession? Recent research has begun to examine the role of succession rules in non-routine transfers of power, particularly designated successors. A designated successor is an individual or, more commonly, the holder of a specific office named in the constitution to assume power if a leadership vacancy occurs. Having a designated successor presents a simple puzzle. Designated successors can threaten the dictator. The designated successor has the motivation to overthrow the dictator, maximizing the successor's time in power and preventing their early removal from their role as successor. Through their status, the successor gains resources and allies who can facilitate a coup d'état against the dictator.[1] A designated successor has both the means and motive to overthrow the dictator. Herz (1952) named this potential danger from a successor the crown-prince problem.

Despite the crown-prince problem, existing research has reached a consensus that designated successors offer more benefits than costs. Designated successors directly protect dictators from coups. Coup plotters must overthrow both the dictator and the successor, increasing the difficulty of staging coups (Frantz and Stein 2017; Konrad and Mui 2017; Meng 2021). Designated successors also reduce the incentives for other elites to plot coups. Elites may stage coups to ensure a transfer of power if the dictator is vulnerable. But designated successors reduce uncertainty over the future and assure elites that the regime will persist past the current dictator (Kokkonen, Møller, and Sundell 2022; Kokkonen and Sundell 2014; Kurrild-Klitgaard 2000; Tullock 1987). Because designated successors reduce the risk of coups, dictators are likely to establish succession rules when they fear such threats.

This line of research treats succession rules themselves as the puzzle. In reality, succession rules are commonplace: over 77% of autocracies in sub-Saharan Africa have succession rules in my data. The true puzzle is why a minority do *not*. I address this puzzle by reversing the relationship between leader survival and succession rules. Previous work argues that only weak dictators create succession rules by simply assuming that strong dictators do not. For example, Meng (2021) asserts that "a leader who is *already* secure and anticipates a smooth succession has no reason to create succession policies" (957; italics in original). The relationship between

1. Following Svolik (2012), I use the term coup to refer to "a forced removal of an authoritarian leader by *any* regime insider, not necessarily the military" (4n8; italics in original).

the threat of a coup and the presence of succession rules has not received full consideration, either theoretically or empirically.

The crown-prince problem leaves open an alternative explanation for why dictators have succession rules despite the risk of coups: the dictator does not fear the threats from succession rules, whether from a successor or other elites. If the dictator believes that they can prevent coups, the crown-prince problem is not a concern. Instead, the possibility that strong dictators have succession rules is assumed away. I follow this possibility and argue that autocracies have succession rules when the threat of a coup is already low. With an already secure dictator, succession rules reduce the threat of perilous transfers of power after a vacancy while not threatening the dictator in their lifetime. The uncommon absence of succession rules is explained by autocracies where a dictator never becomes sufficiently secure.

I test the argument using a new strategy for estimating coup probabilities and original data on succession rules in sub-Saharan African autocracies from 1966 to 2005. For this analysis, I focus on sub-Saharan Africa to ensure comparability with previous results and exclude substitutes for succession rules like dominant ruling parties and parliamentary constitutions. The probability of a successful coup is estimated with Random Forest, a machine learning algorithm. The Random Forest probabilities provide an accurate and direct measurement of a dictator's vulnerability to a coup that is dynamic within a single dictator's tenure. I then model the relationship between the predicted probability of a coup and succession rules using dynamic probit models. When the probability of a coup is higher, autocracies without succession rules are less likely to introduce them, and autocracies with succession rules are less likely to retain them.

This paper contributes to the study of institutions in autocracies specifically and political science broadly. The most obvious implications concern autocratic succession. The prevailing consensus holds that dictators formalize succession rules to prevent coups. By implication, dictators introduce succession rules when they are weak and vulnerable to coups. Existing work has shown a consistent correlation between the presence of succession rules and the avoidance of coups (Frantz and Stein 2017; Kokkonen and Sundell 2014; Kokkonen, Møller, and Sundell 2022; Konrad and Mui 2017; Kurrild-Klitgaard 2000; Meng 2021; Tullock 1987; Zhou 2023).

However, this paper provides evidence that the relationship is, in fact, reversed: dictators have succession rules when they are already strong and can prevent coups. Previous arguments linking succession rules to coup-proofing require retesting. Even if the observed relationship persists, the existing theoretical framework remains incomplete.

The story that weakness creates institutions extends beyond autocratic succession. Since Geddes (1999), the study of autocracy has emphasized the role of institutions (Pepinsky 2014). Nominally-democratic institutions—such as cabinets, constitutions, elections, legislatures, and parties—are associated with longer-serving dictators and more stable regimes. Autocratic institutions facilitate cooperation between dictators and elites, helping to establish boundaries on dictatorial power and allocate resources and policy control (Arriola 2009; Boix and Svolik 2013; Brownlee 2007; Gandhi 2008; Gandhi and Przeworski 2007; Geddes, Wright, and Frantz 2018; Magaloni 2008; Meng 2020; Svolik 2012). Dictators are most likely to need this cooperation in moments of weakness, such as when they need resources, lack power relative to allies, or face challenges to their rule.

The weakness-to-institutions story, in an even broader sense, aligns to the account of state development from institutional economics. In these influential accounts, representative institutions emerged from state weakness. Faced with the need for increased taxation, weak states had to bargain with more powerful social classes to increase their cooperation with the state. In exchange for increased revenue, the state ceded power and expanded the influence and rights of dominant social groups. Representative institutions served as venues for these groups to exercise their powers and restrain the state (Bates and Lien 1985; Levi 1988; North 1990; North and Thomas 1973).

Ultimately, these lines of research—autocratic succession, autocratic institutions, and the birth of representative institutions—can be unified under a power-sharing framework that links weakness to institutionalization. A weak ruler or sovereign, needing the cooperation of a relatively stronger group to maintain power, sacrifices authority and resources to ensure survival. Institutions are then created to formalize and solidify these agreements (Meng and Paine 2022; Meng, Paine, and Powell 2023; R. Powell 2024).

The argument and findings of this paper challenge the power-sharing framework in two

key respects. First, institutions are central to ordinary politics. They perform essential governance functions, such as organizing succession. As such, institutions do not always need to be explained by their role in prolonging a dictator's tenure. Second, already strong and secure dictators have the greatest capacity to create institutions. According to the power-sharing framework, dictators must sacrifice power and resources. Yet weak dictators are weak precisely because they have less power relative to elites and lack sufficient resources. In contrast, strong dictators possess the capacity to redistribute power and resources, enabling them to establish institutions. These points have antecedents. Boucoyannis (2021) demonstrates that strong states, not weak ones as traditionally argued, introduced representative institutions. Slater (2003), in the context of Malaysia, shows that institutionalization can actually bolster a dictator's power rather than restrain it. Most relevant to my argument, Sudduth (2017a; 2017b) shows that dictators purge dangerous elites when the dictator is already in a position of strength rather than waiting for the threat of a coup to emerge. Institutions can emerge from and benefit strong dictators, not weak ones. Greater understanding of the causes is necessary to understand their effects.

The next section discusses the literature on coups and succession rules in greater depth. Then, I argue that autocracies should be more likely to have succession rules when coups are already unlikely. The remainder of the paper tests whether the probability of a coup affects having succession rules. I start by introducing an original dataset on succession rules in sub-Saharan Africa and using a Random Forest model to predict the probability of a successful coup. Next, I describe the empirical model and discuss the results, finding a negative relationship between the probability of a coup and both introducing and retaining succession rules. The final section concludes.

Choosing to Have Succession Rules

Succession rules serve an essential purpose across all types of political regimes. Organizing transfers of power is a basic task of governance. For political regimes to survive in the long term, they must be prepared to transfer power between leaders at any moment. Leader

vacancies are always a possibility. Politics does not supersede biology: leaders fall ill, become incapacitated, and die. The fundamental purpose of succession rules is to help regimes navigate and survive leader vacancies.

Although all regimes must handle succession if they endure long enough, succession is a greater threat to autocracies than democracies. Democracies have inherent strategies for succession through elections. If a vacancy occurs, the next leader is ultimately chosen by an election, and the succession rule determines who will take over until the next election and when the next election occurs. Conversely, autocracies lack inherent systems for succession and often fail to prepare for it altogether. Autocracies frequently arise from crises and overturn the existing constitutional order. Elites in new autocratic regimes can elect to ignore establishing formal procedures in the constitution—if they choose to create a constitution at all.

A vacancy in the dictator's position launches a potential power struggle. The dictator personifies the regime, determining policy and the distribution of privileged positions among elites. When a vacancy occurs, ambitious elites will seek to take power themselves. Other elites will begin organizing around their favored candidates. The stakes of autocratic succession are high. At best, losing candidates and their supporters receive fewer benefits. They risk severe punishments if they failed to support the new dictator, ranging from exclusion from the regime to imprisonment or execution. If elites cannot agree on the next leader or are uncertain about the likely victor in a succession contest, they may stage coups to secure a favorable outcome.

The stakes of succession contests and potentially high levels of uncertainty that they involve ultimately stem from coordination problems. As a form of constitutional rule, succession rules help to resolve coordination problems. The core purpose of constitutions is to facilitate coordination. Constitutions provide rules that coordinate behavior by strengthening mutual expectations and increasing the costs of deviation (Carey 2000; Hardin 1989). While the effects of constitutions are mostly associated with democracies, constitutions serve similarly important roles in autocracies. Modern governments, regardless of regime type, are complex and require significant coordination between leaders and regime members. Constitutions provide the rules that regulate decision-making and interactions between members of government, particularly dictators and elites (Albertus and Menaldo 2012; Barros 2002; Myerson 2008). More broadly,

constitutions serve as operating manuals that inform the dictator and elites how the government should function (Przeworski 2013).

Specifically, succession rules reduce the threat of vacancies turning into succession crises and coups by reducing uncertainty over the power struggle's outcomes and establishing structures for bargaining between factions. Without succession planning, a leadership vacancy leaves elites uncertain over the regime's future and the next dictator. The next dictator could emerge as a threat to the interests of a subset of elites. Rather than waiting for the contest to play out, these elites may exploit the power vacuum and stage a coup. A successful coup guarantees an outcome favorable to the plotters rather than risking the emergence of a dictator opposed to their interests. This possibility can be exacerbated by the presence of factions that disagree over candidates for succession. If elites do not believe that they can agree on the next dictator, factions may race to commit coups and prevent rivals from taking power.

Succession rules reduce the risk that uncertainty will motivate coups. Succession rules influence the probability distribution over who will take power in the event of a vacancy. The most obviously advantaged candidate is the successor, if one exists, even if they only assume power on an interim basis. In the event of a vacancy, the successor gains a structural advantage as holder of the dictator's office and becomes one of the most obvious candidates to coordinate around. Even figures who have ranked as secondary figures in the regime, such as Paul Biya of Cameroon and Daniel arap Moi of Kenya, have consolidated power over the regime by virtue of being the successor during a vacancy.

Most succession rules either do not name successors or only empower successors on an interim basis. Instead, a separate process, such as selection by the legislature or the ruling party, determines the next leader. Although such rules provide less certainty than those with designated successors, they still shape elites' understandings of the future. Elites can form expectations regarding the succession outcome based on the composition of the body responsible for choosing the next leader and the preferences of its members. With succession rules in place, elites develop expectations about the regime's future if the dictator dies, including who the most likely successors will be.

Processes for choosing the next dictator further reduce the threat of factions turning to

violence. Violence can emerge among factions when elites are uncertain about reaching a compromise candidate. Succession rules provide a structure and venue for factions to bargain and reach a compromise candidate, increasing confidence that such a candidate can be found and reducing the likelihood of factions resorting to violence. Staging a coup and establishing a new regime are costly and risky. A compromise candidate who preserves the regime is likely preferable to the risks of attempting to establish a new regime through a coup. Processes in succession rules reduce the risk of factionalization leading to coups by providing a venue for selecting a compromise candidate.

In short, succession rules help autocracies avoid succession crises and ensure a peaceful transfer of power in the event of a dictator's death. Succession rules reduce uncertainty by creating shared expectations over the likely outcomes of power struggles. They also mitigate the threat of factional conflict by providing processes that can select a compromise candidate. Given that succession rules are core elements of political regimes and modern constitutions, the more interesting question is why a minority of autocracies lack them. The answer lies in the new threats that succession rules can create.

The costs of succession rules arise from the creation of potential rivals. Succession rules produce two broad groups within the regime. The advantaged benefit from the succession rule; if the dictator dies and the rule is followed, they are happy with the anticipated outcome. The most obvious member of the advantaged is any named successor, and others include the successor's allies and members of the regime who prize stability. Conversely, the disadvantaged strongly prefer an outcome that diverges from the anticipated effect of the succession rule. Those most disadvantaged are ambitious elites who are not named the successor, their allies, and other enemies of the successor.

The "barrier effect" from existing work can be reinterpreted in terms of the incentives and relative power of these two groups. The advantaged and disadvantaged have opposing incentives. The advantaged want to preserve the regime and wait for the dictator's death so that the succession rule takes effect. The disadvantaged want to stage a coup and install their preferred candidate in power. The balance of power between the advantaged and disadvantaged can help explain when dictators choose to implement succession rules. If the protective power of the ad-

vantaged outweighs the threat of the disadvantaged, the succession rule enhances the dictator's overall security. In such cases, a threatened dictator then has an incentive to use succession rules as a survival strategy.

The incentives for the advantaged, however, can be more nuanced. Certainly, the disadvantaged have stronger reasons to consider staging a coup. Appointing a successor cuts off other elites from taking power peacefully. Once the successor is established, a coup may become the only means for a non-successor to assume power. Elites who do not seek the crown themselves still have preferences regarding the next ruler. An ally assuming power could increase an elite's privileges within the regime, while an adversary taking control could lead to imprisonment, torture, or execution. If elites are dissatisfied with the succession rule's expected outcome, a coup provides them an opportunity to eliminate that possibility.

The advantaged, especially the successor, still have incentives to stage a coup rather than simply wait for the dictator's death. Most successors will want to maximize their time in power as the dictator. Successors may stage a coup to depose the dictator early and extend their tenure. Not all successors will have the ability to stage a successful coup when first appointed. However, over time, the successor can consolidate power and increase the likelihood of a successful coup.

Moreover, the longer the successor waits for the incumbent to leave, the more likely they are to lose their position. Any successor becomes more likely to die as they wait. The successor's growing power also suggests a strategic response from the incumbent. The incumbent may remove the successor before they become too powerful. Regularly rotating successors minimizes the risk of a coup by preventing any successor from amassing sufficient power. Elites are less likely to build alliances with a successor they do not expect to remain in office for long. Staging a coup can help the successor avoid losing their position.

When dictators have succession rules, they are not merely balancing a group of would-be protectors against a group of would-be coup plotters. Both groups have incentives to attempt coups and seize power. Coups are more likely to succeed against weaker dictators, making successors and elites more inclined to favor coups in such cases. Stronger dictators can deter coups and keep both the advantaged—especially the successor—and the disadvantaged pla-

cated. Consequently, dictators are most likely to introduce and retain succession rules after consolidating their rule and ensuring they can prevent coups.[2]

Data on Succession Rules

To test the relationship between the risk of losing power and having succession rules, I collect data on succession rules for all autocracies in sub-Saharan Africa. Sub-Saharan Africa is defined as member states of the African Union that are *not* categorized as Northern Africa by the African Union. Autocracies are identified using an expansive sample of any country coded as autocratic by at least one of Boix, Miller, and Rosato (2012), Cheibub, Gandhi, and Vreeland (2010), and Geddes, Wright, and Frantz (2014). Constitutions are accessed primarily through the Comparative Constitutions Project (Elkins, Ginsburg, and Melton 2014) and World Constitutions Illustrated. In the absence of a permanent constitution, I use the primary governing document where possible, including suspension orders, ordinances, decrees, and fundamental laws.

The data address limitations of existing data for succession rules. Frantz and Stein (2017) and Iqbal and Zorn (2008) identify succession rules using the executive regulation variable from the Polity dataset (Marshall, Gurr, and Jaggers 2014). They code succession rules as present if, according to Polity, the country has designational or regulated succession. Designational succession refers to choices made by elites without genuine competition, including rigged and one-party elections. Regulated succession is hereditary succession or competitive elections. Because the Polity variable is partially based on elections, it lumps routine and non-routine succession rules together. The Polity variable does not distinguish whether succession rules for permanent vacancies exist independently of elections. Meng (2021) collects data on succession rules with designated successors—which, under Meng's definition, is any individual named as the successor after a permanent vacancy, regardless of the time that they can hold power—in sub-Saharan Africa. Meng codes the presence of succession rules that name a specific successor, using existing coding from the Comparative Constitutions Project. Meng's data only include succession rules in place directly before leadership transitions or at the end of a

2. Appendix A provides an example of these dynamics in the context of Zimbabwe under Robert Mugabe.

dictator's tenure. While Meng's data are static, succession rules are dynamic and can change during a single dictator's tenure. Fully characterizing succession rules requires time-series-cross-sectional data rather than a pure cross-section.

Keeping the analysis in sub-Saharan Africa ensures comparability with previous results and controls for important confounders. Existing research on succession rules in modern autocracies has focused on sub-Saharan Africa. The hypothesis proposed in this paper—that succession rules are more likely when the probability of a coup is low—predicts the opposite conclusion from existing work. If the hypothesis is supported, using data from the same region increases confidence that the results contradicting existing work stem from theoretical reasons and not the choice of cases.

Using sub-Saharan Africa also controls for other means of managing succession without rules. Ruling parties are potential substitutes for succession rules. Ruling parties can enforce informal institutions and norms that determine succession without formal rules, or ruling parties can serve as the mechanism for succession themselves (Egorov and Sonin 2024). In the socialist and communist states of Eastern Europe, succession was rarely planned during the dictator's lifetime; instead, the ruling party would choose a new dictator after a vacancy (Gill 2021). Formal rules for irregular transitions were unnecessary because the party fulfilled the institutional role of choosing a new dictator. Many African autocracies have ruling parties, but the parties have different relationships with the state than their Eastern European counterparts. In Eastern Europe, power ran through the party, with state officials serving largely symbolic roles. African autocracies, in contrast, typically incorporate the party into the state formally. Constitutions establish the head of the party as the head of state, and party organs are responsible for managing the succession process. The power of the ruling party is formalized in sub-Saharan African autocracies.

Parliamentary governments are another substitute for succession rules. Parliamentary governments, whether autocratic or democratic, usually lack formal succession rules. If a vacancy occurs, the process for choosing the prime minister repeats, potentially with a caretaker government taking over in the short term. Parliamentary governments, however, are rare in sub-Saharan Africa. Although many former British colonies adopted parliamentary constitutions

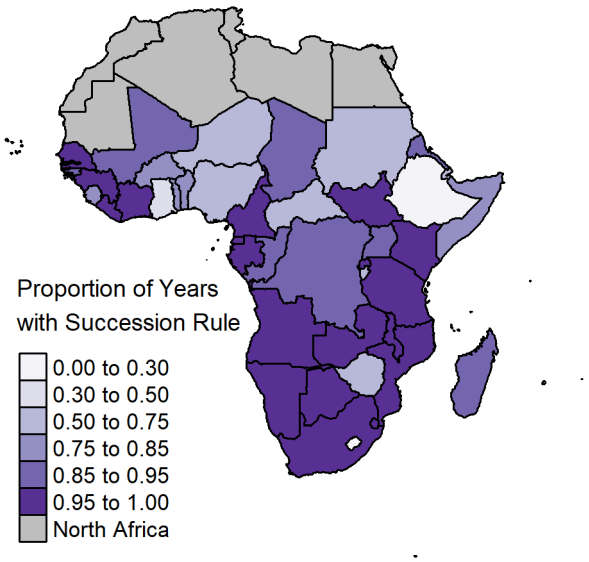

Figure 1. Proportion of years with succession rules among sub-Saharan African autocracies through 2020. Countries with darker shades have succession rules in a higher proportion of years that they are autocratic since independence. Countries in grey—Algeria, Egypt, Libya, Mauritania, Morocco, and Tunisia—are categorized as Northern Africa by the African Union and, therefore, are excluded from the data.

immediately after independence, most eventually switched to presidential systems. Botswana and South Africa, the most prominent remaining parliamentary countries in the region, fuse the head of government and head of state together in an executive presidency rather than separate the roles into a prime minister and president. The presidents of Botswana and South Africa, although chosen by and accountable to parliament, have formal lines of succession. While strong ruling parties and parliamentary constitutions are alternatives to succession rules, they are less of an inferential threat in sub-Saharan Africa.

To construct the succession rules variable, I code whether an autocracy has an identifiable succession rule at a monthly level. Succession rules define how to handle permanent vacancies in the chief executive. A succession rule exists if the constitution, or other governing document if there is no permanent constitution, has a section specifying how to replace the chief executive after a permanent vacancy. To aggregate the monthly data to a yearly level, I code succession rules as 1 if a majority of months have a succession rule and 0 otherwise. Figure 1 graphs the proportion of years that each sub-Saharan African country has had succession rules during autocratic periods for the entire available dataset through 2020. Succession rules are common among African autocracies: over 77% of country-year observations have succession

rules. Nearly half of countries, 21 of 47, have succession rules every year. Ethiopia is the only autocracy that never has succession rules, while Ghana and Lesotho are the only other autocracies that have succession years in less than half of years. The commonality of succession rules underscores the core puzzle. Why autocracies have succession rules is not mysterious. Succession rules resolve essential problems in governing regimes. The more interesting question is why a minority of autocracies lack succession rules.

Estimating the Probability of Coups

One of the main empirical challenges is measuring a dictator's risk of violent removal by elites within the regime. To measure the risk of violent removal, I use a Random Forest model to directly estimate the probability of a successful coup. Coups are identified using Powell and Thyne's (2011) data, updated through 2020. Powell and Thyne define coups as "illegal and overt attempts by the military or other elites within the state apparatus to unseat the sitting executive" (252; italics removed). Coups are successful if the perpetrators of the coup hold power for at least seven days. Powell and Thyne's definition captures the core concept in the argument: the threat of violent removal by actors already in the regime.

The model only predicts whether coups are successful, or whether the coup actually produces a turnover in leadership. Attempting a coup and succeeding in a coup have different data-generating processes; the difference between success and failure is not merely random (De Bruin 2017; J. Powell 2012). Dictators are mostly likely to fear the threat of coups when coups can credibly succeed. Indeed, strong dictators might even bait long-shot coups against them to suppress coup plotters and expand their hold on power (Luo and Rozenas 2023; Timoneda, Escribá-Folch, and Chin 2023). Failed coups, rather than frightening dictators, might present welcome opportunities for power concentration that dictators encourage.

Still, the probability of a successful coup generally correlates with political stability regardless of whether a successful coup occurs. Countries that experienced a failed coup have a lower predicted probability of a coup than countries with successful coups ($t = 2.43$), but the probability is still significantly higher than observations with no attempted coup at all ($t = -2.04$).

Comparing Banks and Wilson's (2021) index of political instability, countries that experience coups, whether successful or unsuccessful, have similar levels of political instability ($t = 1.53$). Both types have more instability than countries with no coups of any type ($t = 5.86$).

Random Forest models work by combining predictions from a pre-specified number of decision trees (for additional descriptions of Random Forest models, see Breiman 2001; Muchlinski et al. 2016). Each decision tree bootstraps the data. The remaining observations are held out-of-bag and excluded from that decision tree's training data. The decision tree generates predictions by splitting the data across a series of nodes. At each node, a subset of the predictors is randomly drawn. The decision tree identifies the dichotomous split among the randomly drawn variables that most reduces the error rate for observations that have reached the node. The splitting process continues until observations reach terminal nodes that end each path. Out-of-bag cases run through the decision tree to generate predictions for cases not sampled in the decision tree. The Random Forest model produces the pre-specified number of decision trees and averages the predictions. Bagging, the process of randomly sampling the observations for each decision tree and aggregating the results, increases the accuracy of predictions while reducing the variance of predictions and minimizing the risk of overfitting.

Compared to previous strategies, Random Forest predictions offer a more accurate, direct, and dynamic measurement of a dictator's risk of violent removal. A common strategy involves using one or more proxies, such as export concentration and foreign support (Boix and Svolik 2013) or leader traits (Meng 2020). Proxies present a basic problem. If the proxies have different results, it is difficult to disentangle whether the relevant feature of the variable—the threat of violent removal—drives the results or whether a separate, irrelevant feature does. The Random Forest model, conversely, measures the risk of a coup directly. Because the components of the model are known, they can be controlled for more easily. Further, existing proxies are generally static or rarely change during a dictator's tenure. The turnover rate, another common measurement (Li 2009; Przeworski et al. 2000), is more dynamic but decreases monotonically during a dictator's tenure. In contrast, the Random Forest predictions are dynamic and can capture short-term fluctuations in the threat of a coup. Of the 28 predictors that included in the Random Forest model, only three—ethnic fractionalization, religious fractionalization, and

mountainous terrain—are completely time invariant. The Random Forest predictions, as a result, are more dynamic and can capture short-term fluctuations that existing proxies cannot include even though some of the model inputs are themselves static.

The Random Forest model also produces more accurate predictions compared to generated regressors used in previous work. Generated regressors from survival models have been used to produce predictions of leader survival (Cheibub 1998) and regime survival (Wright 2008) for use as explanatory variables. Compared to regression models, Random Forest models are more predictive and more flexible. Random Forest models do not impose functional forms on the predictors, allowing for larger and more complex sets of patterns than a researcher could identify. Although the inferential value of machine learning models like Random Forest is a developing topic, machine learning models dominate regression models for pure prediction (Athey and Imbens 2019; Grimmer, Roberts, and Stewart 2021).

The data are split into two samples. The training sample consists of observations used in the Random Forest model. The training sample includes all country-year observations from 1963 to 2006 that have available data for predictors in the Random Forest model but without data on succession rules, excluding all sub-Saharan African autocracies. The training sample compromises 3,578 observations across 122 countries. The empirical sample consists of observations used in the regression models. All African autocracies with data available for the Random Forest predictors are included in the empirical sample, covering 1,269 observations across 39 countries. The Random Forest model based on the training sample is used to produce predicted probabilities of a successful coup in the empirical sample. To be included in the Random Forest model, an observation cannot have missing data any of the predictors. Based on data availability, the Random Forest model covers 39 countries across the period 1966 to 2005. Table B1 lists the countries and years with sufficient data to be included in the empirical sample. The regression models are limited to the same sample.

The Random Forest model includes 28 variables as predictors, summarized in table 1. The choice of variables is based on existing forecasting models for coups and related forms of political instability (e.g., Belkin and Schofer 2003; Gassebner, Gutmann, and Voigt 2016; Gates et al. 2006; Goldstone et al. 2010; Londregan and Poole 1990; Miller, Joseph, and Ohl 2018;

Variable	Source	Description/Notes
Assassinations	Banks and Wilson (2021)	Number of politically motivated murders or attempted murders of government officials and politics.
Cabinet Parties	Nyrup and Bramwell (2020)	Number of parties represented in the cabinet.
Civil Conflict Deaths	Lacina and Gleditsch (2005)*	Total deaths from civil conflict including all parties.
Coal	Haber and Menaldo (2011)	Per capita income from coal.
Democracy	Combined*	1 if all three sources code a democracy.
Demonstrations	Banks and Wilson (2021)	Number of peaceful demonstrations with at least 100 people displaying opposition to government policies.
Eth. Frac.	Fearon and Laitin (2003)	Ethnic fractionalization. Time invariant.
Gas	Haber and Menaldo (2011)	Per capita income from natural gas.
GDP	PWT	Real gross domestic product in millons.
GDP Growth	PWT*	Annual percentage change in GDP.
Int. Conflict Deaths	Lacina and Gleditsch (2005)*	Total deaths from interstate conflict including all parties.
Leader Age	Archigos*	Age in years of chief executive. Averaged if multiple leaders.
Leader Tenure	Archigos*	Years since leader turnover.
Leg. Frac.	Banks and Wilson (2021)	Party fractionalization in the legislature using Rae's (1968) index.
Metals	Haber and Menaldo (2011)	Per capita income from precious and industrial metals.
Mil. Exp.	NMC	Military expenditure as state's total military budget.
Mil. Per.	NMC	Number of military personnel.
Mtn. Ter.	Fearon and Laitin (2003)	Percentage of terrain that is mountainous. Time invariant.
Oil	Haber and Menaldo (2011)	Per capita income from oil.
Population	PWT	Total population.
Pop. Growth	PWT*	Annual percentage change in population.
Purges	Banks and Wilson (2021)	Number of systematic eliminations by jailing or executing political opposition.
Regime Age	Combined*	Number of consecutive years as a democracy or autocracy.
Rel. Frac.	Fearon and Laitin (2003)	Religious fractionalization. Time invariant.
Riots	Banks and Wilson (2021)	Number of riots, or violent demonstrations of more than 100 citizens.
Strikes	Banks and Wilson (2021)	Number of strikes with 1,000 or more workers aimed at national government policies.
Terror	Banks and Wilson (2021)	Number of acts of terrorism or guerrilla warfare.
Total Coups	Powell and Thyne (2011)*	Total number of previous coups.
Years since Coup	Powell and Thyne (2011)*	Number of years since a successful coup occurred (or since 1946 if no coups have occurred).

Notes: * Author's calculations. Archigos version 4.1 (Goemans, Gleditsch, and Chiozza 2009); NMC refers to National Material Capabilities version 6 (Singer 1988; Singer, Bremer, and Stuckey 1972); Powell and Thyne (2011) data updated through 2020; PWT refers to Penn World Tables version 10.01 (Feenstra, Inklaar, and Timmer 2015). The three datasets for democracy are Boix, Miller, and Rosato (2012), Cheibub, Gandhi, and Vreeland (2010), and Geddes, Wright, and Frantz (2014).

Table 1. Variables in the Random Forest model for predicting successful coups

Ward and Beger 2017). The variables were selected to balance predictive accuracy with minimizing the exclusion of cases due to missing data. The variables primarily focus on domestic political instability, economic conditions, political institutions,[3] previous coups and regime changes, and resource wealth. The model consists of 10,000 decision trees, 10 times larger than the standard of 1,000 trees.[4]

Variables in Random Forest models lack direct interpretations. A single variable can be associated with both an increase and a decrease in the probability of a coup, depending on where the variable is split and the outcomes of earlier splits in the tree. Variables can be ranked by their importance according to Gini impurity. Variables with a greater reduction in Gini

3. Rather than dummies for cabinets and legislatures, I use measurements for the number of parties in each. This has practical and theoretical benefits. Practically, dummy variables can bias Random Forest estimates. Theoretically, cabinets and legislatures prevent coups by increasing cooperation and distributing resources (Arriola 2009; Gandhi and Przeworski 2007). If more parties have positions in the cabinet and legislature, the regime is potentially co-opting more members of the opposition.

4. The other two hyperparameters—the number of candidate variables randomly sampled at each node and the minimum number of observations in terminal nodes—are determined using a sequential model-based optimization with 30 random points for evaluation and then 70 iterations for optimization. The optimized hyperparameters are determined by averaging the hyperparameters of the top 5% performing models in the iterated models based on the Brier score for out-of-bag predictions. The optimized hyperparameters are nine variables per node and a minimum of four observations. Ultimately, hyperparameters have a minimal effect on performance for Random Forest models and cause only minor shifts in performance (Probst, Boulesteix, and Bischl 2019).

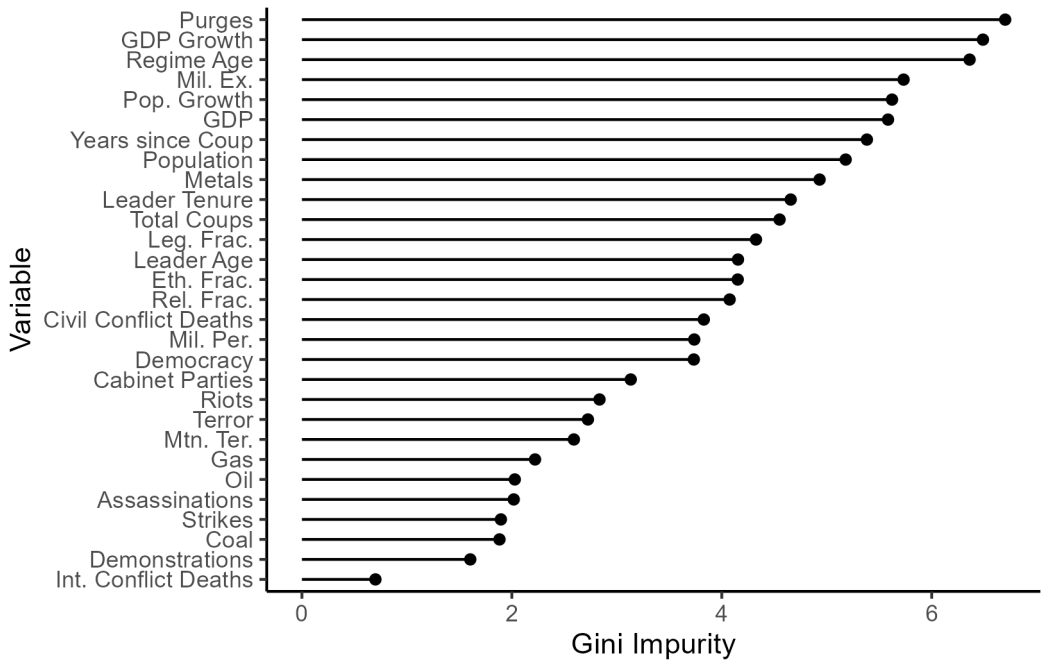

Figure 2. Importance of variables in the Random Forest model for predicting successful coups. Variables are ranked according Gini impurity. Variables with a higher reduction in Gini impurity are more important to the Random Forest model because they are used to split nodes more frequently.

impurity are more important because they are used more often to split nodes. Figure 2 displays the ranked importance of every predictor. GDP growth, purges, and the age of the regime stand out as the three most important predictors. International conflict deaths are the least important predictor. Interestingly, democracy, although frequently cited as a key determinant of coups, is in the bottom half of predictors. Democracy, however, could have further indirect effects through variables like institutions and the economy.

Figure 3 evaluates the performance of the model using a precision-recall curve. The figure compares the precision and recall for cases predicted to have a coup based on different thresholds. Precision is the number of true positives—cases correctly predicted to experience a coup—divided by the sum of true positives and false positives—cases incorrectly predicted to experience coups. Recall is the number of true positives divided by the sum of true positives and false negatives—cases incorrectly predicted to *not* experience a coup. The precision-recall curve is a more appropriate diagnostic than the more common receiver operating characteristic (ROC) curve because coups are uncommon. With imbalanced data, ROC curves exaggerate performance because predicting that no coup occurs is relatively easy. The precision-recall

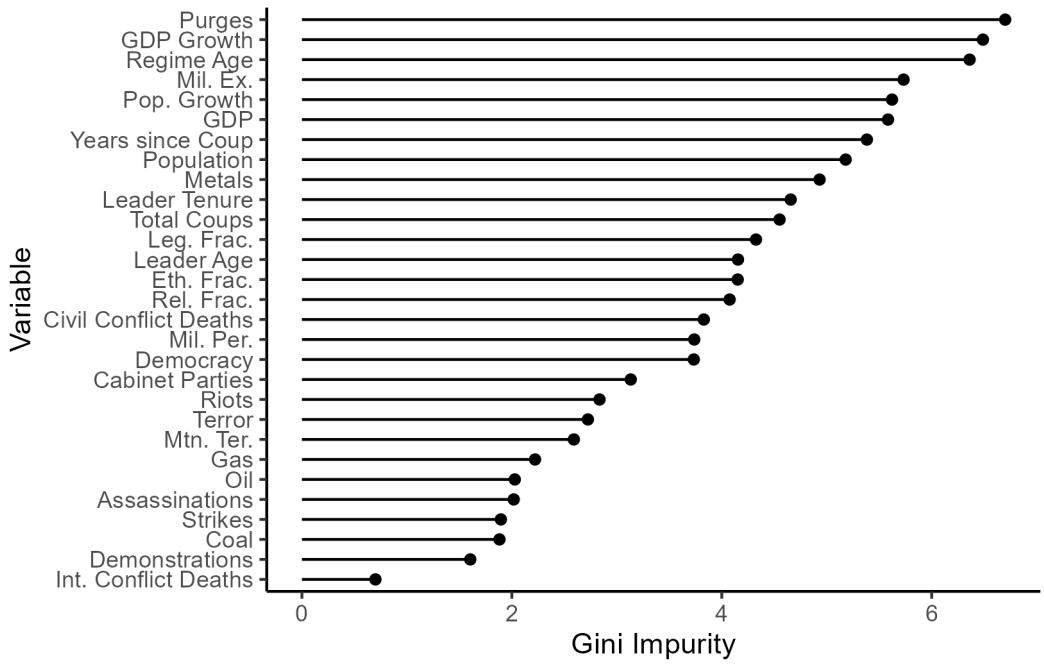

Figure 3. Precision recall curve for the Random Forest model for predicting successful coups. Precision $= \frac{\text{True Positives}}{\text{True Positives+False Positives}}$. Recall $= \frac{\text{True Positives}}{\text{True Positives+False Negatives}}$. The AUC for the training sample used to estimate the model is 0.24, about 14 times higher than the baseline. The AUC in the empirical sample is 0.15, over four times better than the baseline.

curve focuses on predicting coups, which is the more difficult outcome to predict.

The standard summary measure for model performance is the area under the curve (AUC). The baseline performance of a random classifier is simply the proportion of cases that experience coups (Saito and Rehmsmeier 2015). The AUC for the training sample used to estimate the model is 0.24, about 14 times higher than the baseline. The performance drops in the empirical sample due to both a lower AUC and a higher incidence of coups, yet the model's performance remains well above the baseline. The AUC in the empirical sample is 0.15, over four times better than the baseline. The Random Forest model generates accurate predictions for the probability of a coup that can be used to test the argument.

Analysis

Figure 4 presents a preliminary analysis of the relationship between coup probability and the presence of succession rules. The figure compares the distribution of coup probability based on whether succession rules are present. Coup probabilities are generally low, which is

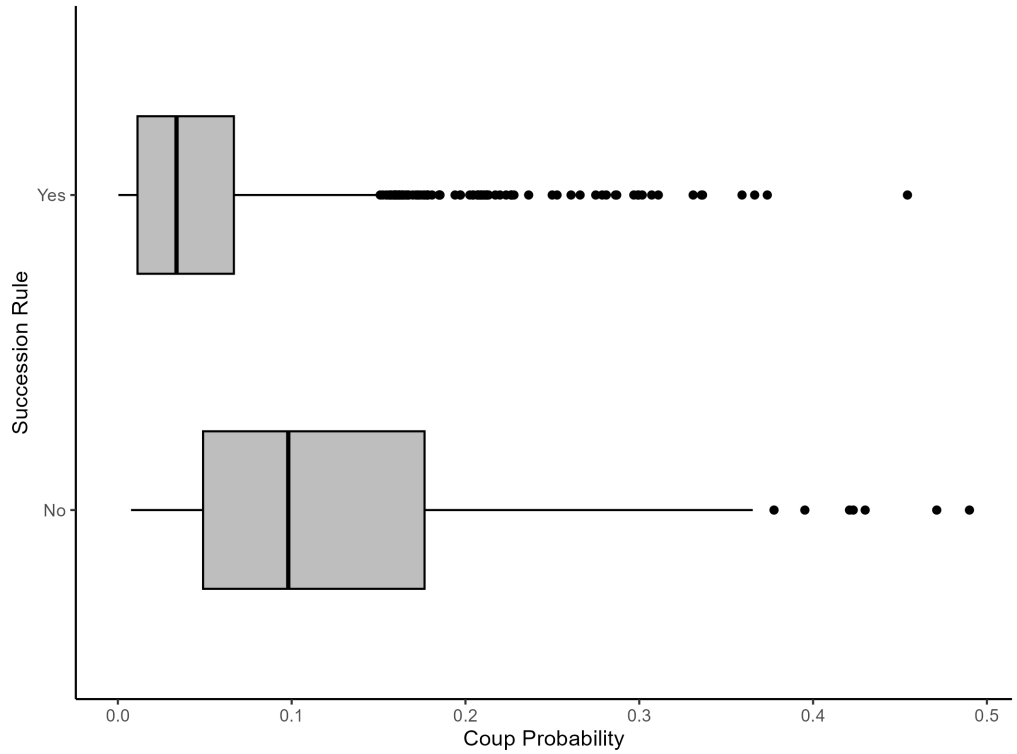

Figure 4. Distribution of coup probability based on having succession rules in sub-Saharan African autocracies. This figure displays the distribution of the predicted probability of a coup based on whether the autocracy has succession rules. Autocracies without succession rules have a higher mean, median, first quartile, and third quartile than autocracies with succession rules. The difference in means is significant at the 99% confidence level ($t = 11.23$).

unsurprising given the rarity of coups. Only 3.62% of observations (46 of 1,269) experience successful coups. Observations without succession rules have significantly higher probabilities of coups. The median probability is 12.83% without succession rules and 4.43% with succession rules. Among observations without succession rules, even the 1st quartile, 7.5%, is higher than the median with succession rules, and the 3rd quartile reaches 20.84%. The difference in means is greater than the difference in medians. The mean coup probability is 12.4% without succession rules and 5.3% with succession rules. Based on a two-sample t-test, the difference is statistically significant at a 99% confidence level ($t = 11.23$). A simple comparison of coup probability between the two groups provides initial evidence that autocracies are more likely to have succession rules when the probability of a coup is low.

I model the relationship between coup probability and having succession rules using dynamic probit models. The dynamic probit model includes a lag of the dependent variable, and it interacts the lag with each independent variable. Interacting each variable with the lag allows

for estimating separate effects of having succession rules based on whether succession rules already exist. The dynamic probit models have three additions. First, I include random effects for autocratic spells—consecutive years that the country is autocratic—to account for unobserved heterogeneity. Second, I add correlated random effects using within-spell means of the independent variables. Using correlated random effects relaxes the usual assumption in random effects models that the independent variables and unobserved heterogeneity are uncorrelated.[5] Third, I include the first observed values of the independent and dependent variables for the autocratic spell.[6] Including the initial values addresses the initial conditions problem without introducing new biases (Rabe-Hesketh and Skrondal 2013; Wooldridge 2005).

The full dynamic probit model takes the form

$$\Pr(\text{Rule}_{it} = 1) = \Phi(\beta\widehat{\text{Coup}}_{it} + \alpha\text{Rule}_{it-1} + \tau_1'\text{Z}_{it} + \tau_2'\text{X}_{it}\text{Rule}_{it-1} + \tau_3'\bar{\text{X}}_i + \tau_4'\text{X}_{i0} + \delta_i). \quad (1)$$

i indexes autocratic spells, and t indexes years. Rule_{it} is a dummy variable indicating the presence of succession rules. $\widehat{\text{Coup}}_{it}$ is the estimated probability of a coup based on the Random Forest model. Z_{it} is a vector of control variables, and X_{it} is a vector that includes control variables and the estimated coup probability. $\bar{\text{X}}_i$ is the vector of within-spell means of X_{it}. X_{i0} is the vector of initial values for all variables, including the dependent variable. δ_i is the autocratic spell random effect.

The models control for the predictors used in the Random Forest model. If any of the predictors for coups also affect having succession rules, coup probability and succession rules could have a spurious correlation. Since the Random Forest model has 24 predictors that could be included in the regressions, the predictors are organized into eight models of one to five related controls.[7] Model (1) only includes the coup probability variable. Model (2) controls for the age of the regime, the cumulative number of coups, and the years since a successful

5. Correlated random effects models are also among the best-performing estimators for binary outcomes when one outcome is rare (Crisman-Cox 2021). Given that over 79% of observations have the succession rules, not having succession rules qualifies as a rare outcome.

6. Autocratic succession rules are coded for every observation, so the first observed value is always the true initial value. Because the independent variables have missing data, the first observed value is not necessarily the true initial value.

7. Democracy is the only predictor excluded from the regression models. The training sample includes a mixture of democracies and autocracies, but the empirical sample is exclusively autocratic. Democracy is constant at 0 for every observation in the regressions.

coup. Model (3) controls for the leader's age, the number of parties in the cabinet, and party fractionalization in the legislature. Model (4) controls for GDP, GDP growth, population, and population growth. Model (5) controls for natural resource wealth from coal, gas, metals, and oil. Model (6) controls for sources of political instability: demonstrations, purges, riots, strikes, and terrorism. Model (7) controls for military personnel and expenditure. Model (8) controls for ethnic and religious fractionalization and mountainous terrain.[8] Table B2 shows summary statistics for all variables in the regression models.

Table 2 presents the coefficient estimates for dynamic probit models. The coefficients are separated based on whether the lagged succession rule equals 0 or 1, separating the coefficients into their relationship with introducing succession rules and retaining succession rules, respectively. Across every model and status of lagged succession rules, the coefficient for coup probability is significant at a 95% confidence level. Most are significant at 99%. Maintaining succession rules has stronger coefficients. The coefficients for introducing succession rules, however, are estimated with less precision and have a larger range of plausible estimates. The results in table 2 support the argument that when coups are more likely, dictators are less likely to have succession rules. This finding holds regardless of whether succession rules existed in the previous year.

The coefficients provide limited information regarding the relationship between coup probability and succession rules. Every variable's effect is conditional on the lagged dependent variable, and each time-varying variable enters the models multiple times through the first-observed values and within-unit means. More fundamentally, in non-linear models, the effect of coup probabilities depends on the values of all other inputs, even without explicit interaction terms. To provide a substantive interpretation, I calculate the average marginal effect (AME) of coup probability in each model conditional on the value of the lagged dependent variable. Confidence intervals are calculated using 1,000 simulations (King, Tomz, and Wittenberg 2000).[9]

Figure 5 shows the full simulated distributions for the AME on introducing succession

8. Due to the large number of controls and additional parameters introduced by each variable, I exclude a model with every predictor included. In a fully specified model, coup probability has a negative and significant coefficient at 95% for introducing and retaining succession rules. The full model, however, is singular, resulting in unreliable standard errors.

9. The simulations were performed using the `marginaleffects` package in `R` (Arel-Bundock, Greifer, and Heiss 2024).

Table 2. Dynamic probit models of autocratic succession rules in sub-Saharan Africa, 1960–2006

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
Lagged Succession Rule	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Coup Probability	-3.54**	-4.69***	-3.33**	-5.41***	-3.36**	-4.69***	-5.51***	-4.76***	-4.17***	-4.34***	-4.44***	-6.102***	-3.59**	-4.97***	-3.13**	-5.26***
	(1.43)	(1.33)	(1.54)	(1.45)	(1.55)	(1.5)	(1.73)	(1.47)	(1.52)	(1.39)	(1.62)	(1.58)	(1.59)	(1.5)	(1.44)	(1.33)
Leader Tenure			0.063*	0.035**												
			(0.034)	(0.017)												
Regime Age			-0.014	-0.018												
			(0.23)	(0.012)												
Total Coups			0.45**	0.36**												
			(0.18)	(0.17)												
Years since Coup			0.003	-0.002												
			(0.011)	(0.007)												
Cabinet Parties					0.15**	-0.035										
					(0.07)	(0.076)										
Leader Age					-0.001	0.028**										
					(0.013)	(0.012)										
Legislative Fractionalization					-0.404	0.51										
					(0.6)	(0.802)										
Logged GDP							-0.61	-0.28								
							(0.42)	(0.41)								
GDP Growth							-3.83**	0.92								
							(1.91)	(1.57)								
Logged Population							0.61	0.48								
							(0.53)	(0.54)								
Population Growth							-11.89	-3.31								
							(11.72)	(12.24)								
Logged Coal									-0.79	0.16						
									(0.83)	(0.57)						
Logged Gas									0.23	-0.11						
									(0.42)	(0.29)						
Logged Metals									-0.06	-0.018						
									(0.14)	(0.12)						
Logged Oil									-0.016	0.02						
									(0.13)	(0.11)						
Assassinations											0.14	-0.69**				
											(0.43)	(0.3)				

Demonstrations					0.34	-0.16		
					(0.38)	(0.18)		
Purges					$-\infty^{\dagger}$	-0.39		
					(—)	(0.45)		
Riots					-0.35	-0.052		
					(0.36)	(0.19)		
Strikes					2.33^{***}	-0.034		
					(0.82)	(0.32)		
Terror					0.086	0.82^{*}		
					(0.104)	(0.49)		
Logged Civil Conflict Deaths							0.12^{**}	-0.062
							(0.062)	(0.049)
Logged Interstate Conflict Deaths							$-0.79^{\dagger}$	$0.73^{\dagger}$
							(111.9)	(211)
Logged Mil. Ex.							0.017	-0.19^{**}
							(0.07)	(0.09)
Logged Mil. Per.							0.049	0.64^{**}
							(0.23)	(0.27)
Ethnic Fractionalization								
Religious Fractionalization								
Mountainous Terrain								
N	1,151	1,151	1,151	1,151	1,151	1,151	1,151	1,151
Autocratic Spells	47	47	47	47	47	47	47	47
Random Intercept Variance	0.22	0.087	0.102	0.13	0.18	0.034	0.14	0.14
Log-Likelihood	-182.08	-167.69	-168.32	-172.42	-176.71	-155	-169.93	-177.12
AIC	380.16	381.38	376.63	392.84	401.41	373.99	387.86	382.25
BIC	420.54	497.5	477.6	514.01	522.57	535.54	509.02	452.92

							-1.51	0.92
							(1.042)	(0.88)
							-0.12	-1.81^{*}
							(0.8)	(0.97)
							-0.015^{*}	0.002
							(0.01)	(0.1)

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors in parentheses. All models include autocratic-spell random effects, within-unit means, and the first observed value of the dependent and all independent variables. Columns labeled 0 display coefficients for introducing succession rules, or when the value of the lagged succession rule is 0. Columns labeled 1 display coefficients for maintaining succession rules, or when the value of the lagged succession rule is 1.

† The coefficient for purges creates separation, rendering the standard p-value unreliable. A likelihood ratio test can produce a more reasonable p-value (see Rainey 2024). The likelihood ratio test provides evidence that the purge coefficients, including the within-unit mean and first value, are jointly significant ($p < 0.05$). The coefficients for international conflict deaths also have extremely large standard errors; however, the likelihood ratio tests indicate that these coefficients are not statistically significant ($p = 0.7$).

rules, or when the lagged value of succession rules is 0, along with 90% and 95% confidence intervals. As expected, the AME of coup probability is negative, and every AME is statistically significant at the 95% level. The weakest AME is in model (2). In model (2), every percentage point increase in the probability of a coup is associated with decreasing the probability of introducing succession rules by 0.62 percentage points. The strongest AME is found in model (4), where each percentage point increase in coup probability corresponds to a 1.056 percentage point decrease in the probability of introducing succession rules.

As with the coefficients in table 2, the AME for introducing succession rules is less precisely estimated, likely due to the smaller number of cases without succession rules. In every model, the upper bound of the 95% confidence interval exceeds -1. The strongest effect is observed in model (4), where at the confidence interval's strongest magnitude, each percentage point increase in coup probability corresponds to a 1.71 percentage point decrease in the probability of introducing succession rules. The weakest point in any confidence interval is also found in model (4), where the lower bound is -0.047 percentage points. The AMEs for introducing succession rules are statistically significant with substantially strong point estimates, but a large range of effects is possible.

Figure 6 graphs the AMEs for retaining succession rules, or when the lagged succession rule is 1. Although the coefficients for retaining succession rules are larger than the coefficients for introducing them in table 2, the AMEs are weaker. The point estimates range from -0.23 percentage points in model (5) to -0.28 percentage points in model (8) for each one percentage point increase in coup probability. The AMEs are also more precisely estimated, as indicated by the narrower confidence intervals. Across all models, the weakest estimate within the confidence intervals is -0.103 percentage points in model (4). The strongest point in any confidence interval is -0.56 percentage points in model (5). Based on the point estimates, coup probability has a weaker effect on retaining succession rules than introducing them, but there is greater confidence regarding the range of effects.

To further contextualize the effects, figure 7 graphs the predicted probabilities of having succession rules based on coup probability and the lagged succession rule. The predictions are generated using model (1), which is the baseline model that excludes control variables.

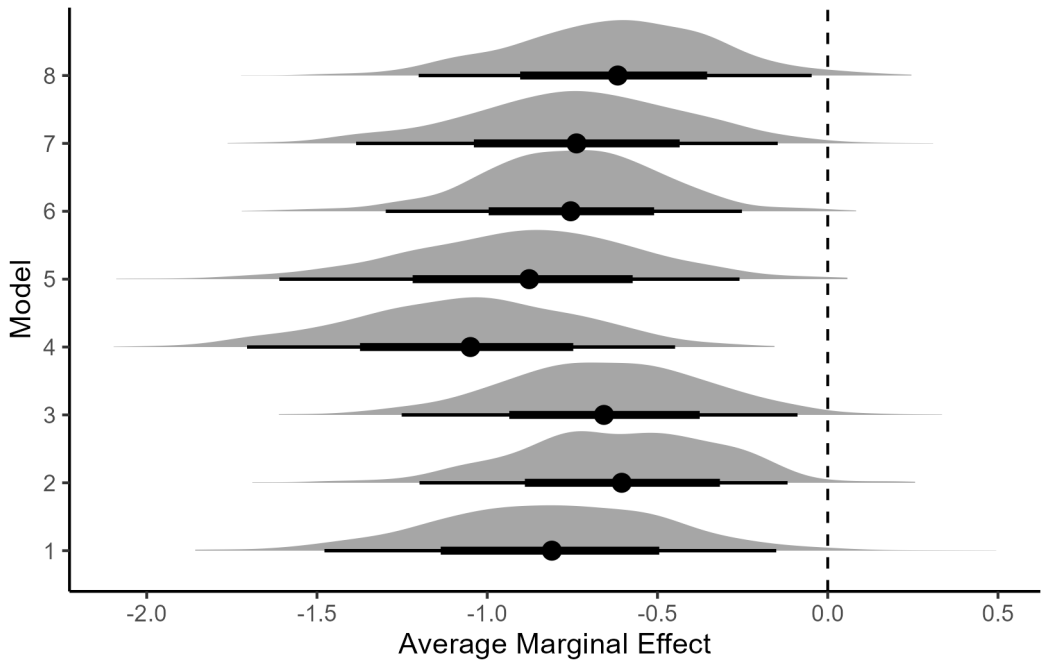

Figure 5. Average marginal effect of coup probability on introducing succession rules. Thin lines represent 95% confidence intervals based on 1,000 simulations. Thick lines represent 90% confidence intervals. Model numbers correspond to table 2. Across every model, higher coup probabilities are significantly associated with lower probabilities of introducing succession rules at a 95% confidence level.

Regardless of the lagged value, increasing coup probability reduces the probability of having succession rules. The lagged value, however, remains the dominant influence. A regime that had succession rules in the previous year is always more likely to have succession rules than a regime that lacked succession rules. Succession rules appear especially difficult to remove once established. The probability of retaining succession rules stays above 90% until coup probability exceeds 28%. Introducing succession rules is more sensitive to coup probability, yet regimes without succession rules remain unlikely to introduce them. For example, a regime with a 1% probability of experiencing a coup has a 43.1% probability of introducing succession rules. Even when coups are very unlikely, a regime without succession rules is more likely to remain without them. Coup probability shapes the decision to introduce and maintain succession rules, but succession rules are highly state dependent.

Appendix C presents results using an alternate coding of the succession rule variable. Although any succession rule can motivate coups against the dictator, a named successor is the biggest threat that succession rules create. Figures C1 and C2 show the AMEs of coup prob-

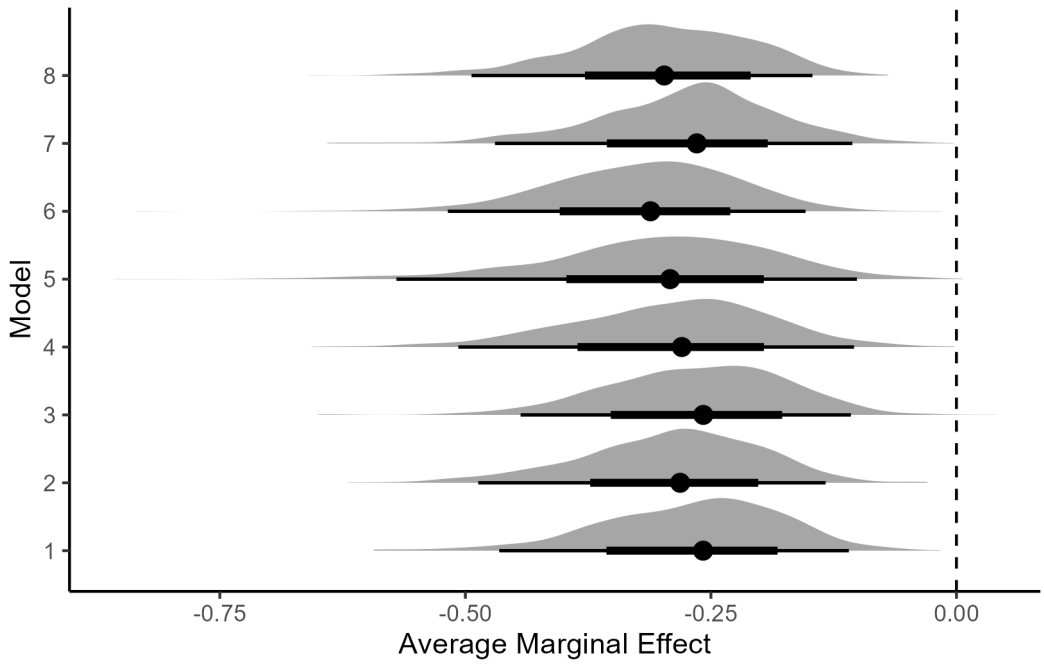

Figure 6. Average marginal effect of coup probability on retaining succession rules. Thin lines represent 95% confidence intervals based on 1,000 simulations. Thick lines represent 90% confidence intervals. Model numbers correspond to table 2. Across every model, higher coup probabilities are associated with lower probabilities of retaining succession rules at a 95% confidence level.

ability on rules that name the specific individual that assumes power after a vacancy. Across all models, higher coup probabilities reduce the probability of introducing and retaining named successor rules at a 95% confidence level.

Appendix D verifies the robustness of the results to different coup data sources. In the Random Forest model for coups, the data from Powell and Thyne (2011) is replaced with Version 1.1 of the Colpus dataset (Chin, Carter, and Wright 2021; Chin and Kirkpatrick 2023). The Random Forest model performs slightly worse with the Colpus data, but the argument is still supported. The AME for introducing succession rules is negative and significant at 90% in every model. Only two models, models (3) and (8), are not significant at 95%. For retaining succession rules, the AME is significant at 95% in every model. The results are slightly weaker using the Colpus data, but the models still support the argument.

Finally, Appendix E looks to account for reverse causality and the correlation with coups. These models, however, are limited because they group introducing and maintaining succession rules together and do not account for autocratic-spell-level unobserved heterogeneity. The

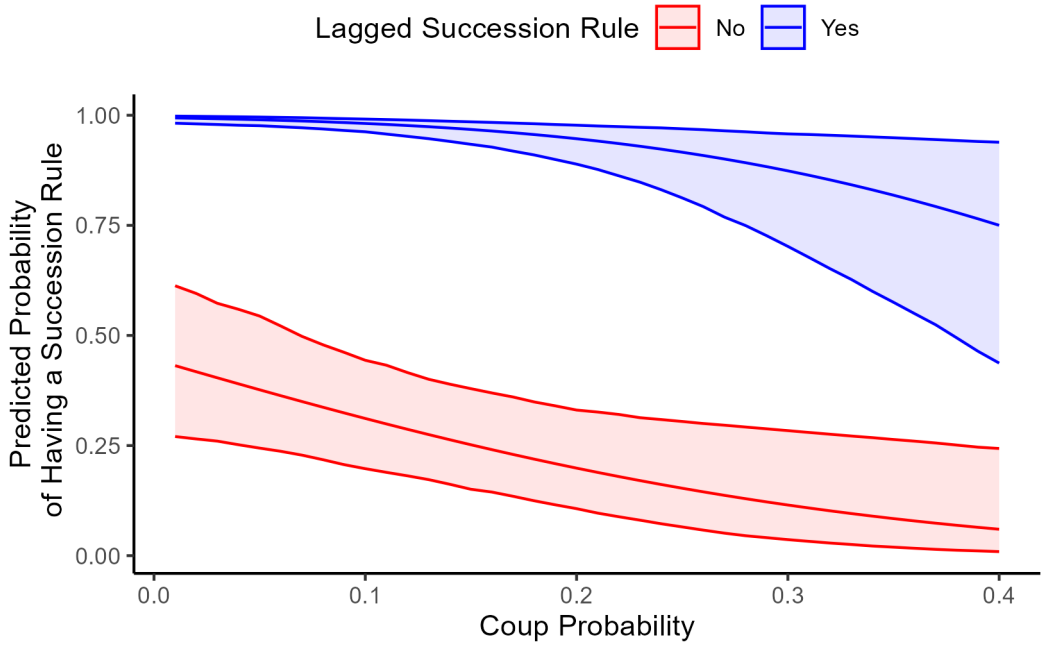

Figure 7. Predicted probability of having succession rules based on coup probability and lagged value of succession rules. Shaded areas represent 95% confidence intervals based on 1,000 simulations. Predictions are generated using model (1) in table 2, which is the baseline model without any control variables. Higher coup probability reduces the probability of having succession rules, but it is always more likely that the current status is maintained.

model in equation (1) cannot rule out whether succession rules affect the probability of experiencing coups and do not account for how the data-generating procedures for coups and succession rules are correlated. To address this, I estimate the bivariate probit model

$$
\begin{aligned}
&\text{Coup}^*_{it} = \alpha \text{Rule}_{it-1} + \gamma' Z_{it-2} + \varepsilon_1,\ \text{Coup}_{it} = \mathbb{1}[\text{Coup}^*_{it} > 0], \\
&\text{Rule}^*_{it-1} = \beta \widehat{\text{Coup}}_{it-2} + \tau' Z_{it-2} + \varepsilon_2,\ \text{Rule}_{it-1} = \mathbb{1}[\text{Rule}^*_{it-1} > 0], \\
&\begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \end{pmatrix} \sim \mathcal{N}\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix} \right].
\end{aligned} \tag{2}
$$

Equation (2) captures the correlation between coups and succession rules, and the lag structure distinguishes whether the probability of a coup influences the presence of succession rules and whether succession rules, in turn, affect the likelihood of a coup.

Table E1 presents the results from the bivariate probit models. As before, predicted coup probability has a negative and significant coefficient on having succession rules in every model. The ρ parameter is negative in most models, indicating that autocracies more likely to have suc-

cession rules in year $t-1$ are less likely to experience coups in year t. However, the coefficient for succession rules on experiencing coups is insignificant in every model. In most models, the coefficient is almost 0, and it is positive in half of them. The bivariate probit models provide evidence that coup probability affects having succession rules but *not* that succession rules affect experiencing a coup.

Conclusion

Autocracies vary in their willingness and ability to regulate political succession. A recent wave of research asks why some autocracies formalize succession in the constitution. According to this research, dictators use succession rules, particularly rules involving designated successors, to reduce the threat of being overthrown. In contrast, I argue that dictators have succession rules when the probability of a coup is already low. Succession rules address a fundamental task of governance by preparing the regime for a leader's demise. Succession rules, however, can also create threats to the dictator's rule by empowering a successor and angering groups of elites. Given the threats created by succession rules, dictators are most likely to have them when they are confident in their ability to suppress these threats.

I test this argument using original data on autocratic succession rules in sub-Saharan Africa from 1966 to 2005 and a new approach for measuring a dictator's security. I use Random Forest, a machine learning algorithm, to predict the probability that a successful coup occurs. Based on dynamic probit models, higher predicted probabilities of a coup are associated with higher probabilities of having succession rules. The association is significant for both introducing succession rules when none existed previously and for retaining rules that are already in place.

Future research should explore the dynamics of informal succession. Dictators can informally designate successors without formal succession rules, and informal succession plans can even supplant formal rules. In the case of Zimbabwe described in Appendix A, for instance, Robert Mugabe typically balanced a successor from the formal line of succession against a potential successor outside it—initially First Vice-President Joice Mujuru against Minister of Defence Emmerson Mnangagwa, then Mnangagwa as first vice-president against First Lady

Grace Mugabe. Identifying informal succession processes poses significant challenges. By definition, informal processes are not written down, and if the plan is never implemented, scholars may never know that it existed. Nonetheless, studying the informal dynamics of succession in autocracies is necessary for a complete understanding of autocratic succession.

Future research could also examine the role of succession outside domestic politics. Existing studies, including this one, primarily focus on the domestic politics of how succession rules emerge and their impact on political survival. Succession matters to anybody interested in a country given succession's role in influencing a regime's stability and policies. International actors are also likely to care about an autocracy's succession processes. Foreign investors and bondholders may be particularly attuned to succession, as it could both secure and endanger their investments.

Finally, the most direct implication of my findings is that, since they contradict the expectations of existing literature, the effects of succession rules on autocratic survival need revisiting. Existing research finds a positive relationship between succession rules and a dictator's political survival; however, these findings may be spurious if dictators have succession rules when they are already likely to survive. Regardless of whether the relationship persists, future research should consider additional motivations for having successors. The variation in how autocracies handle succession is vast. New theories and new data are needed to better explain variation in autocratic succession.

The conclusions of this paper ultimately speak to the fundamental challenge of studying institutions described in the Riker Objection. Institutions are not exogenous forces. Instead, they are political outcomes themselves, often shaped by the same forces that influence the outcomes they are meant to explain (Pepinsky 2014; Riker 1980; Shepsle 2006). The comparative literature on autocracy and institutions rarely studies institutions as outcomes. Scholars who account for potential endogeneity typically treat the causes institutions as either a statistical nuisance or a design problem. However, neither approach is sufficient to address endogeneity comprehensively. Institutions have complex causes that are difficult to address as objects of secondary interest, especially in a cross-national context. Rather than treating endogeneity as merely a problem, scholars should study institutions as outcomes in their own right and subse-

quently evaluate their effects. To understand the effects of institutions, we need to understand their causes.

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Supplementary Material

Coup Risk and Autocratic Succession Rules: Evidence from Sub-Saharan Africa

Contents

A Succession Rules in Zimbabwe

Directly observing the internal dynamics of autocratic succession is challenging. Autocracies are generally more secretive than their democratic counterparts, particularly in matters of high-level politics between the dictator and elites (Barros 2016). Succession is an especially sensitive issue, to the extent that dictators often obscure their succession plans even from elites. Although constitutions are public, the process for drafting them often is not. The evidentiary record on drafting constitutions is particularly lacking in sub-Saharan Africa, home to many of the modern world's autocratic states.

Zimbabwe is an example where changes in succession rules coincided with well-documented shifts in dictator Robert Mugabe's control over the regime. Zimbabwe's first succession rules reflected path dependence from British rule. When Zimbabwe changed its succession rule to reflect the underlying power dynamics, the dictator was at the peak of his power and the succession rule was formalized with a specific successor. The Zimbabwean case shows, consistent with my argument, that a more powerful dictator formalized succession rules whereas previous arguments anticipate that a strengthened dictator would lack the incentives to formalize such a rule.

Initially, Zimbabwe lacked a formal succession rule but introduced one later. Zimbabwe and its predecessor states, Rhodesia and Zimbabwe Rhodesia, had parliamentary systems with ceremonial presidents. In Rhodesia, the cabinet appointed the president, or the "Officer Administering the Government." The presidency was intended to be a temporary office until the United Kingdom recognized Rhodesia's independence and the queen's representative appointed a prime minister, a change that never occurred. Parliament elected the ceremonial president in the short-lived Zimbabwe Rhodesia. Neither Rhodesia nor Zimbabwe Rhodesia required formal succession systems for the prime minister as chief executive because the selection process could simply be repeated if a vacancy occurred.

After Zimbabwe gained independence, the country remained parliamentary. Robert Mugabe ruled as prime minister, and the legislature elected a ceremonial president. As before, prime ministerial vacancies were addressed by repeating the selection process. A constitutional amendment in 1987 restructured the government, centralizing power in the presidency and eliminating the position prime minister. Mugabe, who drove the reforms, assumed the presidency. Along with creating an executive presidency, the amendment introduced a vice-president, appointed and dismissible by the president. After a vacancy, the vice-president would become acting president until new elections were held within 90 days to formally begin a new term for the new president, presumably chosen informally by the ruling party. A 1990 constitutional amendment added a second vice-president, placed beneath the first vice-president in the line of succession.

Consistent with my argument, the constitutional reforms came at the height of Mugabe's power and safety, not at a moment of weakness as anticipated by previous work. In 1987, Mugabe successfully ended a campaign to violently suppress the opposition Zimbabwe African People's Union and merge its remaining members into the new ruling party, the Zimbabwe African National Union-Patriotic Front (ZANU-PF). These reforms further empowered Mugabe, granting him nearly all formal executive powers, including almost complete control of the cabinet (Compagnon 2011). Mugabe's creation of the vice-presidency coincided with the peak of his power, rather than a period of weakness. As one biographer describes Mugabe after the 1987 amendment, Mugabe's "control of appointments to all senior posts in the civil service, the defence forces, the police, and parastatal organisations gave him a virtual stranglehold on

government machinery and unlimited opportunities to exercise patronage"(Meredith 2002, 79).

Zimbabwe's introduction of a new constitution in 2013 also shows elite concerns over succession rules, particularly regarding their effects on a successor's power and likely succession outcomes. In 2008, Mugabe reached an agreement with the opposition Movement for Democratic Change – Tsvangirai, which had won a plurality in the lower house, to introduce a new constitution. Succession rules were a key issue within the ZANU-PF. Mugabe was nearly 90 with no plans to retire. Barring a forced removal, Zimbabwe's next president would likely emerge from Mugabe's increasingly imminent death. The first draft of the new constitution included revisions to the presidential succession system. Under the proposed draft, both vice-presidents would be elected alongside the president on a joint ticket. If a vacancy occurred, the highest-ranking vice-president would fully assume the presidency for the entire remaining term.

High-ranking members of the ZANU-PF rejected the draft partially due to the succession provision. One concern was that giving Mugabe the power to name his running mates would be equivalent to letting him designate his successor. Mugabe, for his part, also wished to avoid making a definitive statement on a possible successor, which the running mate provision might force him to do. Another concern was that the new provisions would too strongly solidify Joice Mujuru, the incumbent first vice-president, as the most likely successor. Mujuru was a hero of Zimbabwe's war for independence and kept a strong constituency through the ZANU-PF Women's League. Although she was weakened politically by her husband's death in a 2011 house fire, she remained likely to retain her position as vice-president. (Joice Mujuru's husband, Solomon, was also a revolutionary hero and one of Zimbabwe's top generals and richest men. Together, the Mujurus could form the most formidable challenges to Mugabe's rule. Regional media implicated Mugabe in the fire that killed Solomon, and the fire has been described as "mysterious" with a "very meticulous nature. . . [that] suggested a professional disposal after a professional assassination" [Chan 2019, 230–31].) High-ranking officials in the ZANU-PF who opposed Mujuru's succession feared that if she were named the running mate, she would be impossible to dislodge as the successor and might not wait for Mugabe's death to seize power (Matyszak 2016).

As a compromise, the new constitution, approved by referendum in 2013, delayed the new succession system's implementation for at least 10 years, almost certainly after Mugabe's death or retirement. Schedule Six of the constitution established an interim system in which the president retained the authority to appoint and freely remove the vice-presidents. Upon a vacancy, the first vice-president would become acting president. The ZANU-PF, as the previous president's party, would choose the next president. The interim succession system avoided giving any candidate a definitive advantage in succession. Instead, the party would negotiate the next leader only after Mugabe's death.

Ultimately, the succession issue prevented Mugabe from holding power until his death. In 2014, Mugabe accused Mujuru of plotting a coup and removed her as first vice-president. Mugabe replaced Mujuru with her main rival in succession, Emmerson Mnangagwa. Grace Mugabe, the first lady, emerged as a contender for succession shortly thereafter. In 2017, Mugabe dismissed Mnangagwa as first vice-president, effectively establishing Grace as Mugabe's hand-chosen successor. The military, however, favored Mnangagwa as the next president and forced Mugabe to resign two weeks later. The ZANU-PF invoked the Schedule Six succession rule and selected Mnangagwa as Mugabe's successor (Chan 2019; Nyarota 2018). Although Mugabe eventually lost control of succession, the development of Zimbabwe's succession rules illustrates key elements of my argument. Mugabe introduced a succession rule after he consolidated power, not when he needed to secure his rule. When Zimbabwe rewrote the constitution,

Mugabe and key officials in the ZANU-PF rejected the initial draft because it made the successor too strong and threatened Mugabe's hold on power.

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B Sample & Summary Statistics

Country	Years
Angola	1979–82, 1985–90, 1993–2005
Benin	1975–89
Botswana	1967–90, 1993–2005
Burkina Faso	1988–2005
Burundi	1967–90, 1996–2000
Cameroon	1966–2005
Central African Republic	1966–89, 1992, 2003–05
Chad	1966–80, 1989–2005
Côte d'Ivoire	1966–2005
Democratic Republic of the Congo	1966–90, 1993–2000, 2003–05
Djibouti	1979–2005
Eswatini	1971–90, 1993–98
Ethiopia	1966–2005
Gabon	1966–89, 1994–2005
The Gambia	1967–82, 1987–88, 1993–2005
Ghana	1966–68, 1972–78, 1981–2000
Guinea	1981–83, 1988–90, 1993–2005
Guinea-Bissau	1976–86, 1989, 1994–2005
Kenya	1967–2001
Lesotho	1967–2005
Liberia	1966–90, 1999–2002
Madagascar	1975–92
Malawi	1967–93
Mali	1968–91
Mozambique	1975–2005
Namibia	1990–2005
Niger	1966–92, 1996–98
Nigeria	1968–78, 1983–97, 2000–05
Republic of the Congo	1966-89, 1994–2000, 2003–2005
Rwanda	1967–71, 1974–2005
Senegal	1966–99
Sierra Leone	1967–90, 1993–2001
South Africa	1966–2005
Sudan	1972–85, 1989–2004
Tanzania	1967–2005
Togo	1966–90, 1993–2005
Uganda	1967–79, 1986–2004
Zambia	1967–90, 1993–2005
Zimbabwe	1981–2005

Table B1. Countries and time periods in the empirical sample

Variable	N	Mean	SD	Min	Q1	Median	Q3	Max
Succession Rule	1151	0.77	0.42	0	1	1	1	1
Coup Probability	1151	0.085	0.081	0.0001	0.021	0.061	0.12	0.47
Leader Tenure	1151	9.3	7.7	0	3	8	14	37
Regime Age	1,151	29	30	0	12	21	33	155
Total Coups	1,151	1.2	1.6	0	0	0	2	6
Years since Coup	1,151	19	21	0	6	13	24	133
Cabinet Parties	1,151	1.5	1.6	0	1	1	1	11
Leader Age	1,151	55	12	19	47	54	63	87
Legislative Fractionalization	1,151	0.16	0.24	0	0	0	0.32	0.97
Logged GDP	1,151	9.4	1.4	6.6	8.4	9.4	10	13
GDP Growth	1,151	0.035	0.067	-0.51	0.0036	0.035	0.063	0.39
Logged Population	1,151	2.1	1	0.31	1.1	2.1	2.8	4.9
Population Growth	1,151	0.027	0.01	-0.07	0.023	0.027	0.031	0.078
Logged Coal	1,151	0.45	1.2	0	0	0	0.0037	5.9
Logged Gas	1,151	0.21	0.66	0	0	0	0	3.9
Logged Metals	1,151	1.6	2.1	0	0	0.32	2.8	7.3
Logged Oil	1,151	0.98	2.1	0	0	0	0	9.3
Assassinations	1,151	0.075	0.37	0	0	0	0	7
Demonstrations	1,151	0.25	1.2	0	0	0	0	26
Purges	1,151	0.061	0.36	0	0	0	0	5
Riots	1,151	0.28	1.3	0	0	0	0	23
Strikes	1,151	0.053	0.32	0	0	0	0	4
Terror	1,151	0.14	0.43	0	0	0	0	5
Logged Civil Conflict Deaths	1,151	1.1	2.6	0	0	0	0	10
Logged Interstate Conflict Deaths	1,151	0.061	0.62	0	0	0	0	8.9
Logged Mil. Ex.	1,151	11	2.4	0	9.8	11	12	15
Logged Mil. Per.	1,151	2.6	1.2	0	1.8	2.4	3.6	5.9
Ethnic Fractionalization	1,151	0.68	0.22	0.036	0.66	0.73	0.83	0.93
Mountainous Terrain	1,151	14	24	0	0.2	3.2	15	82
Religious Fractionalization.	1,151	0.51	0.16	0.11	0.45	0.54	0.62	0.78

Table B2. Summary statistics for the empirical sample

C Succession Rules with Named Successors

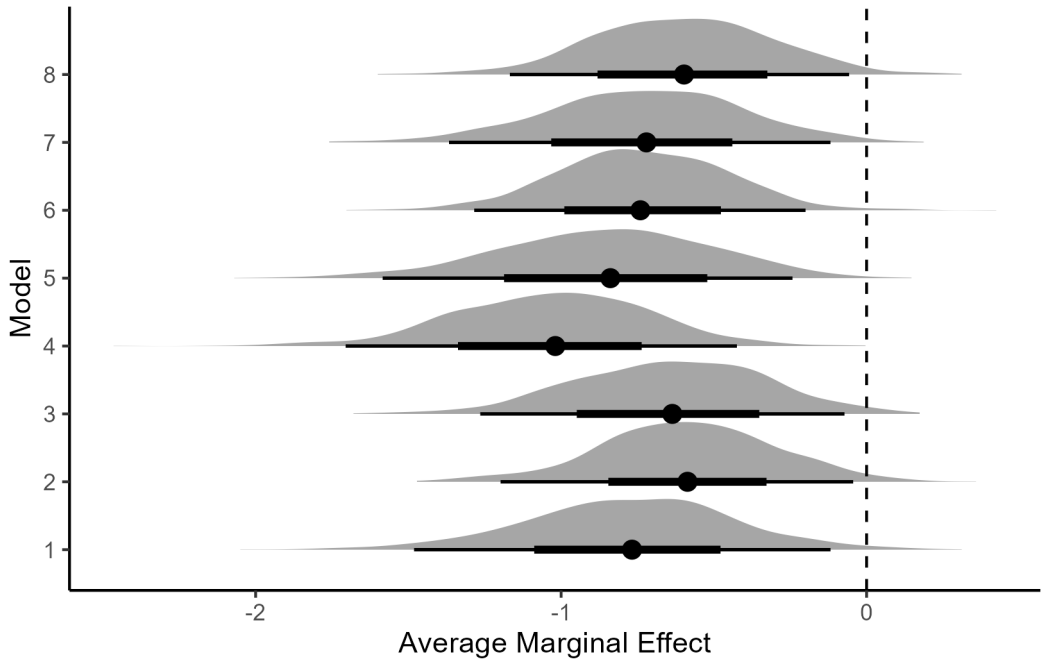

Figure C1. Average marginal effect of coup probability on introducing succession rules with a named successor. Thin lines represent 95% confidence intervals based on 1,000 simulations. Thick lines represent 90% confidence intervals. Across every model, higher coup probabilities are associated with lower probabilities of introducing succession rules with a named successor at a 95% confidence level.

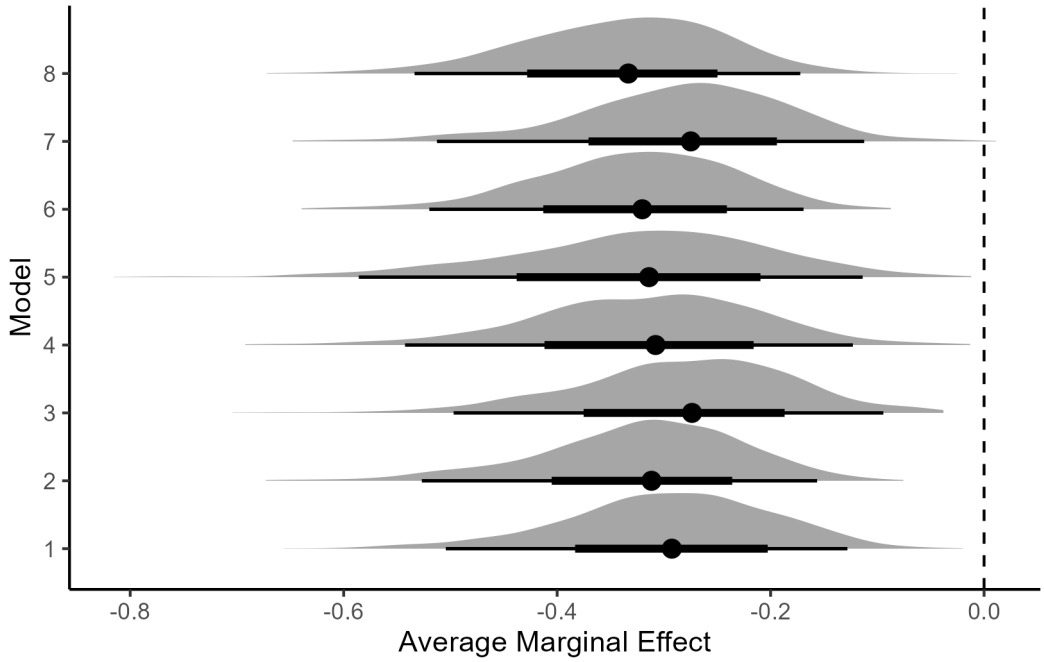

Figure C2. Average marginal effect of coup probability on retaining succession rules with a named successor. Thin lines represent 95% confidence intervals based on 1,000 simulations. Thick lines represent 90% confidence intervals. Across every model, higher coup probabilities are associated with lower probabilities of retaining succession rules with a named successor at a 95% confidence level.

D Colpus Data

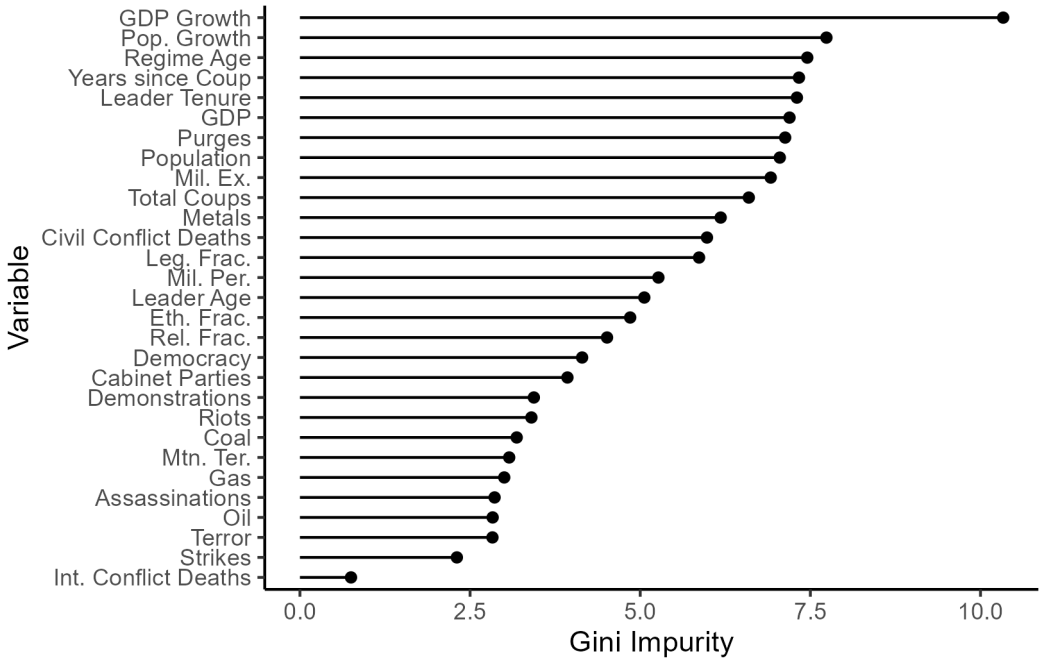

Figure D1. Importance of variables in the random forest model for predicting successful coups using Colpus data. Variables are ranked by Gini impurity. Variables with a higher Gini impurity are more important to the Random Forest model because they are used to split nodes more frequently.

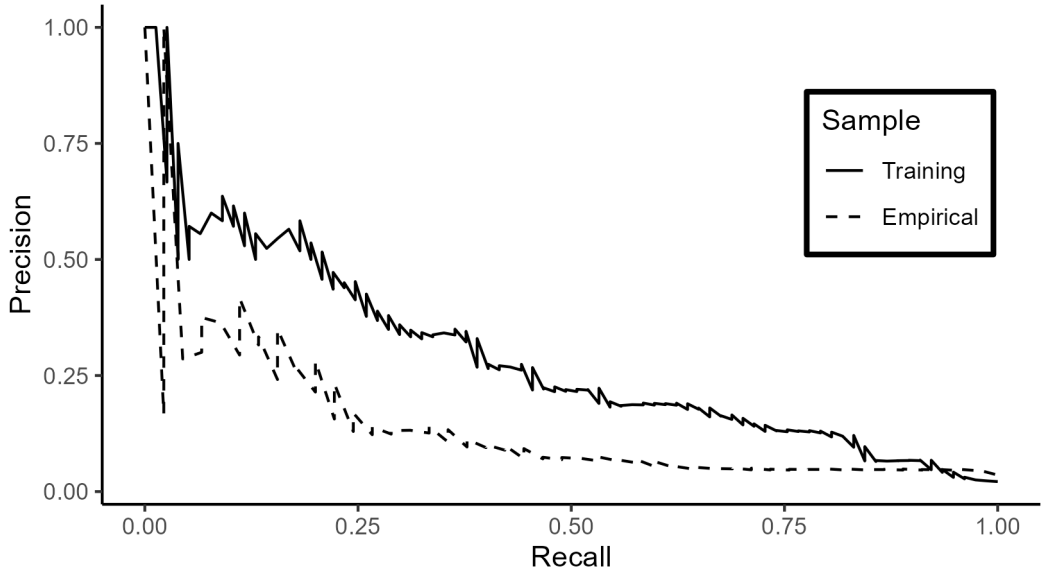

Figure D2. Precision recall curve for the random forest model for predicting successful coups using Colpus data. Precision $= \frac{\text{True Positives}}{\text{True Positives+False Positives}}$. Recall $= \frac{\text{True Positives}}{\text{True Positives+False Negatives}}$. The AUC for the training sample used to estimate the Random Forest model is 0.29, over 13 times higher than the baseline. The AUC in the empirical sample used in the regression models is 0.14, just under four times better than the baseline.

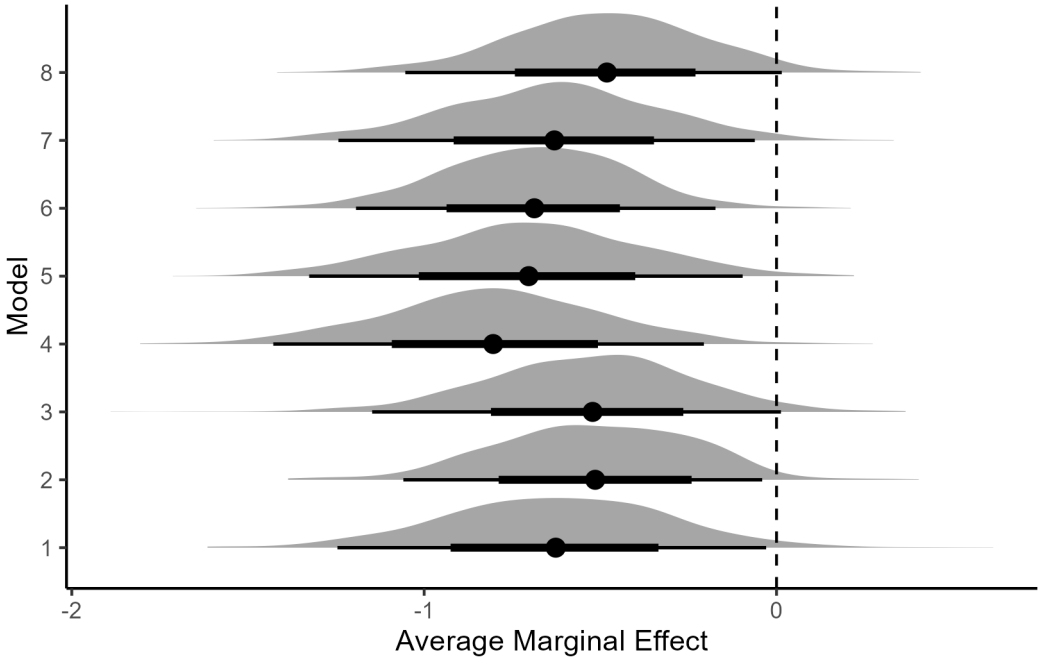

Figure D3. Average marginal effect of coup probability on introducing succession rules using Colpus data. Thin lines represent 95% confidence intervals based on 1,000 simulations. Thick lines represent 90% confidence intervals. Controls in each model correspond to the model numbers in table 2. Across every model except models (3) and (8), higher coup probabilities are associated with lower probabilities of introducing succession rules at a 95% confidence level. Models (3) and (8) are still significant at a 90% confidence level.

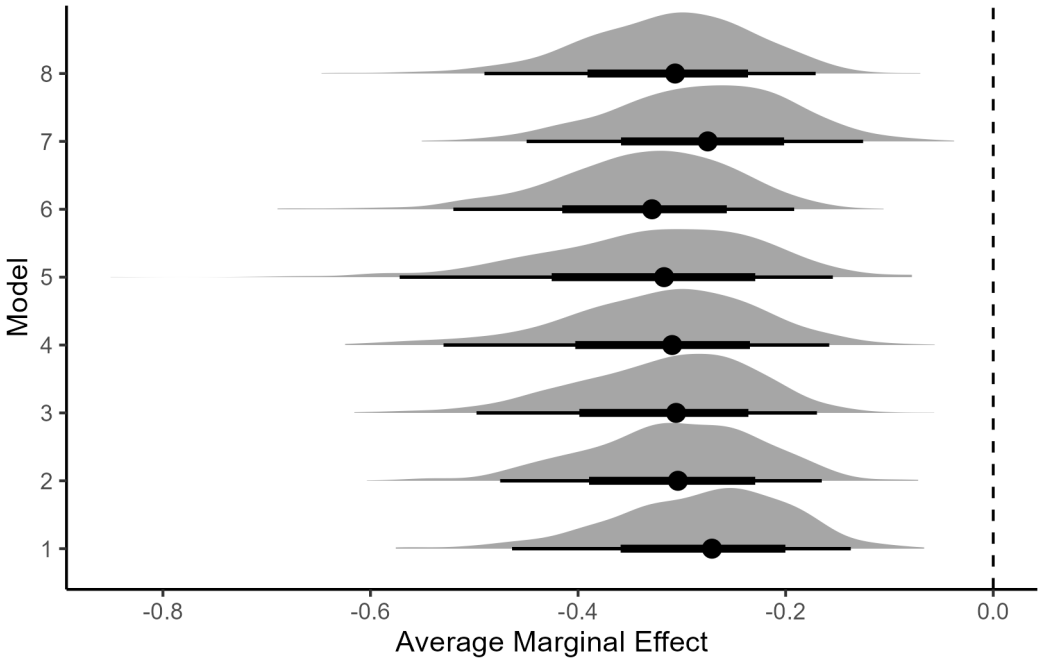

Figure D4. Average marginal effect of coup probability on retaining succession rules using Colpus data. Thin lines represent 95% confidence intervals based on 1,000 simulations. Thick lines represent 90% confidence intervals. Controls in each model correspond to the model numbers in table 2. Across every model, higher coup probabilities are associated with lower probabilities of retaining succession rules at a 95% confidence level.

E Bivariate Probit Models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Coefficient for Rule_{t-1} on Coup_t	-0.82	-0.86	0.0502	0.092	0.027	-0.031	0.018	-0.031
	(0.51)	(0.71)	(0.41)	(0.41)	(0.41)	(0.41)	(0.41)	(0.43)
Coefficient for $\widehat{\text{Coup}}_{t-2}$ on Rule_{t-1}	-6.94***	-6.68***	-5.7***	-5.14***	-5.58***	-6.0074***	-5.62***	-6.0403***
	(1.22)	(1.29)	(1.062)	(1.26)	(1.044)	(1.23)	(1.13)	(1.102)
ρ	0.29	0.29	-0.32	-0.39	-0.33	-0.32	-0.33	-0.29
N	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050
Autocratic Spells	47	47	47	47	47	47	47	47
Log-Likelihood	-609.017	-560.75	-582.8	-587.91	-592.304	-604.2	-602.39	-561.88

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Robust standard errors clustered by autocratic spell in parentheses. Control variables correspond to table 2. All control variables are lagged by two years.

Table E1. Bivariate probit models