

**Making it Personal:  
Regime Type and Nuclear Proliferation**

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**Abstract**

Research on nuclear proliferation has identified numerous factors associated with states' decisions to pursue nuclear weapons, including the nature of the security environment, alliances with great powers, technological resources, and regional status aspirations. Yet study after study has found that regime type has little or no effect on the decision to pursue nuclear weapons. Indeed, in a literature that features little consensus, one point of "specific agreement" is that "regime type has only a minimal effect on proliferation" (Sagan 2011, 236). We argue, however, that conventional approaches comparing the behavior of democracies to that of non-democracies have resulted in incorrect inferences. We combine insights from the study of comparative authoritarianism with those on the causes of nuclear proliferation and argue that leaders of highly centralized, "personalistic" dictatorships have more to gain, and less to lose, by pursuing nuclear weapons than leaders of other regime types. Using our more nuanced classification of regime types, as well as a more theoretically-appropriate modeling approach, we find that regime type in fact has a significant impact on states' decisions to seek nuclear weapons: personalistic regimes are substantially more likely to pursue these weapons than other regime types. This finding is robust to different codings of proliferation dates and a wide range of modeling approaches and specifications. We conclude by discussing the implications of our findings for both theory and policy.

Why do some states pursue nuclear weapons, while others do not? Despite a large literature touting the benefits of democracy for international peace and security, research on the determinants of nuclear proliferation has reached a surprising consensus: domestic political institutions play little role in explaining who seeks these most dangerous of weapons. As one prominent study puts it, “claims...that domestic political factors influence proliferation decisions are much exaggerated” (Jo and Gartzke 2007, 184). Another study concludes that “If domestic politics influences proliferation, it is probably not through regime type” (Sasikumar and Way 2009, 92). Similarly, Alex Montgomery argues that “regime type has little influence on states’ desire to seek such [nuclear] weapons” (Montgomery 2005, 157). Indeed, a recent review of the proliferation literature highlights the claim that “democracies and autocracies are ... similar in their proliferation behavior” as one of the few areas of widespread agreement in proliferation research (Sagan 2011, 237).<sup>1</sup>

Given the importance of domestic political institutions for so many other questions in international security, it is surprising that scholars have discovered at best negligible effects of regime type for nuclear proliferation. Moreover, this finding does not accord with a common-sense reading of the historical record. Was there nothing about Libya’s political regime that encouraged Gaddafi to pursue nuclear weapons until 2003, or North Korea to devote enormous portions of its GDP to actually developing them? Were Iraq under Saddam Hussein or Egypt under Nasser really no different in their motivations or constraints than, say, Brazil, Sweden, or Australia? Answers to these questions have important implications for the non-proliferation strategies that policymakers pursue.

We therefore revisit the theory and evidence. We conclude that the consensus is in fact wrong: domestic institutions do explain proliferation attempts. However, previous studies have missed a substantial regime type effect because they have tended to focus on the distinction between democracies and non-democracies, obscuring important differences among non-democratic regimes. In fact, recent scholarship on institutional variation among autocracies suggests clear reasons that certain types of

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<sup>1</sup> Although as we note below, Sagan critiques this consensus (Sagan 2011 and Miller and Sagan 2011).

dictatorships would be particularly likely to pursue nuclear weapons. Specifically, we argue that leaders of *personalist dictatorships* are particularly likely to view nuclear weapons as an attractive solution to their concerns about regime security, and that they face fewer constraints in following this strategy than leaders in other types of regimes (both democracies and non-personalist authoritarian regimes). By lumping together personalistic dictatorships with other regimes that have both weaker motives to proliferate and face greater constraints, scholars have underestimated the effects of domestic institutions on proliferation decisions.<sup>2</sup> Moreover, they have underplayed an important motive – maintaining the security of the incumbent regime – that we argue plays an important role in personalists’ quest for nuclear weapons.

The rest of the paper proceeds as follows. We begin by reviewing literature about the effects of domestic institutions on nuclear proliferation. We then explain why it is important to disaggregate autocratic regime type both theoretically and empirically. We next test our arguments using previously unavailable data on authoritarian regime type and multiple codings of nuclear program dates, including improved data on proliferation decisions incorporating recent revelations. Using an appropriate classification of regime type and an effects-of-causes research strategy, we uncover a strong relationship between regime type and pursuit of nuclear weapons. These findings hold across different codings of nuclear program dates, with or without the inclusion of a variety of control variables, and given a variety of alternate estimation choices. Our conclusions have important implications for both the literature on nuclear proliferation, and scholars’ burgeoning understanding of the consequences of authoritarian regime type for a multitude of questions in international security.

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<sup>2</sup> Two recent exceptions are Hymans (2009) and Montgomery (2011), who both study the effect of “neo-patrimonialism” on the ability of states to complete nuclear projects *once they are underway*. In contrast, our study focuses on the question of whether countries pursue these projects at all. On the difference between personalism and neo-patrimonialism, see page 9.

### ***Regime Type and Nuclear Proliferation: The State of the Literature***

Given the many studies documenting a link between domestic political institutions and international behavior, it is not surprising that some scholars have focused on institutions in their attempts to explain nuclear proliferation. What is perhaps more surprising is that scholars have reached little consensus about the posited direction of the effect.

Drawing on the influential democratic peace literature, most scholars have focused on the differences between democracies and autocracies. First, several scholars have argued that democracies are less likely to pursue nuclear weapons. Chafetz (1993), for example, argues that democracies are able to tame the security dilemmas that can give rise to a desire for nuclear weapons. As democracy spreads, it reduces the threat of proliferation by enlarging the zone of peace. Others have suggested that democracies may feature greater transparency, which could reduce the ability of security elites to promote a nuclear program in an insulated “strategic enclave” (Sasikumar and Way 2009). Still others have argued that when democracies do commit to non-proliferation efforts by joining the NPT, these commitments are more durable (Miller and Sagan 2011); democracies have behaved differently, though only after joining the NPT (Sagan 2011). Finally, some have credited citizen campaigns against nuclear weapons with restraining programs in some European countries and in Japan (Cirincione 2008; Wittner 1997), and these types of movements are more likely to prove influential in democracies.

Others, however, have argued that regime type has little effect because the factors that encourage proliferation attempts do not vary greatly across democracies and autocracies (Montgomery 2005). For example, studies emphasizing the role of particular leaders have not linked leader characteristics to regime type (Hymans 2006, Montgomery 2009). Other studies have focused on “strategies of regime survival,” arguing that economically inward-looking leaders are most willing to bear the costs of proliferation, but have not tied the choice of economic strategy to particular domestic

political institutions (Solingen 2007). Still others have emphasized the importance of vested bureaucratic interests, without linking this factor to (or mentioning) regime type (Cirincione 2008).

Finally, some scholars have argued that democracy can actually *foster* proliferation. Democratic governments might be tempted to pander to nationalist populations as they compete to boost their popularity and retain power (Perkovich 1999; Snyder 2000). In countries ranging from Pakistan to France to India, nuclear weapons programs enjoy great public support, suggesting that an open political process may not discourage the pursuit of nuclear weapons. Building on this theme, Kroenig (2009) infers that “democracies may be more prone to nuclear proliferation because they may be more subject to pressure from domestic constituencies that favor nuclear development,” and finds a positive relationship between democracy and proliferation.

In line with the mixed views of the theoretical literature, empirical studies have found at best minimal differences in the proliferation rates of democratic and autocratic states. For example, in their cross-national statistical analysis of nuclear proliferation, Singh and Way (2004) find no clear effect of democracy or democratization on either the exploration or active pursuit of nuclear weapons. Similarly, Jo and Gartzke (2007) find that democracy has a negligible effect on pursuit and acquisition, concluding that researchers are misguided when they focus on regime type. In a study of the diffusion of military technology, Horowitz (2010) finds no relationship between a country’s Polity score and its likelihood of launching a nuclear weapons program. Similarly, exploring the link between civilian nuclear technology and proliferation, Fuhrmann (2009) finds no relationship between democracy and weapons proliferation. Qualitative methods have yielded similar conclusions. Drawing on comparative case studies, Campbell, Einhorn, and Reiss (2004) find only mixed evidence that democratic institutions affect a state’s pursuit of nuclear weapons. Solingen (2007), focusing on East Asia and the Middle East, concludes that the democracy/autocracy distinction does not account for variation in proliferation. Sasikumar and Way (2009) similarly conclude that “democracy ... does not promote nuclear restraint.”

In sum, the existing theory and evidence provide few reasons to believe that regime type either fosters or discourages the pursuit of nuclear weapons.

### ***Revisiting the Link Between Domestic Institutions and Nuclear Proliferation***

The question remains, however, whether previous scholarship has conceptualized regime type appropriately. Below, we analyze the potential benefits of acquiring nuclear weapons and the potential costs entailed by the process of nuclear acquisition from the perspective of government leaders. Our analysis reveals that certain types of dictatorships – personalist dictatorships – engender appreciably stronger *motives* to proliferate, including the desire for regime security, and create fewer *constraints* in pursuing this goal.

#### *Motives*

A first obvious motive is that nuclear weapons can enhance a state’s security: nuclear weapons may deter attacks and also reduce the possibility of coercion. Accordingly, numerous studies have focused on leaders’ motives to secure the country’s “national” interests and territorial integrity, particularly when facing powerful rivals (Potter 1982; Betts 1993; Paul 2000; Quester 2005).

In addition, states may have important non-security motives (Sagan 1996). Domestic interest groups, including segments of the military, the scientific establishment, and industries that might profit from sustained state investment in a nuclear program may have powerful parochial interests in pursuing nuclear weapons (Sagan 1996; Solingen 2007; Byman and Lind 2010). Third, governments may seek the prestige that goes along with “joining the nuclear club” and may view nuclear weapons as important symbols of national independence and status (O’Neill 2006; Sagan 1996).

In addition to these widely-recognized motives, however, a different type of “security” motive exists as well: the security of the incumbent regime from external interference, as distinct from

“national” security.<sup>3</sup> Many believe, for example, that possession of nuclear weapons by countries such as Pakistan or North Korea deters the United States from intervening in their internal affairs (Creveld 1993; Lake 2011; Payne 1996; Schneider 1995). As Lawrence Freedman writes, “one only needs to contemplate the impact of a completed Iraqi nuclear program on Western calculations during the Gulf crisis to appreciate the importance of such a step” (Freedman 1994). Or, as Zbigniew Brzezinski put it: “The contrast between the attack on militarily weak Iraq and America’s forbearance of the nuclear-armed North Korea has strengthened the conviction of the Iranians that their security can only be enhanced by nuclear weapons” (Brzezinski 2005). For leaders seeking security against foreign threats to their rule, a small nuclear arsenal could prove invaluable.

#### *Costs and Constraints*

However, pursuing nuclear weapons can also entail significant costs. First, nuclear programs are expensive, and states incur large opportunity costs by investing in a nuclear program rather than other goods or industries. Second, states may face severe international opprobrium for attempting to acquire nuclear weapons, including being ostracized from the international community or facing economic sanctions, as North Korea and Iran have learned. Finally, governments that desire nuclear weapons may be thwarted by domestic actors who believe that the costs outweigh the benefits. As Hymans (2011) demonstrates in the case of Japan, leaders must secure the long-term assent of important veto players if they are to sustain the effort it takes to build a nuclear program (Hymans 2011).

It should be evident from this discussion that domestic institutions could affect the desire for and constraints against pursuing nuclear weapons. If domestic political institutions foster strong motives to acquire nuclear weapons rather than building other sources of military power, and if actors with such motives are insulated from the international and domestic costs of proliferation, then we should expect “regime type” to matter greatly. However, by focusing on differences between democracies and

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<sup>3</sup> Solingen (2007) and Koblenz (2010) focus primarily on how nuclear programs can combat *internal* threats.

dictatorships, rather than investigating how domestic institutions vary across authoritarian regimes, scholars have missed the most important sources of institutional variation.<sup>4</sup>

### *The Politics of Personalist Dictatorships*

A growing literature on the politics of authoritarianism has revealed significant variation in the domestic institutional structure of dictatorships, with important consequences for a variety of domestic and international outcomes – including, we argue, nuclear proliferation. Here, we first introduce the concept of personalist dictatorship, describing the institutional structures of these regimes. We then explain why personalist dictators are particularly likely to covet nuclear weapons, and face fewer constraints in pursuing this strategy.

One of the most consequential ways in which dictatorships vary is the extent to which the leader faces institutionally-induced constraints on his rule (Geddes 2003; Magaloni 2006; Svobik 2009), or put differently, faces important veto players. In some authoritarian regimes, known here as “personalistic,” a paramount leader enjoys enormous personal discretion over government decisions, to an extent unseen even in other dictatorships. In these regimes, nominal institutions such as the military or political parties have little independent power, and one individual leader has achieved dominance over the entire state structure (Geddes 2003). This concept is related to, but different from the concept of neo-patrimonialism (Hymans 2008; Montgomery 2010) in that it is possible for a personalist regime to have well-developed bureaucracy, as long as the regime structure is ultimately dominated by a single individual. Stalin’s Soviet Union, which is personalist but not neopatrimonial, provides a case in point.

This lack of strong institutions has important consequences for leaders’ strategies of rule. On one hand, the weak institutional environment of a personalist regime provides leaders with opportunities for personal enrichment and power that are unavailable to leaders in other political systems. However, in order to maintain these perquisites, leaders are induced to choose strategies of survival that emphasize

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<sup>4</sup> Again, see Montgomery (2010) and Hymans (2008) for exceptions regarding the ability to turn desire into acquisition, an issue we revisit later.

rooting out enemies and disrupting coordination, rather than providing popular policies as non-personalist leaders are forced to do.<sup>5</sup> As Svobik (2009) has documented, most dictators lose power not through mass protests or democratization movements, but at the hands of regime insiders or their own security forces.<sup>6</sup> Personalist leaders therefore take great pains to secure their rule both among regime insiders and the military ranks. The latter is particularly important because the support or at least acquiescence of the military is crucial for a coup to succeed, which, given the weak institutional environment, is the greatest threat to the tenure of a personalist dictator.

Facing this environment, personalist leaders respond in predictable ways to minimize the threat of ouster while maximizing personal autonomy and enrichment. The lack of checks allows the leader to restrict important government and military positions to relatives and trusted cronies, with competence a secondary concern. They may also ensure the compliance of regime insiders by implicating them in the regime's atrocities, threatening their families, and creating a cult of personality that makes challengers seem illegitimate to the public. These are convenient ways to deter defection: cronies "sink or swim" with the regime.<sup>7</sup> Moreover, personal control over the internal security apparatus allows the leader to inhibit coordination by spying on and coercing potential opponents within and outside the regime. Nearly all personalist leaders use their great discretion to tamper with the military hierarchy, often depriving their soldiers of the training, weapons, and organizational autonomy necessary to fight effectively, since those same tools could be used against them. Together, these strategies ensure that regime insiders remain loyal, and that even if opponents wished to organize a coup, their ability to coordinate is severely weakened. In sum, personalist regimes are marked both by a near-total absence of institutionalized veto players, as well as specific forms of military organization that, as we will show, have important implications for the desire to acquire nuclear weapons.

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<sup>5</sup> This is consistent with the logic of selectorate theory (Buono de Mesquita et al, 2003).

<sup>6</sup> For example, even though protests in Egypt sparked Mubarak's ouster, it was the military's decision not to support him that determined Mubarak's fate.

<sup>7</sup> Bratton and Van de Walle (1994).

This absence of institutionalized opposition distinguishes personalist regimes from non-personalist regimes, which feature significantly greater domestic constraint on leaders. In single party or dominant party regimes, for example, an institutionalized political party plays a crucial role in politics and is not simply a tool of the incumbent leader. Regularized procedures, instead of personal ties to the incumbent, determine party promotions, with merit and seniority playing important roles. Alternatively, the regime may be controlled by a (non-personalist) military junta, as in Argentina or Brazil. These regimes often feature term limits or regularized turnover of rulers, as well as consultative councils among the services to direct policy. In both civilian and military regimes, elites are able to limit any attempts on the part of the leader to shore up power in the military by disrupting military hierarchy. In sum, whether the regime's structure is civilian or military, institutions in non-personalist regimes ensure that regime insiders depend to a much lesser extent on the incumbent's survival for their own political futures, and are also better able to coordinate to oust incompetent or unresponsive rulers, as Nikita Khrushchev and Leopoldo Galtieri learned the hard way.

Thus, non-personalist regimes, like democracies, tend to feature two characteristics with important implications for their decisions to pursue nuclear weapons: a greater number of constraints or "veto players," and relatively professional military organizations. It is therefore clearly worth revisiting how domestic political institutions, particularly their absence in personalist regimes, affect decisions to seek a nuclear capability.

#### *Personalist Dictatorships: Strong Motives, Fewer Constraints*

When it comes to decisions about pursuing nuclear weapons, personalist dictators face many of the same motives as leaders of other regime types, including concerns about territorial integrity, incentives to stoke nationalism, or the desire for greater prestige.<sup>8</sup> In addition to these motives, personalist dictators may find nuclear weapons to be particularly tempting for three reasons. First,

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<sup>8</sup> See for example Cigar 2011 on Saddam's various motives.

personalist leaders have especially strong grounds to fear that foreign interference will jeopardize the security of their regime. Second, expanding the country's conventional military power to combat these threats entails more acute tradeoffs for personalist leaders. Third, the structure of personalist regimes means that these leaders are much less constrained in their ability to pursue their resulting nuclear ambitions.

First, personalist dictatorships present unusually tempting targets for foreign intervention. A growing body of scholarship has argued that the internal dynamics of personalist dictatorships make these leaders particularly likely to resort to violence against civilians (Davenport 2007) and also to initiate violence internationally (Weeks 2012). It is therefore no surprise that, as human rights abuses and international violence become less normatively acceptable, personalist leaders such as Saddam Hussein, Muammar Qaddafi, the Kim family, and now Bashar Al-Assad are reviled internationally, with many countries calling for their fall.

Second, whereas one response to external threats would be to expand the country's conventional forces, above we noted that personal control over the military is a crucial component of personalist leaders' grip on power. The problem with increasing the power of conventional military forces is that creating a competent military organization requires the leader to delegate authority and organizational power to generals and other military officers. But this in turn could severely undermine the leader's personal control. Although Saddam Hussein, for example, built a large standing army, the internal logic of his regime created severe tradeoffs between fighting effectiveness and internal security. Saddam's fear of a coup caused him to limit communications even between senior officers and implement elaborate restrictions that made it virtually impossible for Iraqi military commanders to engage in military planning, coordination among units, or even basic training maneuvers (Woods et al. 2006). Similar problems have plagued military effectiveness in other personalist regimes (Brooks 1998, Quinlivan 1999). Syria's military effectiveness, for example, was undercut by Hafez Al-Assad's reticence to promote officers that were not trusted fellow Alawis. Personalist leaders may nonetheless

build large armies as a way to deter invasion, provide internal security, and coopt important segments of society; but as numerous studies have indicated, these armies tend to be notoriously ineffective in proportion to their size, and may therefore fail to deter invasion, as demonstrated clearly in the two Gulf Wars.

Of course, leaders of other types of regimes may also be wary of coups (Dunn 1978), and may therefore face incentives to coup-proof their regimes as well. But in no other type of regime is the leader's tenure so dependent on his ability to hobble the military's organizational capacity. For personalist dictators, coups and other "irregular" means of ouster, which typically require the backing of the military, are the dominant way that leaders are removed from office (Debs and Goemans 2009). In contrast, in non-personalist regimes, threats to the leader's survival are more likely to stem from non-military sources. Other regime elites are wary of the leader amassing so much personal power at their expense (Magaloni 2008), and they therefore guard closely against the leader attempting to build personal control over the military apparatus in the first place. Non-personalist leaders are therefore forced to seek other ways to ensure their continued tenure, such as providing sound policies. As a consequence, non-personalistic leaders who enhance the competence of the military face less of a shock to their expected survival in office than do personalist leaders.

Given personalists' reluctance to build an effective conventional army, nuclear weapons provide a tempting alternative. The very nature of a nuclear program requires intense secrecy. The capacities being built lie in the hands of scientists, rather than soldiers who could turn against the regime. Moreover, the nuclear program can remain a relatively autonomous enclave that does not require the leader to ease up on coup-proofing measures elsewhere. While some early analysts speculated that nuclear weapons might increase coup risk by emboldening generals to seize these weapons (Dunn 1978), little subsequent historical evidence supports this conjecture. In sum, nuclear weapons are unique in their ability to allow the dictator to build military capacity without simultaneously enhancing domestic threats to his survival.

Once attained, a nuclear weapon provides a powerful deterrent to outside interference, both by discouraging an overt military attack, and raising the risks of covert operations. Instability following regime failure in North Korea, for example, could allow weapons to fall into the hands of a rogue military faction or even terrorists. Outsiders will therefore be extremely reluctant to engage in regime sabotage unless they are certain that nuclear material can be secured during any resulting instability. Although most dictators are loathe to articulate publicly such self-interested motives for acquiring nuclear weapons, much less admit to a program before it has been completed, evidence nonetheless supports this interpretation of personalists' motives. After observing the run-up to war against Iraq, Kim-Jong Il's North Korea accelerated its pursuit of nuclear weapons. In April 2003, soon after the fall of Saddam Hussein, a North Korean statement explicitly said that "The Iraqi war teaches a lesson that in order to prevent a war and defend the security of a country and the sovereignty of a nation, it is necessary to have a powerful physical deterrent force."<sup>9</sup> In March 2011, days after the start of the Western military intervention in Libya, North Korea issued another statement indicating that Libya had been "duped" when it gave up its nuclear program and that Gaddafi would have been better off keeping his program.<sup>10</sup> In fact, there are some indications that Saddam's regime, faced with an imminent conflict with the U.S., envied the North Koreans their shield, which they viewed as having successfully deterred forceful regime change (Cigar 2011, p. 42).

On the other side of the equation, personalist dictators are uniquely free of the constraints that plague other potential proliferators. First, returning to Hymans' (2011) insight about the importance of veto players, personalists face few, if any, domestic veto players of the sort that appear in either democracies or non-personalist dictatorships. They may be able to devote huge portions of GNP to a nuclear project even if other domestic actors would prefer to see the money spent elsewhere. For example, Kim Jong-Il's North Korea was able to devote large sums to the pursuit of nuclear weapons

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<sup>9</sup> Glenn Kessler and Doug Struck, "N. Korean Statements Jeopardize New Talks; Nuclear Program's Status Is Unclear," *The Washington Post*, April 19, 2004, Section A p. 1.

<sup>10</sup> Mark McDonald, "North Korea Suggests Libya Should Have Kept Nuclear Program," *The New York Times*, March 25, 2011, pA12.

even while thousands of people were starving to death in the early 1990s. Second, personalist leaders may be willing to accept the international opprobrium that comes with a nuclear program. Without powerful domestic interests to stop him, and able to dip into the state treasury to maintain his own consumption, a personalist dictator may be willing to withstand the risk of external isolation in order to secure ultimate regime stability. In sum, personalist leaders are particularly keen on acquiring nuclear weapons as a ticket to longevity, and face fewer constraints on doing so.

### ***Regime Type and Nuclear Proliferation: 1946-2009***

To test the hypothesis that personalistic regimes are more likely to pursue nuclear weapons than other kinds of regimes, we estimate a series of statistical models spanning the years 1946 to 2009. A word about our estimation strategy is in order. We are interested in the causal effect of personalist regime type on propensity to pursue nuclear weapons. This contrasts with much of the proliferation literature, which adopts a “causes of effects” approach. That is, many studies ask “what are the correlates of nuclear weapons proliferation?” and evaluate a wide range of variables side-by-side without focusing on the individual causal effect of a particular variable. This catch-all “causes of effects” approach, which may in appropriate circumstances allow researchers to *describe* correlations among variables, contrasts with an “effects of causes” strategy in which one designs the analysis to evaluate the (causal) relationship between a specific predictor and outcome of interest (Morgan and Winship 2007). Appealingly, the effects of causes approach avoids the “garbage can” or “kitchen sink” models against which methodologists so often warn (Achen 2002, 2005; Berk 2004; Ray 2003, 2005). As Clarke (2009) summarizes: “nowhere in the literature on variable selection does bigger equal better” (p. 57).

Following an effects of causes approach, we begin by asking what other variables we would need to condition on in order to draw valid inferences about the relationship between personalist regime type and pursuit of nuclear weapons. If personalistic regimes were distributed by a random process, as in

an experimental study, we could simply compare the rate of nuclear arms pursuit among personalist regimes with that among other types, and draw valid inferences from the results. But since this is unlikely, we need to control for variables that affect both the pursuit of nuclear weapons and the likelihood of a personalist regime.

However, if the results are to shed light on the causal effect of personalist regimes, we should control *only* for variables that are not themselves a consequence of personalist regime type. Variables that cause both personalism and nuclear proliferation are “good controls” for our purposes; those that are themselves caused by personalism are “bad controls” because they induce post-treatment bias (Angrist and Pischke 2008). In other words, the analysis should include only variables that address omitted variable bias, and avoid those that induce post-treatment bias (Gelman and Hill 2006). This is important in assessing the causal effect of personalism because many of the variables typically used in quantitative studies of nuclear proliferation are themselves a consequence of regime type. This is similar to a problem encountered in labor economics: one cannot accurately assess the effect of education on earnings if one also controls for occupation. Since education causes occupation – in other words, occupation is post-treatment – it is a “bad control” for a study interested in the causal effect of education (Angrist and Pischke 2008). Controlling for the pathways by which education affects income – both positive and negative – hinders our ability to estimate the total effect of education.<sup>11</sup> In this example, rather than add in more controls “we would do better to control only for variables that are not themselves caused by education” (Angrist and Pischke 2008, 66). And because adding unnecessary variables often does more harm than good (Achen 1986; Breiman 1992), our main models control only for variables that are not themselves caused by personalism. This is different from previous studies of nuclear proliferation, which usually employ a causes-of-effects approach and include many “post-treatment” variables that are themselves partially shaped by regime type, such as alliance status, prior

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<sup>11</sup> Importantly, controlling for post-treatment variables may either reduce *or* inflate the estimated effect of the variable of interest. We cannot say in which direction it errs unless we have a full understanding of *all* the pathways by which it may influence the outcome of interest.

history of conflict, and integration into the world economy. Including such intermediate variables, partially caused by regime type itself, generates incorrect estimates of the total effect of regime type.

*Dependent Variable: The Pursuit of Nuclear Weapons*

Our outcome of interest is the pursuit of nuclear weapons. To record nuclear weapons status, we use codings from Singh and Way (2004) and Jo and Gartzke (2006), who independently coded dates for initiation of nuclear weapons programs and of weapons acquisition.<sup>12</sup> Although their dates are broadly similar, they do differ in some cases, and these differences can potentially matter (Montgomery and Sagan, 2009). We are agnostic about differences among these codings: reasonable analysts can set thresholds at differing levels and read historical evidence differently (dates from both sets of codings are listed in the appendix). Rather, our goal is to ensure that the results are not sensitive to any particular coding, and we therefore run all of the analyses using both datasets.

*Measuring Personalism*

In order to measure personalist regimes, we rely on two related sources of data. For the 1946-1999 time period, we use the answers to a series of questions collected by Barbara Geddes in her research on authoritarian regimes (Geddes 2003), and subsequently deployed in more recent studies (Weeks 2012). From this information, we create an index of eight variables that capture the extent to which the leader is free of constraints on his personal rule: 1) does access to high government office depend on the personal favor of the leader; 2) do country specialists view the politburo or equivalent as a rubber stamp for the leader's decisions; 3) does the leader personally control the security forces; 4) if there is a supporting party, does the leader choose most of the members of the politburo-equivalent; 5) was the successor to the first leader, or is the heir apparent, a member of the same family, clan, tribe, or minority ethnic group as the first leader; 6) has normal military hierarchy been seriously disorganized or

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<sup>12</sup> We use an updated version of the Singh and Way dates, based on new information available after the publication of their original paper. Most significantly, they now code Egypt as having pursued nuclear weapons from 1965 to 1974, Syria as pursuing from 2000 onwards, and have new program end dates for Iraq, Libya, and North Korea.

overturned, or has the leader created new military forces loyal to him personally; 7) have dissenting officers or officers from different regions, tribes, religions, or ethnic groups been murdered, imprisoned, or forced into exile; and 8) if the leader is from the military, has the officer corps been marginalized from most decision making. We then compute a ratio of the number of “yes” answers out of the total number of questions, and categorize a country as “personalist” if it receives a score of greater than .5; in practice, very few regimes come close to this threshold, as index scores tend to cluster around “0” and “1.” Importantly, none of these indicators are influenced by the leader’s *behavior* in international affairs: these are domestic indicators of the structure of the regime, and are not endogenous to the dependent variable. Our approach to measuring personalism differs slightly from Geddes’ own regime typology: we focus more on the leader’s personal power and less on other features of the regime, such as whether there are local-level party organizations. For example, our measure (quite reasonably) treats Mao and Stalin as personalist dictators (but not Jiang or Khrushchev), whereas they are considered non-personalist single-party rulers in the Geddes typology because the leaders fostered a wide-reaching (if personalized) party organization at lower levels of the regime. For years after 1999, however, we rely on an update to the dataset by Joseph Wright (2008). This dataset has the advantage of including more recent observations, though we unfortunately do not have the “raw” data to create the regime index we use for the pre-1999 data. Our inspection of the data indicates that the Wright data accord closely with our conception of personalism.

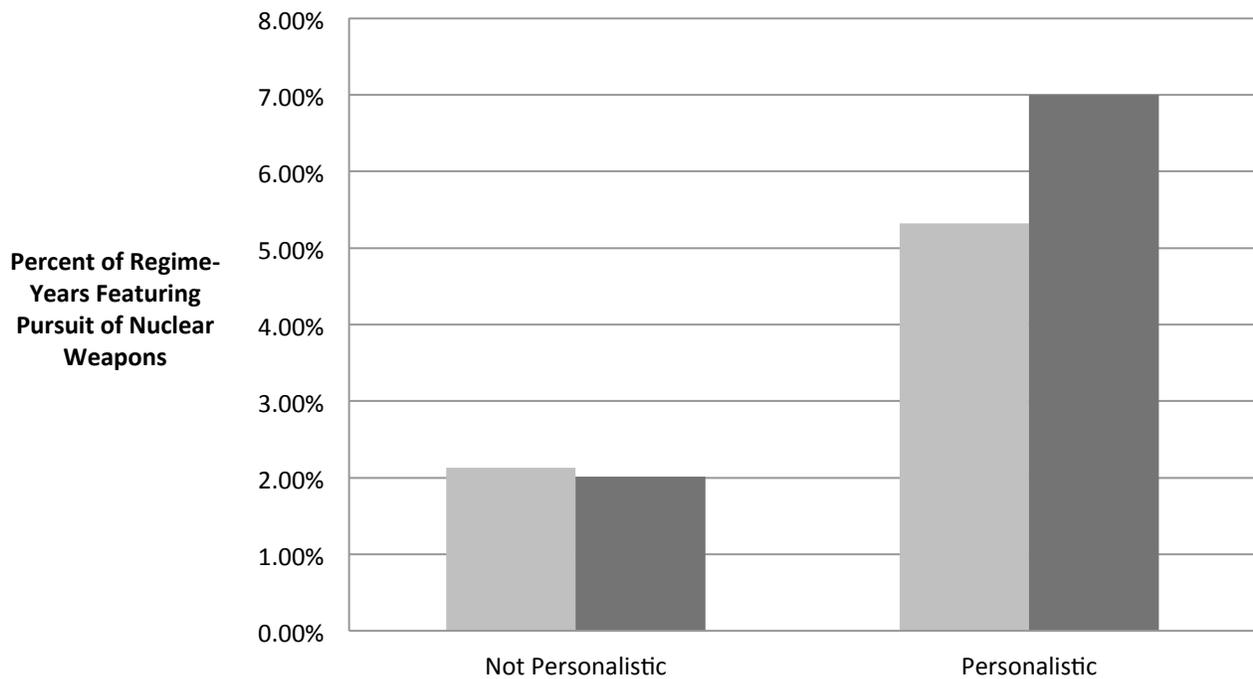
### *Results*

Our findings reveal strong evidence that personalist regimes are more likely than other regime types to pursue nuclear weapons. We begin by examining the rate at which personalist regimes pursue nuclear weapons compared to other regimes. Our unit of observation is the regime-year. Figure 1 plots the percentage of regime type years in which personalist regimes were pursuing nuclear weapons alongside the percentage for all other states; the light gray bars are based on the JG program dates whereas the dark gray bars use the updated SW dates. The difference is dramatic. Depending on the

coding, either 5.3 per cent (JG data) or 7 per cent (SW data) of personalist regime-years featured the pursuit of nuclear weapons, whereas for all other regime types the rate was around 2.1 (JG) or 2.0 per cent (SW).

– Figure 1 about here –

**Figure 1: Personalist Regimes and Pursuit of Nuclear Weapons**



**Note:** Light gray indicates program dates according to Jo and Gartzke; dark gray indicates program dates according to the updated Singh and Way codings.

Of course, controlling for potential confounders is important. Personalism might, for example, co-vary with economic development in a way that obscures the relationship between regime type and pursuit of nuclear weapons. Similarly, personalism may occur more frequently in countries boasting greater military capabilities (in the sense of the COW material resources index), something that may be associated with a greater likelihood of pursuit of nuclear weapons. In view of these concerns, we

estimate logistic regression models that control for confounding variables, but keep in mind the importance of limiting the inclusion of “post-treatment” variables that would bias our estimates of the effect of personalist regime type.

Since observations over time within a particular country are clearly not independent, failure to account for temporal dependence within each cross section can result in underestimates of standard errors, leading to unduly optimistic inferences (Beck, Katz, and Tucker 1998). We thus include three regressors to model time passed without the pursuit of nuclear weapons:  $t$ ,  $t^2$ , and  $t^3$  (Carter and Signorino 2010).<sup>13</sup>

In keeping with our agnostic stance regarding various codings of the dates of nuclear programs, we use both the updated SW dates and the JG dates in turn. Table 1 reports a series of models using the SW dates. In these models, country-years are coded as one if a state is pursuing nuclear weapons and zero otherwise; when states acquire nuclear weapons, the country drops out of the analysis. We start with a basic model including only the personalist regime type dummy, a pre-treatment control for security environment, and the cubic polynomial variables to account for grouped temporal dependence. Our control for security environment is a variable counting the number of shared land borders with other states (Stinnett et al. 2002). In our preferred models, we intentionally avoid some standard measures of the security environment – such as rate of involvement in MIDs or enduring rivalry participation – because recent evidence indicates that personalism likely *causes* greater conflict involvement for these regimes (Peceny, Beer, and Sanchez-Terry 2002 and Weeks 2012). MID involvement is therefore “post-treatment” to personalist regime type. In contrast, the number of shared land borders with other states – another proxy for security challenges and one of the most powerful predictors of conflict involvement (Bremer 1992) – does not share this drawback: it is unlikely that personalism *causes* the geographical situation of a state. The number of land borders therefore provides a suitable pre-treatment proxy for intensity of the security environment.

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<sup>13</sup> We also follow standard practice by clustering standard errors by country.

-- Table 1 about here --

**Table 1. Personalist Regimes and the Pursuit of Nuclear Weapons  
(Dependent Variable: Singh and Way codings)**

	<i>Basic Model</i>	<i>Plus Population</i>	<i>Plus Capabilities</i>	<i>Plus Economic Development</i>
Personalist Regime	1.86 <sup>&lt;.001</sup> (.556)	1.89 <sup>&lt;.001</sup> (.588)	1.88 <sup>&lt;.001</sup> (.544)	1.20 <sup>.062</sup> (.63)
Number of Land Borders (security environment)	.66 <sup>&lt;.001</sup> (.181)	.49 <sup>.162</sup> (.178)	.98 <sup>&lt;.001</sup> (.234)	.17 <sup>.249</sup> (.145)
Population (ln)	-	1.45 <sup>&lt;.001</sup> (.332)	-	-
Capabilities	-	-	45.39 <sup>.042</sup> (22.31)	59.72 <sup>.013</sup> (24.07)
GPD per Capita (ln)	-	-	-	.165 <sup>.626</sup> (.353)
Years Without Pursuit of Nuclear Weapons (t)	-1.34 <sup>&lt;.001</sup> (.127)	-1.27 <sup>&lt;.001</sup> (.122)	-1.32 <sup>&lt;.001</sup> (.122)	-1.73 <sup>&lt;.001</sup> (.174)
t <sup>2</sup>	.064 <sup>&lt;.001</sup> (.007)	.061 <sup>&lt;.001</sup> (.007)	.063 <sup>&lt;.001</sup> (.007)	.096 <sup>&lt;.001</sup> (.012)
t <sup>3</sup>	-.0008 <sup>&lt;.001</sup> (.0001)	-.0008 <sup>&lt;.001</sup> (.0001)	-.0008 <sup>&lt;.001</sup> (.0001)	-.0014 <sup>&lt;.001</sup> (.0002)
Constant	-8.48 <sup>&lt;.001</sup> (1.25)	-8.48 <sup>&lt;.001</sup> (1.25)	-8.27 <sup>&lt;.001</sup> (1.32)	-2.88 (3.42)
Log likelihood	-227.95	-223.66	-232.55	-159.81
Countries	196	196	196	187
Observations	7,599	7,599	7,599	5,902

*Notes:* two-tailed p-values in italicized super-scripts, standard errors in parentheses. Shaded row highlights the variable of interest.

The results, reported in Table 1, support our predictions. Personalism is strongly associated with the pursuit of nuclear weapons at better than the 1 per cent level. Not surprisingly, the number of land borders is also associated with the likelihood of pursuing nuclear weapons. The cubic polynomial variables are individually and jointly highly significant. In the next columns, we report three modifications of this basic model.<sup>14</sup> First, we add the log of population as a (not post-treatment) indicator of economic size, reflecting the possibility that more populous countries are better able to marshal the resources necessary for a nuclear weapons program. In subsequent models, we add two alternate, but likely not exogenous, indicators of material resources: the COW CINC data capabilities index,<sup>15</sup> and (the natural log of) real gross domestic product per capita as a measure of economic development. More highly developed countries face lower technological hurdles and opportunity costs when considering the pursuit of nuclear weapons; low levels of economic development may also foster personalism.<sup>16</sup>

Across all these specifications, the effect of personalism remains both substantively and statistically significant. We opt for a conservative approach in reporting two-tailed p-values, even though our hypothesis is directional and a one-tailed value would be appropriate. In terms of magnitude of the effect, the coefficient in the “proliferation relevant” only model (the smallest of the four) implies that personalist regimes had 4.95 the odds of pursuing nuclear weapons compared to other regime types. Not surprisingly, greater material capabilities are positively related to the likelihood of pursuing nuclear

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<sup>14</sup> Adding CINC and, especially, economic variables causes the loss of some observations, specifically those after 2000. This is unfortunate since those years feature actions of great relevance to our analysis: personalist Libya’s abandonment of its pursuit of nuclear weapons, personalist North Korea’s continued pursuit and ultimate acquisition of weapons, and autocratic (but not personalist) Iran’s continued pursuit.

<sup>15</sup> It is possible that some of the components of this variable may be endogenous to personalist regime type, for example if personalist regimes are more likely to build strong militaries. If personalism causes greater military spending, controlling for capabilities would suppress some of the effect of personalism. If on the other hand personalism reduces military power, controlling for capabilities would inflate the estimate on personalism. Unfortunately, to our knowledge no existing studies resolve these issues, which is why we omit these variables in our preferred models.

<sup>16</sup> This variable could induce downward post-treatment bias if personalism impedes economic growth. Including or excluding these variables, however, does not substantively affect the results.

weapons: larger populations and higher CINC scores are strongly associated with pursuing nuclear weapons. GDP per capita is not significant.<sup>17</sup>

Table 2 records the results of repeating these analyses with the Jo and Gartzke data. Once again, personalism has a strong and significant effect across all four specifications. The coefficients are always larger than with the SW data, and significance is at  $p=.036$  or better in all specifications. Not surprisingly, results for the control variables also mirror those reported in Table 1: more land borders with other states, larger populations, and greater material capabilities are all positively associated with proliferation risk, and the cubic polynomial variables are highly significant. These results are not sensitive to the deletion or recoding of specific countries, lowering the threshold for interest in nuclear weapons, or adding a variety of other variables, as we show in the supporting information appendix.

-- Table 2 about here --

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<sup>17</sup> As we introduce new variables, the coefficient on personalism changes a small amount. As we add variables, we also lose observations due to missing data on these new variables. This raises the question: are the changes on personalism due to the new variables, or the loss of observations? The answer is that almost all of the change is due to the loss of observations. Re-estimating the basic models in both Tables 1 and 2 with the observations available for the other models yields coefficients that are nearly identical. Losing nearly a decade of informative observations is the culprit here, not the addition of control variables.

**Table 2. Personalist Regimes and the Pursuit of Nuclear Weapons  
(Dependent Variable: Jo and Gartzke codings)**

	<i>Basic Model</i>	<i>Plus Population</i>	<i>Plus Capabilities</i>	<i>Plus Economic Development</i>
Personalist Regime	2.09 <sup>&lt;.001</sup> (.573)	2.13 <sup>&lt;.001</sup> (.599)	2.10 <sup>&lt;.001</sup> (.593)	1.10 <sup>.045</sup> (.552)
Number of Land Borders (security environment)	.977 <sup>&lt;.001</sup> (.202)	.577 <sup>.003</sup> (.193)	.893 <sup>&lt;.001</sup> (.267)	.149 <sup>.219</sup> (.122)
Capabilities	-	-	84.42 <sup>.003</sup> (28.27)	37.35 <sup>.069</sup> (20.54)
Population (ln)	-	1.64 <sup>&lt;.001</sup> (.409)	-	-
GPD per Capita (ln)	-	-	-	.0001 <sup>.999</sup> (.299)
Years Without Pursuit of Nuclear Weapons (t)	-1.73 <sup>&lt;.001</sup> (.166)	-1.65 <sup>&lt;.001</sup> (.163)	-1.70 <sup>&lt;.001</sup> (.168)	-1.67 <sup>&lt;.001</sup> (.158)
t <sup>2</sup>	.103 <sup>&lt;.001</sup> (.012)	.099 <sup>&lt;.001</sup> (.012)	.101 <sup>&lt;.001</sup> (.012)	.095 <sup>&lt;.001</sup> (.012)
t <sup>3</sup>	-.0017 <sup>&lt;.001</sup> (.0002)	-.0015 <sup>&lt;.001</sup> (.0002)	-.0016 <sup>&lt;.001</sup> (.0002)	-.0015 <sup>&lt;.001</sup> (.0002)
Constant	-8.76 <sup>&lt;.001</sup> (1.40)	-22.01 <sup>&lt;.001</sup> (4.96)	-8.99 <sup>&lt;.001</sup> (2.41)	-.287 <sup>.925</sup> (3.05)
Log likelihood	-217.74	-206.42	-211.94	-168.63
Countries	190	190	190	145
Observations	7,591	7,591	7,591	4,491

*Notes:* two-tailed p-values in italicized super-scripts, standard errors in parentheses. Shaded row highlights the variable of interest.

One further analysis warrants discussion. Our argument is that personalist leaders have both greater motive and means (in terms of fewer constraints) to pursue nuclear weapons. The results presented thus far demonstrate a relationship between personalist regimes and the pursuit of nuclear weapons. Yet, this affinity could potentially arise because personalist regimes are *inefficient* in carrying out demanding, technologically advanced projects. They might not be more likely than other regime types to *start* pursuing nuclear weapons, but may instead just spend a large number of regime-years pursuing them without ever acquiring explosive devices (Hymans 2008; Montgomery 2010). To be sure, some personalist regimes have spent large amounts of time in the fruitless pursuit of nuclear weapons; according the SW data, Libya did so from 1970 to 2003.<sup>18</sup>

To focus solely on the propensity to *start* the pursuit of nuclear weapons, we estimated Cox proportional hazard models of the timing of the initiation of weapons programs. The relevant question is: how likely is a country to start pursuing nuclear weapons in a given year, given that it has not done so up until this point? In this analysis, countries drop out after they begin pursuing nuclear weapons. The length of time they spend pursuing programs is irrelevant to the analysis. The downside, of course, is that program initiations are rare; the overwhelming majority of countries never launch nuclear weapons programs. This small number of positive outcomes makes significant results unlikely, providing a very demanding test of our argument, and using the Cox model also assesses the sensitivity of our results to the particular model reported above (grouped logistic regression with time polynomials).

Because we have no strong theoretical priors about the about the distributional form of the duration times, we estimate Cox proportional hazard models. The Cox model is attractive since it allows us to estimate the relationship between the covariates and the hazard rate without having to make any assumptions about the shape of the baseline hazard rate (Box-Steffensmeier and Jones 2004).

We re-ran the models presented in Tables 1 and 2 using Cox models. To ease interpretation, we exponentiated the coefficients and report the resulting hazard ratios in Table 3. In this form, the

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<sup>18</sup> We explore this possibility more thoroughly in the supporting information appendix.

coefficient can be read as the number by which we would multiply the risk (hazard) of starting a nuclear weapons program in a given year for a one-unit increase in the independent variable. To illustrate, the first entry in Table 5 reports a coefficient of 2.49 on the personalist regime variable. This indicates that the “risk” of starting a weapons program in a given year among personalist regimes is 249 percent the risk for non-personalist regime types (in other words, it is about 149 percent higher).

-- Table 3 about here --

**Table 3. The Pursuit of Nuclear Weapons and Personalist Regimes:  
Cox Proportional Hazard Models**

	<i>Singh and Way dates</i>	<i>Jo and Gartzke dates</i>
Basic model	2.49 <sup>.071</sup> (1.25)	2.39 <sup>.089</sup> (1.22)
Plus capabilities	2.98 <sup>.032</sup> (1.57)	2.82 <sup>.058</sup> (1.54)
Plus population	2.93 <sup>.046</sup> (1.47)	2.86 <sup>.059</sup> (1.82)
Plus economic development	3.02 <sup>.024</sup> (1.48)	3.12 <sup>.062</sup> (1.89)

*Notes:* All entries are hazard ratios for the personalist regime variable in specifications matching those reported in Tables 1 and 2. Two-tailed p-values in italicized super-scripts, and standard errors in parentheses below.

To conserve space, Table 3 records only the coefficients on the personalist regime variable, although the models are otherwise identical to those in Tables 1 and 2 (with the exception of the cubic polynomial). Across all specifications, personalist regime type is substantively important and significant at better than the .10 level, with (two-tailed) p-values ranging from .023 to .089 depending the specification. Despite the rarity of “exits” from the duration analysis – SW record 19 program starts, JG

count 17 – personalism retains an affinity to the pursuit of nuclear weapons. Personalist regimes are more likely to start weapons programs than other types of regimes.

The Cox models used to produce the estimates reported in Table 3 assume that parameters are stable over time: specifically, the proportional hazard assumption entails that the effect of a change in an explanatory variable is to shift the hazard by a factor of proportionality that remains constant over time. One might suspect that this is not the case over the 50-plus years of the atomic age covered in the analysis. Effects may increase or decrease, or even reverse sign, perhaps as a result of changing norms about the acceptability of nuclear weapons. Fortunately, we can test the non-proportionality assumption and, if necessary, make corrections (Box-Steffensmeier and Zorn 2008). We performed both a global proportionality test and covariate-specific tests. The global tests indicated that we cannot reject the null hypothesis of proportionality in any of the eight models, nor can we reject it for any of individual covariates.

### ***Conclusion***

The conventional wisdom that regime type has little effect on decisions to pursue nuclear weapons appears to be wildly off the mark. Previous studies suffered from two blinders causing them to overlook a very strong relationship between one particular configuration of domestic political institutions and proliferation decisions. First, international relations scholarship has focused rather narrowly on differences between democracy and dictatorship, whereas the most interesting variation appears to involve one particular type of non-democratic regime: personalist dictatorships. Second, previous quantitative scholarship on nuclear proliferation has tended to employ a “causes of effects” rather than an “effects of causes” approach. Rather than designing studies to assess the causal impact of a particular variable, which in some cases mediates in favor of a parsimonious modeling approach, scholars have often included a large number of predictor variables in their analyses, among them several that are clearly shaped in part by regime type. Including such post-treatment variables obscures the total effect of regime type (Angrist and Pischke 2008; Gelman and Hill 2006), leading scholars to misunderstand the effect of regime type on the pursuit of nuclear weapons.

By separating personalist dictatorships from other types of regimes and revisiting the evidence, we found a robust and substantively important effect of personal dictatorship on proliferation. We hypothesized, first, that personalist dictators are particularly likely to desire nuclear weapons because such weapons provide these rulers with insurance against external influence in their domestic affairs. Importantly, nuclear weapons can provide this protection without requiring the regime to build a professional conventional military, which could, ironically, undermine the dictator's domestic hold on power by arming and training potential opponents of the regime. Second, we argued that personalist dictators are uniquely free of domestic checks and balances or veto players who could oppose a sustained investment in nuclear programs even in the face of international condemnation. Personalist dictators have both greater motives and face fewer political checks on pursuing the nuclear option.

The findings, therefore, have important implications for both scholars and policymakers. First, they add to a growing body of evidence that personalist regimes pose particularly severe threats to international peace and security. Policymakers, when possible, should therefore discourage leaders from amassing substantial amounts of personal political power. Second, our results indicate that policymakers have been right to be particularly suspicious of countries such as Libya, North Korea, Iraq, and Syria when it comes to proliferation. Personalistic regimes such as these have, in the past, been the most likely type of domestic political regime to develop a secret nuclear program. North Korea's apparent success in actually manufacturing a nuclear weapon demonstrates that despite these regimes' inefficiencies, the leaders may be so domestically powerful – and so determined to preserve their regimes – that they will flout international norms and covertly pursue these dangerous weapons to the point of success. And given the lack of constraints in these regimes, they may be more reckless in their wielding of nuclear weapons upon possessing them (Weeks 2012). Intelligence analysts would do well to pay special attention to any suspicious activities on the part of regimes such as Hugo Chavez's Venezuela, Omar

Al-Bashir's Sudan, or Alexander Lukashenko's Belarus.<sup>19</sup> Analysts will also want to keep a close eye on the kind of regime that emerges from ongoing turmoil in Egypt.<sup>20</sup> Third, recall our argument that one motivating factor behind personalists' dogged pursuit of nuclear weapons is their intense fear of regime overthrow. Foreign attempts to oust personalist leaders such as Saddam Hussein and Muammar Gaddafi may add fuel to the fears of leaders such as Chavez, Assad, or other aspiring or actual personalist dictators. Policymakers must therefore be aware that foreign-imposed regime change, although tempting (especially since this type of regime is more likely to proliferate), may actually increase the determination of other leaders to acquire a nuclear blanket and thus avoid a similar fate. When it comes to stemming proliferation, an ounce of prevention (in terms of discouraging the emergence of personalism) may be worth more than a pound of cure. Faced with existing personalist regimes, however, less emphasis on public international calls for regime change might lower the sense of embattlement and reduce perceptions of outside threats to regime survival. The result could be a diminished sense of urgency to develop nuclear weapons and a reduction in the pressure to attain regional legitimacy and existential security by means of the development of nuclear weapons.

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<sup>19</sup> Although Belarus renounced nuclear weapons after the fall of the Soviet Union, its relationship with Russia has since deteriorated and Lukashenko has called the decision to give up nuclear weapons "a major mistake" in recent years, as well as claiming that the Ukraine kept "hundreds of kilograms" of weapons grade uranium. "Belarus Freezes Plan to Give Up Uranium Stockpile," *The Seattle Times*, August 19, 2011.

<sup>20</sup> Regime codings covering 1946 to 2010 by Joseph Wright, Erica Frantz, and Barbara Geddes are available at <http://dictators.la.psu.edu/>.

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