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 decide to pursue nuclear weapons, while others do not? Despite a large literature touting the benefits of democracy for international peace and security, recent research on the determinants of nuclear proliferation has reached a surprising consensus: domestic political institutions play little role in explaining who seeks out 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 "The level of democracy is not significant in explaining decisions on nuclear weapons. 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 flags the claim that "democracies and autocracies are seen to be similar in their proliferation behavior" as one of the few areas of widespread agreement in this area of research (Sagan 2011, 237). In many other studies of proliferation, regime type is most notable for its total absence.

Given the importance of domestic political institutions for so many other questions in international security research, it is somewhat puzzling that scholars have discovered at best negligible effects of regime type for nuclear proliferation. Moreover, this finding does not seem to accord with a common sense reading of the historical record. Was there nothing about Libya's domestic 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 after its transition to democracy, Sweden, or Australia? Our 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 existing consensus is in fact wrong: certain bundles of domestic institutions are strong predictors of proliferation attempts. However, previous studies have missed a substantial regime type effect because they have tended to focus too

rigidly on the distinction between democracies and non-democracies that is emphasized by the influential democratic peace literature. Unfortunately, this focus obscures important differences among non-democratic regimes. In fact, recent scholarship on institutional variation among autocracies suggests clear reasons that certain types of dictatorships would be particularly likely to pursue nuclear weapons. Specifically, we argue that leaders of *personalist dictatorships* are particularly likely to have preferences that tempt them to pursue nuclear weapons, 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 these personalistic leaders with other dictators who have both weaker motives to proliferate and face greater constraints, scholars have underestimated the effects of domestic institutions on proliferation decisions.[1] 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 briefly 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 argue that personalistic regimes are likely to have stronger motives to proliferate than other types of states – including the motive to protect regime security – and also face markedly lower constraints in doing so. We then test our arguments using previously unavailable data on authoritarian regime type, and using multiple codings of nuclear program dates, including new and improved data on proliferation decisions that incorporates recent revelations about states' nuclear programs. 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

[1] Two recent exceptions to the focus on democracy versus autocracy 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. For a discussion of the difference between personalism and neo-patrimonalism, see page 9.

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 our burgeoning understanding of the consequences of authoritarian regime type for a multitude of questions in international security.

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 this factor 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. In line with the dominant strand of this literature, a number of scholars have argued that democracies are less likely to pursue nuclear weapons than autocracies. Glenn Chafetz, for example, argues that democracies, linked by shared values and connected by thick institutional webs, forge a security community that tames the security dilemmas that can give rise to a desire for nuclear weapons (Chafetz 1993). As democracy spreads, it reduces the threat of proliferation by enlarging the zone of peace. Others have focused on whether security elites, who may have a vested interest in proliferation, are able to carve out an autonomous enclave in which to pursue weapons (Sagan 1996). Democracies may feature greater transparency, and thus reduce the ability of security elites to gain the autonomy necessary 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). This provides some evidence that democracies have behaved differently regarding nuclear weapons proliferation, though only after joining the NPT (Sagan 2011). Finally, some have credited large 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 arise and prove influential in democracies.

Others, however, have argued that we should expect to see no effect of regime type because the salient factors do not vary strongly across democracies and autocracies. As Alex Montgomery emphasizes (2005), much of the proliferation literature focuses on either organizational pathologies or concerns for security or prestige as principle drivers of proliferation – and these factors may have little obvious connection to the democracy-authoritarian dichotomy. Some studies emphasize the role of particular leaders, but fail to link these to regime-type characteristics; Montgomery, for examples, argues that individual leaders may have an effect "at the margin," but does not link leader characteristics to domestic institutions (2009, 165). Although Jacques Hymans credits individual leaders with considerably more importance, he focuses on leader's psychological conception of their nation's identity without explicitly drawing linkages to regime type (Hymans 2006). Alternatively, Etel Solingen focuses on "strategies of regime survival," arguing that economically inward-looking leaders are more likely to bear the costs of proliferation than leaders who choose greater economic openness and interdependence (Solingen 2007). Again, however, she does not link the choice of economic strategy to particular domestic political institutions. Finally, in a broad review of the motives for acquiring nuclear weapons, Joseph Cirincione emphasizes the importance of vested bureaucratic interests, but makes no link to (or mention of) 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, France, to India, nuclear weapons are often very popular with the public, calling into question the idea that governments that are more responsive to public opinion will be less likely to pursue or acquire nuclear weapons. Building on this theme, Matthew Kroenig 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 (Kroenig 2009).

In sum, existing theories of nuclear proliferation have not made a strong case that domestic institutions – or more specifically, the presence or absence of democracy – affect proliferation decisions in a clear and direct way. It is therefore perhaps not surprising that most 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, Sonali Singh and Christopher Way find no clear effect of democracy or democratization (measured using the Polity index) on either the exploration of the nuclear option or the active pursuit of nuclear weapons (Singh and Way 2004). Similarly, Dong-Joon Jo and Erik Gartzke find that democracy has a negligible effect on the pursuit and acquisition of nuclear weapons, concluding that researchers are barking up the wrong tree when they focus on regime type (Jo and Gartzke 2007). In a study of the diffusion of military technology, Michael Horowitz finds no relationship between a country's Polity index score and its likelihood of launching a nuclear weapons program (Horowitz 2010). Similarly, an influential paper exploring the link of between civilian nuclear technology and proliferation finds no link between democracy and weapons proliferation (Fuhrmann 2009). Qualitative methods have yielded similar conclusions. Drawing on comparative case studies, Mitchell Reiss and others find only mixed evidence that democratic institutions affect a state's desire to acquire nuclear weapons (Campbell, Einhorn, and Reiss 2004). Etel Solingen shows that the democracy/autocracy distinction cannot account for variation in proliferation across East Asia and the Middle East, thus motivating her focus on domestic coalitions instead of regime type (Solingen 2007). Focusing on South Asia, Sasikumar and Way conclude that "democracy as measured in procedural terms does not promote nuclear restraint" (Sasikumar and Way 2009). In sum, the existing theory and evidence on the relationship between regime type and proliferation appears to provide no strong reasons to believe that regime type matters for nuclear weapons proliferation.

Revisiting the Link Between Domestic Institutions and Nuclear Proliferation

The question remains, however, whether previous scholarship has conceptualized regime type in a way that is tailored to explaining nuclear proliferation. Below, we build on existing arguments about nuclear proliferation to distinguish between the potential costs and benefits of acquiring nuclear weapons. In the process, we highlight a previously under-appreciated motive – the desire for regime security, as opposed to national security – which we argue has played an important role in many leaders' decisions to pursue nuclear weapons. This conceptualization of the potential costs and benefits of proliferation reveals that certain types of dictatorships should have appreciably stronger incentives to proliferate. However, the conventional distinction between democracies and non-democracies obscures the domestic institutional variation that is most important to understanding the pursuit of nuclear weapons. In fact, the logic of nuclear proliferation suggests that domestic institutions in some types of dictatorships are particularly likely to foster incentives to seek nuclear capabilities.

To show this, we first outline both the potential benefits of acquiring nuclear weapons and the potential costs entailed by the process of nuclear acquisition. Put differently, we can focus on the *motives* to proliferate on the one hand, and the *constraints* on proliferation, which may be domestic or international, on the other hand. We then discuss how these motives and constraints foster nuclear proliferation by one particular regime type: personalist dictatorships.

Motives

First, different states could conceivably place different value on acquiring nuclear weapons. One obvious motive is that nuclear weapons can enhance the state's security: nuclear weapons may deter would-be attackers and reduce the possibility of coercion; typical formulations have focused primarily on states' motives to secure the country's "national" interests and territorial integrity, in particular when facing conventionally stronger rivals.[2]

[2] See for example, (Betts 1993; Paul 2000; Potter 1982; Quester 2005) . For empirical evidence that security motives frequently matter, see Singh and Way 2004, Jo and Gartzke 2007.

In addition, states may also have important non-security motives (Sagan 1996). Domestic interest groups, including parts of the military, the scientific establishment, and industries that might profit from sustained state investment in a nuclear program may have powerful parochial reasons to pursue nuclear weapons.[3] Third, leaders and populations 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 three widely-recognized motives, however, scholars and policymakers have more recently begin to discern a different type of "security" motive, distinct from the country's "national" security: the security of the incumbent regime. Solingen (Solingen 2007) focuses primarily on internal sources of threats: nuclear weapons are "a powerful source of myths ripe for exploitation by inward-looking leaders for domestic as much as external purposes" (p. 42), solidifying the regime's popularity.[4] But nuclear weapons also can protect a regime – as distinct from the state – from external security threats. It is widely believed, for example, that possession of nuclear weapons by countries such as Pakistan or North Korea could deter 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). For leaders of unpopular regimes seeking security against foreign threats, a small nuclear arsenal could prove invaluable. After observing the demise of Saddam Hussein, Kim-Jong Il's North Korea accelerated its pursuit of nuclear weapons. Many would agree with Zbigniew Brzezinski in concluding that regime insecurity can create a domino effect of interest in nuclear weapons: "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).

[3] See for example Sagan 1996 and Solingen 2007.

[4] In a related vein, Koblentz (Koblentz 2010) argues that chemical and biological weapons can defend leaders from internal threats to their rule, highlighting in particular the Iraqi case under Saddam Hussein.

Costs

However, pursuing nuclear weapons can also entail significant costs. First, nuclear programs are expensive, and states – particularly small or impoverished ones – may incur large opportunity costs by investing in a nuclear program rather than other domestic goods or industries.[5] 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, Iraq, and Iran have learned. Finally, domestic actors who desire nuclear weapons may be thwarted by other domestic groups who believe that the costs outweigh the benefits. Leaders must therefore have the long-term assent of their supporting coalition if they are to sustain the effort it takes to build a nuclear program even in the face of resource constraints and international condemnation.

It should be evident from this discussion that domestic institutions could affect the desire for and constraints against pursing nuclear weapons. If domestic political institutions foster strong motives to acquire nuclear weapons, 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.

Why then, has previous scholarship hypothesized so little effect of domestic institutions on choices to proliferate? We argue that the reason is that international relations scholars have tended to focus on differences between democracies and dictatorships, rather than investigating how domestic institutions vary across authoritarian regimes.[6] But a growing literature on the politics of authoritarianism has shown great variation in the domestic institutional structure of dictatorships, with important consequences for a variety of domestic and international outcomes – including, we argue, nuclear proliferation.[7]

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[5] See Lindley and Clemency 2009 for estimates of the percent of GDP required to produce the same number of nuclear weapons in different countries.

[6] Again, see Montgomery (Montgomery 2010) and Hymans (Hymans 2008) for an exception applied to the ability to turn desire for nuclear weapons into acquisition, an issue we revisit later.

[7] Friedrich and Brzezinski 1956, Arendt 1973, O'Donnell 1978, Linz 2000, Wintrobe 2000, Brooker 2000, Geddes 2003, Slater 2003, Gandhi and Przeworski 2006, Brownlee 2007, Magaloni 2006, 2008, Pepinsky 2009, Levitsky and Way 2010Levitsky and Way 2010, and Cheibub, Gandhi, and Vreeland

The Politics of Personal Dictatorship

One of the most consequential ways in which dictatorships vary is in the ability of domestic institutions to constrain individual leaders: the extent to which an individual leader holds the levers of power (Geddes 2003; Magaloni 2006; Svolik 2009). In some authoritarian regimes, known as despotic, sultanistic (Cheibub, Gandhi, and Vreeland 2010; Weber 1997), or here, "personalistic," a paramount leader enjoy an enormous amount of personal discretion over government decisions, to an extent unseen even in other dictatorships. In these personalistic regimes, according to Barbara Geddes, one individual leader has achieved dominance over the entire state structure. Policy decisions lie mainly at his discretion, and institutions such as the military or any political parties have been eviscerated to the point that they have little independent power (Geddes 2003). This concept is different from the concept of neo-patrimonialism (Hymans 2008; Montgomery 2010) in that in our definition, it is possible for a personalist regime to have highly-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.

To achieve and maintain this level of dominance, personalist dictators employ a number of strategies. They often use secret police and multiple overlapping military and paramilitary organizations to spy on and coerce opposition both within and outside the regime. To ensure that no rival becomes too powerful, personalist dictators may also frequently reorganize institutions wholesale, a technique Gaddafi has used to great effect. Trusting no one, personalist dictators such as Hussein often limit their inner circle and important offices to relatives and trusted cronies. Alternatively, they may elevate "nobodies" to high office knowing that they pose little threat, a tactic used by Haile Selassie. They may also ensure the compliance of regime insiders by implicating them in the regime's atrocities. Employing these strategies ensures that cronies "sink or swim" with the regime and are unlikely to defect in the face

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2010. See Ezrow and Frantz 2011 for a helpful overview of the various typologies. On the effects of authoritarian regime type for international security, see Peceny, Beer, and Sanchez-Terry 2002, Weeks 2008, and Debs and Goemans 2010, among others.

of challenges to the dictator's personal rule.[8] Personalist dictators will also often devise a cult of personality, further increasing the costs of challenges. This way, opposition to the regime would not only have to organize a coup, but would also have to convince the public on the morning after that the old leader was illegitimate. This is a tactic used by North Korea's Kim family to chilling effect. Finally, it is important to note that these personalist regimes are often deliberately created and sustained by leaders with extreme, even tyrannical, personalities (Glad 2002; Post 2004b; Rosen 2005).

This personal control over the state apparatus sets personalist dictators apart from non-personalist autocrats, who face significantly greater domestic constraints, even in the absence of democracy. As Svolik (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.[9] In non-personalist dictatorships, therefore, regime insiders are much less beholden to the incumbent and depend to a much lesser extent on the incumbent's survival for their own political futures.

In single party or dominant party regimes, for example, an institutionalized political party plays an important role in politics and is not simply a tool of the incumbent leader. Regularized procedures allow party officials to be promoted based in part on merit and seniority, and nepotism and cronyism, while certainly not absent, are significantly reduced compared to personalist regimes. The military also remains relatively professional and free of the leader's personal interference. Subsequently, elites in such regimes are better able to coordinate to oust an incompetent or unresponsive ruler, as Khrushchev learned the hard way.[10] Alternatively, the regime may be controlled by a (non-personalist) military junta,

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[8]For African examples, see Bratton and Van de Walle 1994. Bueno de Mesquita et al's selectorate theory argues that the loyalty of regime insiders is a function of the relative size of this ruling coalition (Bueno de Mesquita et al. 2003).

[9] In fact, even though protests in Egypt sparked Mubarak's ouster, it was the military's decision not to support him and shoot at protesters that sealed Mubarak's fate.

[10] A large and relatively professional bureaucracy may also play an important role in the regime, acting as a veto player for some important policy decisions, as modern China shows; see for example Mertha 2009. In addition to single party regimes, there are "competitive authoritarian" regimes or "electoral autocracies" that are hybrids of democracies and authoritarianism (Levitsky and Way 2010, Schedler 2006, Brownlee 2007). See also Cheibub, Gandhi, and Vreeland 2010 on civilian dictatorships. Monarchies in which rule is passed down through heredity can more closely resemble either the

as in the case of Argentina or Brazil. Again, the military hierarchy stays intact and the military preserves its regular procedures of promotion (Geddes 2009). These regimes often feature term limits or regularized turnover of rulers, as well as consultative councils in which top members of the various services play a role in directing policy. In addition to official power-sharing at the junta level, the leader is kept in check by the credible threat of a coup.[11]

Thus, different dictatorships feature markedly different domestic institutions, with markedly different constraints on the leaders at their helm. The recent literature on authoritarianism and international relations has found that these differences are consequential for foreign policy outcomes (Debs and Goemans 2009; Peceny, Beer, and Sanchez-Terry 2002; Weeks n.d., 2008). It is therefore clearly worth investigating whether these institutions – or more specifically, the lack of constraining institutions in personalist dictatorships and the specific types of leaders these regimes select for – affect decisions to pursue nuclear weapons.

Personalist Dictatorships: Strong Motives, Fewer Constraints

First, personalist dictators are subject to many of the same pressures as other types of countries. Like all types of states, they face concerns about maintaining their state's territorial integrity. Like democracies and other regimes, they may also wish to stoke nationalism, which may be all the more important when the regime is failing to provide public goods or a healthy economy, a source of legitimacy in most other regimes. They may also, like some other types of regimes, wish to maintain the support of the military; Daniel Byman and Jennifer Lind (2010) for example argue that nuclear weapons play a key role in ensuring the continued support of the North Korean military for the Kim regime.

In many ways, then, the motives for personalist leaders to proliferate are at least as strong as those found in other types of regimes, whether democratic or authoritarian. But other motives appear even more likely to arise in personalist dictatorships. First, as psychological analyses of "tyrants" have

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personalist or the "single party" model. Michael Herb has described how ruling families in some monarchies can exert powerful constraints on the leader (Herb 1999).

[11] For more on military regimes, see Nordlinger 1977, Remmer 1989, Gandhi and Przeworski 2006.

shown, the types of leaders who become personalist dictators often suffer from intense narcissism, leading to grandiose ambitions (Glad 2002). They often believe that they and their country deserve a seat at the table with other important states, and desire nuclear capabilities as a ticket to being taken seriously. For example, in 2008 Muammar Gaddafi of Libya gathered together over 200 African tribal rulers and kings, where he espoused his vision of a single African government (led, presumably, by the "King of Kings," Gaddafi himself).[12] Nor is Kim Jong Il a mere mortal: his birth, according to the North Korean government, was heralded by a double rainbow and the appearance of a new star. The start of North Korea's nuclear weapons program is closely associated with his rise to power (Armstrong n.d.). Moreover, intense narcissists have a tendency to conflate the achievements of the state with their own personal greatness, interpreting accomplishments such as the completion of grandiose infrastructure projects, palaces, or perhaps nuclear weapons as validation of their own grandiose self-image (Post 1993). Nuclear weapons programs have often been strongly linked to specific personalities that have been classified as malignant narcissists (Post 2003, 2004a): for example, Muammar Gaddafi, Saddam Hussein, and Kim Jong-Il.

Second, personalist dictatorships present tempting targets for foreign intervention, due in no small part to their frequent human rights violations, foreign aggression against neighboring countries, and deplorable living standards. One would think that one way to increase the regime's security would be to develop a strong military, but the problem is that competent military institutions require the leader to delegate authority and organizational power to generals who may decide to turn against their patron. Saddam Hussein's fear of an internal coup, for example, caused him to limit communications even between senior officers. His elaborate monitoring and restrictions made it virtually impossible for Iraqi military commanders to engage in any sort of military planning, coordination among units, or even basic training maneuvers (Woods et al. 2006). Similar problems have plagued military effectiveness in other

[12] "Gaddafi: Africa's 'king of kings,'" August 29, 2008; http://news.bbc.co.uk/2/hi/uk_news/7588033.stm.

personalist regimes (Brooks 1998, Quinlivan 1999). Syria's military effectiveness, for example, was undercut by Hafez Al-Assad's unwillingness to promote officers that were not fellow Alawis.

Given the difficulty of building an effective conventional army, nuclear weapons provide a tempting alternative. The very nature of a nuclear program requires intense secrecy. The "military capacity" being built lies in the hands of scientists, rather than soldiers who could then turn against the regime. The dictator can therefore build military capacity without increasing the risk of a coup. Moreover, once complete, a nuclear program can provide a powerful deterrent to outside interference: witnessing the fate of Saddam Hussein can only have enhanced Kim Jong Il's motivation to acquire weapons of his own. In addition to deterring an overt military attack, nuclear weapons also raise the potential risks of covert operations. The instability that could ensue from 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 proper care of nuclear material will be maintained during any resulting instability. In sum, given the unattractiveness of alternative options, personalist dictators are particularly likely to desire nuclear weapons as a ticket to regime longevity.

On the other side of the equation, personalist dictators are uniquely free of the constraints that plague other potential proliferators. First, they face few domestic veto players of the sort faced by either democrats, 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 even while large numbers of people were starving to death in the early 1990s, and according to estimates by Global Zero, the regime continues to spend $700 million per year on nuclear weapons alone (Blitz 2011), a sum equivalent to nearly 2 per cent of its estimated GDP.[13] Second, personalist leaders may be willing to accept the international opprobrium that comes with a nuclear program. Without powerful

[13] Compare this with the average *total* defense spending to GDP ratio among 147 countries in 2008 of 2.04% (according to SIPRI data).

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.[14] Far from being a weakness, international opprobrium can actually benefit the political survival of personalist dictators by allowing them to scapegoat foreign enemies for their problems, and to claim credit for standing up to powerful foreign oppressors. In sum, personalist leaders are particularly keen on acquiring nuclear weapons, 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, we estimate a series of statistical models spanning the years 1946 to 2009. Before turning to the analysis, however, a word about our estimation strategy is in order. We are interested in the causal effect of personalist regime type on propensity to pursue to nuclear weapons. This contrasts with much of the existing literature on nuclear weapons proliferation, which adopts what is best described as a "causes of effects" approach. That is, many studies begin by asking "what are the correlates of nuclear weapons proliferation?" and then proceed to evaluate a wide range of variables side-by-side or to discuss a series of "drivers" of proliferation. This catch-all "causes of effects" approach contrasts with an "effects of causes" strategy in which one tries to evaluate the (causal) relationship between a specific variable of interest and an outcome of interest. Whereas a causes of effects approach may, in appropriate circumstances, allow researchers to *describe* correlations among variables, the research strategy associated with an effects of causes approach is better suited to assessing the causal effect of one particular variable (Morgan and Winship 2007). Moreover, the effects of causes approach avoids the

[14] On the other hand, Escribà Folch and Wright 2010 find that personalist dictators are more likely to be destabilized by sanctions than single party or military rulers. They hypothesize that this is because personalist dictators often depend on external rents for their survival and find it difficult to either increase domestic repression or locate alternative sources of revenue for patronage. It is possible that this is due to a selection effect, however, whereby non-personalist leaders only pursue policies that lead to sanctions when they are exceptionally resolved and enjoy strong domestic support for that policy choice.

"garbage can" or "kitchen sink" models against which methodologists so often warn (Achen 2002, 2005; Berk 2004; Ray 2003, 2005).[15]

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, of course, there is no reason to believe personalist regimes are distributed as if by chance. For this reason, 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" for our purpose 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, and therefore their inclusion would bias the estimates of the total effect of regime type.[16] This is similar to a problem commonly 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 effects

[15] As Kevin Clarke summarizes the econometric literature on variable selection: "nowhere in the literature on variable selection does bigger equal better" (Clarke 2009, 57).
[16] In the decidedly non-technical language of a recent textbook: "controlling for a post-treatment variable messes up the estimate of total treatment effects" (Gelman and Hill 2006, 188).

income – both positive and negative – hinders our ability to estimate the total effect of education.[17] 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 since adding unnecessary variables can often do more harm than good (C. Achen 1986; Breiman 1992), our main models therefore control only for variables that are not themselves caused by personalist regimes. This is different from previous studies of nuclear proliferation, which usually employ a causes-of-effects approach: they often include many "post-treatment" variables that are themselves partially shaped by regime type, such as alliance status, prior history of conflict, and similar variables. Including such intermediate variables, which are partially caused by regime type itself, generates incorrect estimates of the total effect of regime type.[18] Nonetheless, for interested readers, we do include such variables as sensitivity analyses, and find that including them does not alter our finding that personalism is strongly associated with proliferation.

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 two prominent papers. Singh and Way (2004) and Jo and Gartzke (2006) independently coded dates for initiation of nuclear weapons programs and of weapons acquisition.[19] Although their dates are broadly similar, they do differ in some cases, and these differences can potentially matter (Montgomery and Sagan, 2009). For example, whereas Singh and Way code South

[17] It is important to note that controlling for post-treatment variables is not conservative (in the sense that it can only reduce the strength of association between the variable of interest and outcome); mistakenly controlling for a post-treatment variable can also inflate the estimated effect of the variable of interest. The point is that if we include post-treatment variables, the estimate of the coefficient on the variable of interest will be wrong; 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.

[18] This is an inevitable consequence of controlling for an intermediate outcome. The consequence itself is not in question; the only question is whether a given outcome is intermediate in the sense of being influenced by the variable of interest. As argued below, there are good reasons to believe that several variables common in proliferation studies are intermediate in the sense of being influenced by personalist regime type.

[19] 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, and have new program end dates for Iraq, Libya, and North Korea.

Africa as beginning its program in 1974, Jo and Gartzke record a date of 1971. Moreover, Singh and Way (henceforth SW) are a bit more expansive with their codings, recording Egypt and Libya, for example, as pursuing weapons for some years, whereas as Jo and Gartzke (henceforth JG) do not.[20] We are agnostic about differences among these codings, as reasonable analysts can set thresholds at differing levels and read historical evidence differently (all 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. Country-years receive a value of one on the dependent variable when they are listed as pursuing (or possessing a program) nuclear weapons in a given year, and zero otherwise. After countries acquire nuclear weapons, they drop out of the dataset.

Measuring Personalism

In order to measure personalist regimes, we rely on two related sources of data. For data for the 1946-1999 time period, we use the information collected by Barbara Geddes in her research on authoritarian regimes (Geddes 2003). From this information, we create an index of eight variables, including whether access to high government office depends on the personal favor of the leader, whether country specialists viewed the politburo or equivalent as a rubber stamp for the leader's decisions, whether the leader personally controlled the security forces, and five similar questions that explicitly capture the leader's personal rule.[21] This differs slightly from Geddes own regime typology, focusing more on the leader's personal power and less on the overall structure of the regime. For example, this 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. For years after

[20] On the other hand, Jo and Gartzke count Yugoslavia and Sweden as having full weapons programs, whereas Singh and Way code them as falling short of that threshold.

[21] The five other questions were: 1) If there is a supporting party, does the leader choose most of the members of the politburo-equivalent? 2) 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? 3) Has normal military hierarchy been seriously disorganized or overturned, or has the leader created new military forces loyal to him personally? 4) Have dissenting officers or officers from different regions, tribes, religions, or ethnic groups been murdered, imprisoned, or forced into exile? 5) If the leader is from the military, has the officer corps been marginalized from most decision making?

1999, we rely on an update to the dataset by Joseph Wright (2008). This dataset has the advantage of including more recent observations, though we do not have the "raw" data to create the regime typology.

Results

Our findings reveal strong evidence that personalist regimes are more likely to pursue nuclear weapons than other regime types. We begin our analysis by simply 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 5.4 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 2.7 (JG) or 2.1 per cent (SW). In terms of raw proliferation rates, personalistic regimes clearly have an affinity with the pursuit of nuclear weapons.

-- Figure 1 about here --

Of course, it is important to account for potential confounding variables. 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 our observations vary across both time and space, several potential problems arise for standard logit models (Beck, Katz, and Tucker 1998). Specifically, observations over time within a particular country are clearly not independent, and time-period specific influences may affect all

countries at the same time. Failure to account for temporal dependence across observations within each cross section can result in underestimates of standard errors, leading to unduly optimistic inferences. Possible ways for dealing with this include adding a counter variable for years that have passed without the pursuit of nuclear weapons or, alternatively, a natural cubic spline with three knots measuring the time passed without pursuit of nuclear weapons (Beck, Katz, and Tucker 1998). However, adding a cubic polynomial approximation provides a simpler alternative that performs better in Monte Carlo analyses (Carter and Signorino 2010). We thus include three regressors to model time passed without the pursuit of nuclear weapons: t, t^2, and t^3.

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 the number of shared land borders with other states. In our preferred models, we 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 *causes* greater conflict involvement for these regimes (Peceny, Beer, and Sanchez-Terry 2002, Peceny and Butler 2004; and Weeks n.d.). MIDs are therefore "post-treatment" to personalist regime type. However, 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) – is unlikely to share this drawback: it is unlikely that personalism *causes* the geographical situation of a state. In other words, the number of land borders provides a pre-treatment proxy for intensity of the security environment. Accordingly, we include a variable counting the number of shared land borders (or less

than 25 miles of sea) (Stinnett et al. 2002). Later, we relax this concern with post-treatment security variables and explore the consequences of including conventional indicators of conflict involvement.

-- Table 1 about here --

The results, reported in Table 1, strongly support our predictions. Starting with the basic model, 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 shared with other states is also strongly 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.[22] First, we add the COW CINC data capabilities index, reflecting the possibility that countries with greater material/military resources may prove more likely to pursue nuclear weapons.[23] We then add (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; the occurrence of personalism may also be correlated with level of economic development.[24] Finally, we repeat this final model by including only "proliferation relevant" country-years. Countries with extremely small economies or extremely low levels of development are very unlikely to pursue nuclear weapons. To be sure, very poor countries have pursued nuclear weapons, North Korea, Mao's China, and Pakistan among them. Given these examples, we should be cautious

[22] Adding COW 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.

[23] 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 slows economic capacity, which reduces military power, controlling for capabilities would inflate the estimate on personalism. Unfortunately, to our knowledge no existing studies speak directly to these issues (though see fn 24 below).

[24] This variable could also potentially introduce post-treatment bias, if personalism either fosters or impedes economic growth. While the empirical literature on regime type and economic growth yields mixed results, little of it directly addresses the effect of personalist dictatorship, (though see Wright (2008) for evidence that binding legislatures in authoritarian regimes encourage economic growth.) Including or excluding these variables, however, does not substantively affect the results.

about assuming poor countries cannot possibly pursue nuclear weapons. Nonetheless, it seems safe to assume that states such as Vanuatu, the Maldives, or St. Lucia present no real proliferation risk. With this in mind, we exclude proliferation irrelevant observations by excluding all countries with economies smaller than that of the smallest economy ever to begin the pursuit of nuclear weapons.[25]

Across all these specifications, the effect of personalism remains both substantively and statistically significant.[26] Not surprisingly, greater material capabilities prove to be positively related to the likelihood of pursuit of nuclear weapons. GDP per capita is not significant, and excluding "proliferation irrelevant" observations makes little difference. A minor puzzle arises when GDP per capita is added: the number of land borders decreases in significance, whereas that of material capabilities increases. Why? The answer lies with the loss of observations incurred by missing data on economic development – running the model without GDP per capita on only the observations for which it is available also produces the same change as adding GDP per capita to that specification. Given our interests, however, it is the fact that the coefficient on personalism remains broadly the same across all of these specifications that is important.[27] The coefficient on personalism remains large and the p-value never drops below .025.

-- Table 2 about here --

Next, we repeat these analyses with the Jo and Gartzke codings of program dates. Table 2 records these results. 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

[25] For SW, this is Libya (1970); for JG, it is Israel (1955).

[26] We are being conservative 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.

[27] As we introduce new variables, the coefficient on personalism does change 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.

better in all specifications.[28] Not surprisingly, results for the control variables also mirror those reported in Table 1: more land borders with other states and greater material capabilities are all positively associated with proliferation risk, and the cubic polynomial variables are highly significant.

To investigate further the sensitivity of results to any particular coding of nuclear weapons program, we repeated the analyses using an indicator that includes dalliances with nuclear weapons shy of full-blown pursuit: SW's coding of "exploration" of the nuclear option (in addition to pursuit). This variable includes states that featured "political authorization to explore the option or by linking research to defense agencies that would oversee any potential weapons development" but stopped short of launching an explicit effort to acquire weapons (Singh and Way 2004). This more permissive coding captures Switzerland's serious consideration of nuclear weapons in the 1950s and 1960s, for example, whereas their pursuit coding does not (nor do JG code Switzerland as having a full-blown program). It also yields earlier "start" dates as many countries progressed from exploring the option to explicit pursuit of weapons – since these earlier dates may fall under a different regime type classification, it is interesting to know whether the results are sensitive to the difference.

-- Table 3 about here --

The results recorded in Table 3 parallel those for the more restrictive codings of nuclear programs. Even when counting lower levels of demonstrated interested in nuclear weapons, personalism still has a strong and significant effect across all four specifications. The coefficients are a bit smaller than with the SW pursuit data, but significance is at p=.012 or better across all specifications.

-- Table 4 about here --

Table 4 reports the results of a further battery of sensitivity tests. The entries in each row record the estimated coefficient *on personalist regime* for models using the SW and JG dates. All coefficients are based on variants of the "plus capabilities" models reported in Tables 1 and 2 – we chose this model to maximize the number of observations. The most important thing to note about the results in Table 4 is

[28] In terms of magnitude of the effect, the coefficient in the "proliferation relevant" only model implies that personalist regimes had 6.11 the odds of pursuing nuclear weapons compared to other regime types.

the consistency of the coefficients, both in terms of size and, more importantly, statistical significance: in 20 of the 21 specifications, personalism is significant at better than the .001 level (and the exception is .003). We briefly describe each of these variations on the basic model in the order in which they appear in Table 4:

- Personalist regimes may well *desire* nuclear weapons, but may also be particularly *inept* in pursuing them. In particular, neo-patrimonial regimes may take longer to complete nuclear programs (Hymans 2008; Montgomery 2010), piling up years of pursuit without every acquiring weapons. To assess this possibility, we counted years of possession of nuclear weapons in addition to years of pursuit – adding many years of possession by non-personalist regimes, which offsets the long pursuits of a handful of personalist regimes. Nonetheless, personalism retains a strong affinity with nuclear weapons.
- Row two replaces the pre-treatment security environment variables with a more traditional indicator (albeit a post-treatment one): participation in enduring rivalry. Row 2 used Bennett's coding, updated by the author to cover years up to 2009 (Bennett 1998). The estimated coefficient on personalism increases with this change.
- Codings of enduring rivalries can differ substantially. Thus we replaced Bennett's coding with that of Goertz and Diehl in row 3 (Klein, Goertz, and Diehl 2006). The estimated coefficient on personalism is not affected by this change.
- Both of these indicators of rivalry are based on density of disputes. However, rivalry – and the serious political tensions entailed – need not be militarized (or at least not to such a degree) to pose a risk of conflict (Thompson 2001). We thus tried Thomson's (2001) broader indicator of rivalry in row 4. The estimated coefficient on personalism remains similar.
- Most indicators of enduring rivalry are based on density of dispute (Bennett 1998; Klein, Goertz, and Diehl 2006) ; in row 5, we substitute dispute involvement in place of rivalry dummies. Using MID involvement (Ghosn, Palmer, and Bremer 2004) as the indicator of security environment makes little difference.
- Including fixed effects restricts the analysis to changes over time within the countries which at some point pursued nuclear weapons – throwing out cross-sectional variation, and dropping a large number of observations since the vast majority of countries feature no variation over time on the dependent variable. Nonetheless, we estimated fixed effects models for the sake of completeness, and despite the radically condensed dataset, personalism is still positive and significant.
- We experimented with adding a second regime type dummy, this time including one for all non-personalist autocracies. Doing so had little impact on the coefficient on personalism.[29]
- Finally, as noted by others (Hymans 2008; Montgomery 2010), some personalist regimes have pursued nuclear weapons for a very long time without acquiring them. To ascertain whether any of these are influential outliers driving the results on personalism, we experimented with dropping four of the long-time pursuers of nuclear weapons from the analysis in turn: North Korea, Iran[30], Iraq, and Libya. Personalist regime type retained significance even when these long-time pursuers of nuclear weapons were dropped.

[29] We experimented with including a variety of dummies representing differing sub-categories of regime type. None altered the substantively and statistical significance of personalism.

[30] We follow the Geddes data and Wright update and do not code Iran as personalist, even during the years of Ayatollah Khomeini's rule, although many scholars would count Khomeini as personalist.

One further analysis warrants discussion. Our argument is that personalist leaders have both the motive and the 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, as we acknowledge above, this affinity could potentially arise because personalist regimes are so *inefficient* in carrying out such 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. By way of contrast, North Korea took a long time, but was ultimately successful in acquiring at least a rudimentary nuclear explosive capability. Our argument is not at odds with this possibility; quite the contrary, we expect that the pathologies undercutting the military effectiveness of personalists discussed above should also limit the efficiency of their nuclear weapons programs.

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 it difficult to obtain significant results, providing a very demanding test of our argument, and using Cox model also assesses the sensitivity of our results to a particular model (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 for our purposes 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). The hazard rate is then given by:

$$h_i(t) = h_0(t)\exp(\beta'x)$$

where $h_o(t)$ is the baseline hazard function, t is time, and $\beta'x$ are the regression parameters and covariates.

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 5. In this form, the 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 5 about here --

To conserve space, Table 5 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 17 program starts, JG count 15 – 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 5 make a rather strong assumption in requiring 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

In sum, 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 what we find to be a very strong relationship between one particular configuration of domestic political institutions and proliferation decisions. First, international relations scholarship has tended to focus 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 case mediates in favor of a parsimonious modeling approach, scholars have tended to include a large number of predictor variables in their analyses, among them several which 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 revisiting the evidence and separating personalist dictatorships from other types of regimes, 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 in a way that does not require the regime to build a strong 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 the motives, and the means, to proliferate.

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. Not all dictatorships are equally dangerous to peace, and policymakers, when possible, should 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. Intelligence analysts would do well to pay special attention to any suspicious activities on the part of these regimes. 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 Saddam Hussein and Muammar Gaddafi only 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 only increase the determination of other leaders to acquire a comforting nuclear blanket to insulate themselves from a similar fate. When it comes to stemming proliferation, an ounce of prevention (in terms of discouraging the emergence of personalism) may be worth well more than a pound of cure (in terms of forcible regime change).

APPENDIX

Nuclear Proliferation Dates, 1945-2009

	Singh and Way (updated)			Jo and Gartzke	
	Explore	Pursue	Acquire	Program	Acquire
Algeria	1983-				
Argentina	1968-1977	1978-1990			
Australia	1956-1960	1961-1973			
Brazil	1953-1977	1978-1990		1978-1990	
China		1955-1963	1964-	1956-1963	1964-
Egypt	1960-1964	1965-1974			
France	1946-1953	1954-1959	1960-	1954-1959	1960-
India	1954-1963	1964-1987	1988-	1964-1987	1988-
Indonesia	1965-1967				
Iran	1976-1984	1985-		1974-	
Iraq	1976-1982	1982-1995		1973- 2002	
Israel	1949-1957	1958-1968	1969 -	1955-1965	1966-
Korea, North	1965-1979	1980-2005	2006-	1982-2005	2006-
Korea, South	1959-1969	1970-1978		1972-1975	
Libya	1970 - 2003	1970-2003			
Pakistan		1972-1986	1987-	1972-1986	1987-
Romania	1985-1990			1981-1989	
South Africa	1969-1973	1974-1978	1979-1991	1971-1978	1979-1990
Soviet Union		1945-1948	1949-	1945-1948	1949-
Sweden	1946-1969			1946-1969	
Switzerland	1946-1970				
Taiwan (1)		1967-1977		1976-1976	
Taiwan (2)	1987-1988				
United Kingdom	1945 -	1947-1951	1952-	1946-1951	1952-
United States	1945 -		1945-		1945-
Yugoslavia (1)	1954-1965			1953-1963	
Yugoslavia (2)	1974-1988			1982-1987	

Notes: Categories are mutually exclusive, so that a country cannot be listed under both "explore" and "pursue" or "program" and "acquire" in the same year. Jo and Gartzke's dates have been modified to provide an acquisition date for North Korea and a program end date for Iraq. The modified Singh and Way dates are taken from: http://falcon.arts.cornell.edu/crw12/ (March 12, 2011).

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

	Basic Model	***Plus Capabilities***	***Plus Economic Development***	***Only "Proliferation Relevant" Observations***
Personalist Regime	2.42$^{<.001}$ (.647)	2.37$^{<.001}$ (.632)	1.69$^{.011}$ (.666)	1.60$^{.025}$ (.711)
Number of Land Borders (security environment)	1.08$^{<.001}$ (.232)	.98$^{<.001}$ (.234)	.21$^{.162}$ (.153)	.20$^{.246}$ (.176)
Capabilities	-	37.31$^{.167}$ (27.02)	54.4$^{.019}$ (23.11)	46.19$^{.071}$ (25.61)
GPD per Capita (ln)	-		.271$^{.443}$ (.353)	-.042$^{.915}$ (.394)
Years Without Pursuit of Nuclear Weapons (t)	-1.76$^{<.001}$ (.179)	-1.74$^{<.001}$ (.181)	-1.70$^{<.001}$ (.172)	-1.67$^{<.001}$ (.174)
t^2	.099$^{<.001}$ (.012)	.098$^{<.001}$ (.012)	.093$^{<.001}$ (.012)	.091$^{<.001}$ (.012)
t^3	-.0015$^{<.001}$ (.0002)	-.0015$^{<.001}$ (.0002)	-.0014$^{<.001}$ (.0002)	-.0014$^{<.001}$ (.0002)
Constant	-10.20$^{<.001}$ (1.55)	-9.66$^{<.001}$ (1.55)	-3.83 (3.44)	-1.08 (3.75)
Log likelihood	-200.95	-199.73	-245.04	-147.58
Countries	188	187	187	145
Observations	7,933	7,584	5,898	4,489

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

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

	Basic Model	***Plus Capabilities***	***Plus Economic Development***	***Only "Proliferation Relevant" Observations***
Personalist Regime	3.23$^{<.001}$ (.753)	3.26$^{<.001}$ (.764)	1.79$^{.020}$ (.636)	1.81$^{.036}$ (.860)
Number of Land Borders (security environment)	.965$^{<.001}$ (.232)	.815$^{<.001}$ (.311)	.138$^{.581}$ (.125)	.070$^{.675}$ (.157)
Capabilities	-	101.52$^{<.001}$ (31.71)	54.38$^{.016}$ (20.78)	62.83$^{.075}$ (35.28)
GPD per Capita (ln)	-		.127$^{.745}$ (.332)	-.123$^{.772}$ (.423)
Years Without Pursuit of Nuclear Weapons (t)	-2.01$^{<.001}$ (.247)	-1.98$^{<.001}$ (.248)	-1.98$^{<.001}$ (.215)	-1.93$^{<.001}$ (.230)
t^2	.120$^{<.001}$ (.017)	.118$^{<.001}$ (.017)	.112$^{<.001}$ (.015)	.109$^{<.001}$ (.016)
t^3	-.0019$^{<.001}$ (.0003)	-.0019$^{<.001}$ (.0003)	-.0018$^{<.001}$ (.0003)	-.0017$^{<.001}$ (.0003)
Constant	-10.02$^{<.001}$ (1.53)	-9.96$^{<.001}$ (2.94)	-.917 (3.40)	-.130 (4.46)
Log likelihood	-161.06	-155.46	-120.63	-119.85
Countries	188	188	184	145
Observations	7,960	7,522	5,861	4,491

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

Table 3. Personalist Regimes and the Pursuit of Nuclear Weapons
(Dependent Variable: Singh and Way codings, both explore and pursue)

	Basic Model	***Plus Capabilities***	***Plus Economic Development***	***Only "Proliferation Relevant" Observations***
Personalist Regime	2.30$^{<.001}$ (.523)	2.27$^{<.001}$ (.517)	1.25$^{.008}$ (.467)	1.22$^{.012}$ (.485)
Number of Land Borders (security environment)	.712$^{<.001}$ (.151)	.653$^{<.001}$ (.151)	.180$^{.056}$ (.095)	.145.^{118} (.094)
Capabilities	-	42.99$^{.054}$ (22.33)	22.47$^{.119}$ (14.39)	13.68$^{.336}$ (14.23)
GPD per Capita (ln)	-		-.023$^{.918}$ (.226)	-.269$^{.257}$ (.237)
Years Without Pursuit of Nuclear Weapons (t)	-1.59$^{<.001}$ (.129)	-1.57$^{<.001}$ (.130)	-1.59$^{<.001}$ (.119)	-1.56$^{<.001}$ (.119)
t^2	.088$^{<.001}$ (.009)	.087$^{<.001}$ (.009)	.083$^{<.001}$ (.009)	.081$^{<.001}$ (.008)
t^3	-.0014$^{<.001}$ (.0002)	-.0013$^{<.001}$ (.0002)	-.0012$^{<.001}$ (.0002)	-.0012$^{<.001}$ (.0002)
Constant	-6.08$^{<.001}$ (1.02)	-5.94$^{<.001}$ (1.06)	.720 (2.04)	3.14$^{.141}$ (2.13)
Log likelihood	-300.84	-298.65	-233.29	-224.90
Countries	195	195	189	145
Observations	7,933	7,584	5,898	4,489

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

Table 4. The Pursuit of Nuclear Weapons and Personalist Regimes: alternate specifications

	Singh and Way dates	*Jo and Gartzke dates*
Pursuing or possessing nuclear weapons	2.18$^{.001}$ (.637)	3.03$^{<.001}$ (.716)
Enduring rivalry (instead of land borders) – Bennett coding	2.55$^{<.001}$ (.633)	3.47$^{<.001}$ (.852)
Enduring rivalry (instead of land borders) – Goertz & Diehl coding	2.87$^{<.001}$ (.617)	3.70$^{<.001}$ (.874)
Enduring rivalry (instead of land borders) – Thompson coding	2.81$^{<.001}$ (.624)	3.61$^{<.001}$ (.822)
MID involvement (instead of land borders)	2.81$^{<.001}$ (.624)	3.81$^{<.001}$ (.824)
Including country fixed effects[a]	2.96$^{<.001}$ (.904)	3.83$^{<.001}$ (.991)
Compared to non-personalist autocracies[b]	2.67$^{.001}$ (.768)	3.75$^{<.001}$ (.990)
Excluding North Korea	2.22$^{<.001}$ (.624)	3.03$^{<.001}$ (.747)
Excluding Iran	2.46$^{<.001}$ (.636)	3.31$^{<.001}$ (.764)
Excluding Iraq	2.06$^{.003}$ (.624)	2.86$^{<.001}$ (.800)
Excluding Libya	2.34$^{<.001}$ (.652)	3.28$^{<.001}$ (.757)

Notes: All entries are for coefficients on the personalist regime type coefficients in variants of models from Table 1. Two-tailed p-values in italicized super-scripts, and standard errors are in parentheses.

a. Most countries are dropped due to lack of variation in outcome. n=771 for the SW data; n=657 for the JG data.

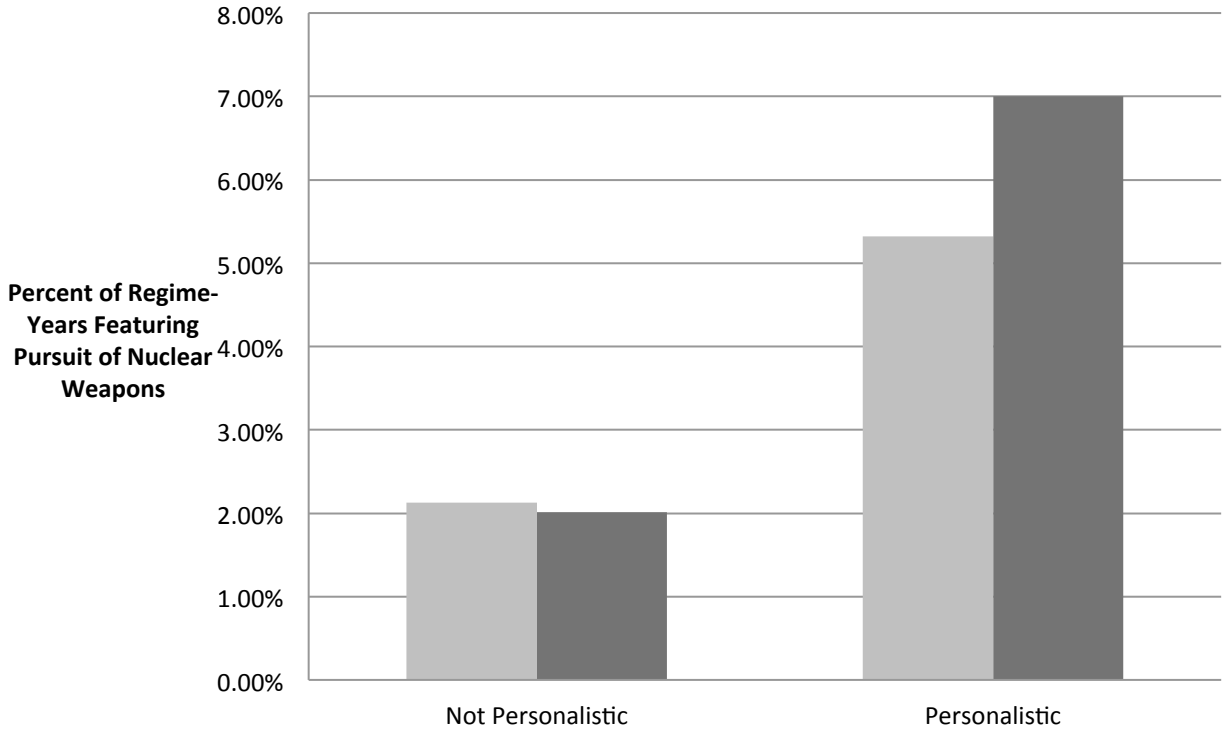
b. The non-personalist dummy is not significantly different from democracy in either model (coefficient of.42 with p-value of .48 with SW data, and .64 with p of .38 for JG dates), but is significantly different from personalism in both (we can reject the null hypothesis of no difference at above the .001 level with both the SW and JG data).

Table 5. The Pursuit of Nuclear Weapons and Personalist Regimes: Cox Proportional Hazard Models

	Singh and Way dates	*Jo and Gartzke dates*
Basic model	2.49$^{.071}$ (1.25)	2.39$^{.089}$ (1.22)
Plus capabilities	2.98$^{.032}$ (1.57)	2.82$^{.058}$ (1.54)
Plus economic development	3.02$^{.024}$ (1.48)	3.12$^{.062}$ (1.89)
Only "proliferation relevant" observations	3.04$^{.023}$ (1.47)	3.20$^{.040}$ (1.82)

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.

Figure 1:
Personalist Regimes and Pursuit of Nuclear Weapons



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