

Public Support for Nuclear Proliferation: Experimental Evidence from Brazil

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How do mass publics in non-nuclear weapon states form their preferences over the acquisition of nuclear weapons? We field a survey experiment in Brazil, a possessor of uranium-enrichment capabilities with a long history of nuclear ambitions. Our three sets of results support the view that members of the public approach nuclear proliferation strategically, that is, by taking into account how their home state interacts with enemies and allies alike. First, the external security environment is a major driver for individual-level preferences: when security is plentiful, only a small minority of the public in Brazil supports proliferation, but a deterioration of external conditions engenders a high minority in support for nuclear-weapon acquisition. Second, the mere extension by the United States of conventional (rather than nuclear) security assurances suffices to dampen public support for an indigenous nuclear deterrent, restoring a majority view opposing proliferation. Third, conventional security assurances shape public sentiment on nuclear acquisition irrespective of whether they are credible or not. These results contribute to the effort currently unfolding in the scholarly community to make sense of how citizens outside the United States think about international security in a nuclear world.

Introduction

In this article we experimentally explore the conditions under which citizens in a non-nuclear possessor will support the acquisition of nuclear weapons. Up to date, the bulk of experimental scholarly work in the field has focused on public support for nuclear-weapon *use* (e.g., Sagan and Valentino 2017; Carpenter and Montgomery 2020; Sukin 2020b; Allison et al., 2022). By adding to the nascent literature on public support for nuclear-weapon *acquisition* (Ko 2019; Sukin 2020a), we shed light onto one of the most important questions afflicting international security today: what policy decisions might best contribute to a world without further nuclear proliferation? Answers to this question are urgent at a historical juncture where great-power competition threatens to undermine the global non-proliferation regime (Gibbons and Herzog 2022), and render the major players in the international system less effective in curbing proliferation (Gheorghe 2019).

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Making sense of public preferences for nuclear proliferation matters because even if the critical decisions about acquisition are made by small groups of policy-makers in tightly-controlled elite circles, the choice to ‘break out’ is so revolutionary that it requires wider social legitimation. As previous work has shown, when issues of national security are at stake, even non-elected officials take heed of public opinion (Lin-Greenberg 2021). Additionally, populist leaders the world over have in recent years energized sections of their popular base, polarizing society with the view to push back against traditional elite orthodoxy on a range of sensitive policy areas, including international security. Public opinion can therefore play a significant role in shaping up the context within which decisions for nuclear acquisition or forbearance are made.

We explore public sentiment toward nuclear acquisition by fielding a survey experiment to a national sample in Brazil. In doing so, we proceed in three steps. First, we test whether and how changes in the external security environment drive public preferences in a nuclear latent state. Second, we assess whether the introduction of conventional security guarantees by the United States affects public support for proliferation in scenarios of security scarcity. Third, we inspect whether the level of credibility of these U.S. conventional security guarantees shapes public attitudes toward proliferation. We consider Brazil to be an ideal setting for this study for several reasons. Brazil is a non-nuclear possessor that features significant nuclear technology capabilities, increasing the plausibility of a ‘break out’ scenario. More specifically, it possesses facilities for uranium milling and mining, uranium conversion, nuclear energy generation, and uranium enrichment (Kassenova 2014). With the materials and technical expertise required to indigenously produce fissile material (Spektor et al. 2019), Brazil is a highly latent nuclear state (Herzog 2020). Furthermore, nuclear-technology capabilities have

for decades coexisted with heated domestic political contention around nuclear choices (Spektor 2016; 2019), further anchoring our experimental scenario in reality. Contemporary Brazil is a good case for experimental treatment as well because public assessments of the external threat environment are so divisive: while one half of the population believes the international environment to be benign and safe, the other half sees it as fundamentally malign and threatening (Haerpfer et al. 2020). Last but not least, Brazil is a good setting to probe the effect of foreign security assurances on domestic support for proliferation because the country has for generations lived under the shadow of U.S. hegemony in the Western Hemisphere. Firmly embedded in the U.S. alliance system since World War II and the Rio Pact (1947), successive administrations in Brazil have turned to the U.S. for protection against actual or potential or actual enemies. Together, these features allow for great variation on our dependent variable of interest, that is, support among mass publics for an indigenous nuclear deterrent.

We obtain three main results. We find that a deterioration in the external security environment – even when the nature of the threat is non-nuclear – expands the pool of individuals who support nuclear-weapon acquisition from a low minority to a high minority of the public. In addition, we find that the introduction of U.S. conventional security guarantees markedly shrinks domestic support for proliferation, suggesting that in this case that the mere presence of American protection can operate as a substitute for proliferation. Finally, our study also shows that U.S. conventional security guarantees dampen public support for proliferation irrespective of how credible they are.

These results help advance the literature on the acquisition of nuclear weapons on two separate fronts. On the one hand, we provide empirical validation at the level of the individual to recent theoretical work positing that actors approach nuclear proliferation strategically, that is, by

attending to the interactions between a nuclear aspirant, her allies and her enemies (Monteiro and Debs 2014; Debs and Monteiro 2017). On the other hand, by providing the first experimental evidence on nuclear acquisition from Brazil – a relatively understudied case of nuclear latency –, we contribute to the effort currently ongoing in the scholarly community to make sense of how citizens outside the U.S. think through their nuclear choices (Sukin 2020a; Ko 2019).

The next section presents our theoretical expectations and hypotheses. We then lay out our experimental design before presenting results. The concluding section discusses our main findings and explores the implications that follow.

Theoretical Expectations

States do not acquire nuclear weapons lightly. Sensitive technologies are hard and expensive to develop, great-power patrons can turn against the proliferating plans of their weaker clients, and adversaries can attack a potential proliferator preemptively before their nascent capabilities become fully operational (Knopf 2012; Debs and Monteiro 2017). Given these proliferation costs, scholars have advanced three distinct but related points. First, they have argued that states living in benign external security environments have less incentive to proliferate than their peers in environments where security is scarce (e.g., Sagan 1996/1997; Jo and Gartzke 2007; Monteiro and Debs 2014). When an external threat exists, states determine “whether the threat is dire enough that the potential proliferator perceives nuclear weapons as yielding a security benefit in mitigating it” (Monteiro and Debs 2014, 20). Second, scholars argue that nuclear security guarantees from a powerful ally can attenuate the insecurity of states, incentivizing them not to proliferate (Monteiro and Debs 2014; Jo and Gartzke 2007; Bleek

and Lorber 2014; Tertrais 2012). And third, scholars discuss whether these nuclear security guarantees need to be credible in order to induce non-proliferation: the conventional wisdom has it that guarantees can substitute for proliferation only if they are credible (Jo and Gartzke 2007; Monteiro and Debs 2014; Sagan 1997; Singh and Way 2004), but recent experimental research has shown that high credibility guarantees might not in themselves be reassuring (Sukin 2020a).

In this article we draw inspiration from these arguments to experimentally test public support for proliferation in Brazil. To ensure the ecological validity of our experiment, we adapt the insights from the extant literatures to our specific context. Our first adaptation pertains to the nature of the external threat: rather than focus on a nuclear threat, we confront respondents to hypothetical scenarios where Brazil faces a *conventional* threat. The possibility of nuclear war has been rare in Latin America. Since the onset of the nuclear age, only one state in the region has ever confronted the prospects of nuclear war, and then only for a very short period (Cuba during the missile crisis of October 1962). By contrast, during the same time frame the region has seen numerous conventional conflicts (Mares 2012). Since a hypothetical survey scenario where Brazil confronts a nuclear threat may strike respondents as implausible, putting them off the questionnaire and thereby weakening the treatment effect, we built our scenario around a conventional threat. This said, we expect the following relationship:

H1: Public support for nuclear proliferation will be higher in environments where non-nuclear external security threats are acute compared to security environments where external threat are less intense or nonexistent.

Our second adaptation refers to the nature of the U.S. security guarantee. Whereas previous studies explore the role of *nuclear* security assurances and guarantees on demand for proliferation, our hypothetical scenarios feature *conventional* guarantees.[†] We do this to be consistent with the historical evolution of U.S.-Brazil security relations, a bilateral dynamic in which the offering by the U.S. of *nuclear* security assurances is exceedingly unlikely. Sticking to conventional security assurances has the additional advantage of allowing us to intervene in an important scholarly debate on the effects of security guarantees: can non-nuclear assurances ever work as an effective nonproliferation tool? The bulk of the extant literature either implies or posits that conventional security guarantees are incapable of convincing a nuclear aspirant to forgo nuclear weapons because conventional protection is too expensive and too inefficient a tool to cope with threats in a world where weapons of mass destruction exist (Bailey 1993). A recent quantitative study finds no evidence that conventional protection curbs proliferation motives (Reiter 2014). According to this line of reasoning, for security guarantees to be effective nonproliferation tools they need to extend a nuclear umbrella (Tertrais 2012). Yet, some scholars have questioned this view. For example, Bleek and Lorber (2014, 434) argue that the extension of a conventional military and diplomatic umbrella over Japan should be at least partially credited with inducing nuclear forbearance. Knopf (2012) in turn suggests that policymakers sometimes act as if conventional assurances can indeed reassure, as in the case of the George W. Bush administration in the wake of the terrorist attacks of Sept 11, 2001, which laid down the foundations for non-nuclear assurances in its Quadrennial Review and its National Security Strategy. Our findings help adjudicate this debate. To be sure, the downside of our choice to test the role of conventional rather than nuclear protection is that we lose comparability. After all, other experimental research in the field has focused specifically on

[†] In the analysis that follows we use the terms guarantee and assurance interchangeably. Unless otherwise noted, the expressions refer to the promise of protection from a security patron to a client state.

the effects on public sentiment of protection provided through nuclear umbrellas (Sukin 2020a; Ko 2019). We acknowledge this limitation, but hope to contribute to experimentally illuminating new phenomena (the effect of conventional protection) in the field of global nuclear politics. We therefore hypothesize:

H2: Given an acute non-nuclear external security threat, public support for proliferation will decrease in the presence of conventional security guarantees from a powerful ally compared to the absence of such guarantees.

Finally, we experimentally test whether conventional security guarantees provided by the U.S. need to be credible if they are to shape individual-level preferences over nuclear proliferation. By exploring whether the level of credibility of conventional patron protection is a deal breaker for nuclear forbearance, we expand the experimental literature beyond its current focus on the credibility of nuclear security guarantees.

H3: Given an acute non-nuclear external security threat, public support for proliferation will decrease in the presence of high credibility conventional security guarantees from a powerful ally.

H4: Given an acute non-nuclear external security threat, public support for proliferation will increase in the presence of low credibility conventional security guarantees from a powerful ally.

Experiment Design

We ran our survey experiment on a national sample of 2001 Brazilians in December 2019. Respondents were recruited by the Datafolha Institute, which used quotas (age, education,

gender, income, and region) to reflect the demographics of the Brazilian population.[‡] The experiment, shown in Figure 1 (Appendix Item 7), proceeded as follows. After participants consented to participate in the survey, they were asked standard demographic questions. We then administered the experimental portion of the study by telling participants they would be asked to read a hypothetical situation about their country's acquisition of nuclear weapons. They were then randomly split into seven groups, before responding to the outcome measure, that is, whether they support a hypothetical government decision to acquire nuclear weapons.

In the first three groups, respondents were presented with scenarios that varied information about the nature of the external security environment. In the first group (N = 288), respondents heard that Brazil “does not have an enemy country strong enough to threaten its security” (*No Threat*). They were then asked about their support for the acquisition of nuclear weapons. This group enabled us to determine the baseline public preference on nuclear proliferation. A second group (N = 284) heard that “a weak enemy country poses a major military threat to Brazil's security” (*Threat from Low-Power State*), and a third group (N = 285) heard that “a powerful enemy country poses a major military threat to Brazil's security” (*Threat from High-Power State*), before being asked whether or not they support the acquisition of nuclear weapons.

This first set of treatments results in three different ways of measuring support for proliferation by allowing comparisons between (a) the baseline and a scenario of ‘Threat from Low-Power State,’ (b) the baseline and a scenario of ‘Threat from High-Power State,’ and (c) the ‘Threat from High-Power State’ and ‘Threat from Low-Power State’ scenarios. In the comparison in item (c), the information about the level of power of the state posing the external threat is in

[‡] See items 1 and 2 in the Appendix for sample composition, sampling strategy, and balance tests.

practice working as a proxy for the significance of that threat. As a result, this piece of information is driving the treatment effect on support for proliferation.[§] Taken together, these treatment conditions capture how different external security environments – on a range from plentiful to scarce – yield differential effects on public support for proliferation (Hypothesis 1).

To increase experimental control over respondents' assumptions about the scenario of acute external insecurity, we informed a fourth group of respondents (N = 283) that Brazil faces a threat from a high-power state but lacks U.S. protection (“Consider that a powerful enemy country poses a major military threat to Brazil’s security. The United States says it will not protect Brazil”). We create this treatment because, without an explicit cue of the absence of an ally’s security guarantee, respondents might inadvertently assume that the U.S. would protect Brazil in the face of an external threat from a high-power enemy, potentially biasing our results. This strategy is in line with recent experimental research that highlights the importance of controlling for contextual factors that can affect beliefs about features of the scenario through “information leakage” (Dafoe et al. 2018).

To determine whether support for proliferation is affected by the presence of conventional security guarantees by a powerful ally (Hypothesis 2), we told a fifth group of respondents (N = 287), “Consider that a powerful enemy country poses a major military threat to Brazil’s security. The United States says it will protect Brazil” (*U.S. Conventional Security Guarantee*). We then asked respondents to indicate their level of support for the decision to proliferate. We

[§] Please note that the comparisons in items (a) and (b) differ in more than one respect by bundling together the level of threat and the type of country posing the threat, making it impossible for us to precisely identify which of these two factors is driving support for proliferation.

primed the U.S. as the powerful ally in the vignette to increase its external validity: the U.S. is the obvious choice of protector because it has for several decades been the sole hegemon in the region Brazil inhabits. In the event of a significant military threat to Brazil, it is plausible to expect the U.S. (rather than any other country) to boost its conventional security commitment to Brazil, thereby mitigating Brazil's potential disposition to nuclearize. Indeed, observational research has shown that a clear majority of Brazilians spontaneously identify the U.S. (51,29%) as a source of protection, with China trailing in the second position far behind (5.5%) (Spektor and Fasolin 2021). These figures attenuate potential concerns that respondents might perceive the choice of actor inconsistent with the treatment being manipulated, which could affect treatment effects (Brutger et al. *forthcoming*).**

Finally, the remaining respondents were assigned to treatments that sought to determine whether in a scenario of acute external threat posed by a powerful state, high-credibility conventional security guarantees by the U.S. affect support for proliferation compared to low-credibility guarantees (Hypotheses 3 and 4). To create propitious experimental conditions, we picked Brazilian government official expressions of trust in the U.S. security guarantee as a proxy for their level of credibility. National elites are in an advantageous position to shape public perceptions in national security matters in general (Myrick 2021), and in nuclear politics in particular (Herzog et al. 2022). Respondents assigned to the high credibility treatment (N = 284) heard, "Consider that a powerful enemy country poses a major military threat to Brazil's security. The U.S says it will protect Brazil, and the Brazilian government says it trusts this promise". Those assigned to the low credibility condition (N = 290) heard, "Consider that a

** One limitation of this treatment is that choosing the U.S. as the source of protection excludes the possibility that the U.S. might be the source of threat itself, complicating our ability to compare the 'U.S. Conventional Security Guarantee' scenario to the 'Threat from a High-Power State' scenario.

powerful enemy country poses a major military threat to Brazil's security. The U.S. says it will protect Brazil, and the Brazilian government says it does not trust this promise." After administering these vignettes, we asked participants whether or not they support a government policy to proliferate.

Experimental Results

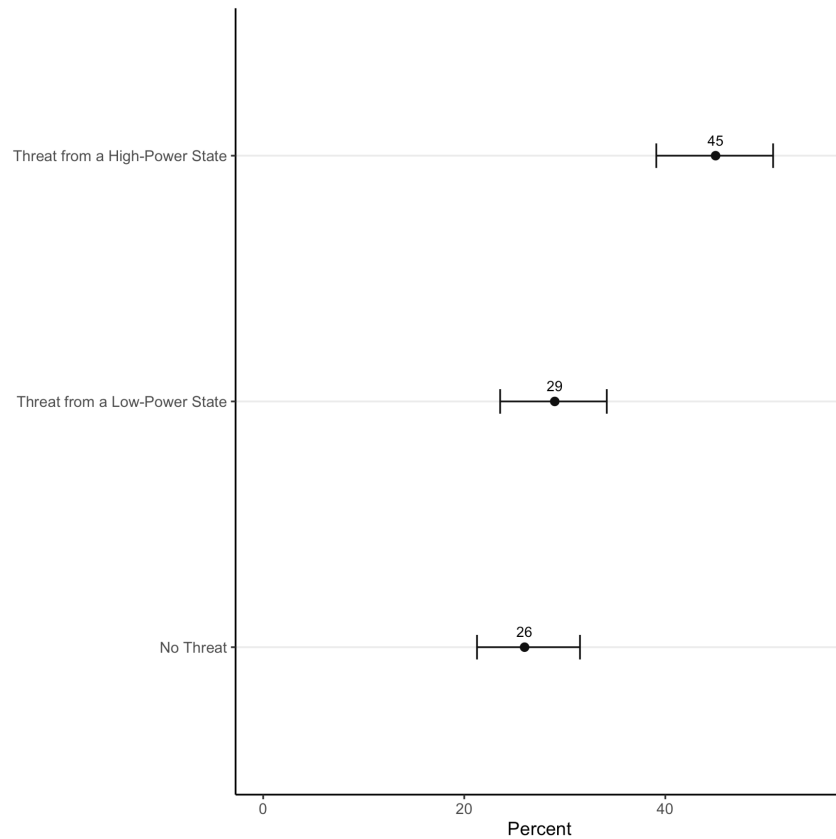
External Security Environments and Support for Proliferation

Figure 1 shows how individuals respond to three different types of external security environment: no threat, threat from low-power state, and threat from a high-power state. Overall, we find that when the external security environment deteriorates, moving from plentiful to scarcer security, public support for proliferation increases. More specifically, support for proliferation in the 'no threat' scenario is limited to a low minority of 26.4 percentage points of our sample. Low minority support is maintained in the 'threat from low-power state' scenario, albeit with a minor, statistically insignificant increase of 2.5 percentage points when compared to the 'no threat' scenario. By contrast, in the 'threat from a high-power state' scenario, support for proliferation is 18.7 percentage points higher than the baseline ('no threat' scenario), reaching a high minority of 45.1 percentage points. This result is statistically significant at $p\text{-value} < 0.01$ and it is robust to a number of control variables (Appendix Item 3.2). Results are stable when we change the baseline scenario of comparison: support for proliferation increases 16.2 percentage points ($p < 0.05$) when the source of threat changes from 'low-power state' to 'high-power state'.^{††} We therefore conclude in line with hypothesis

^{††} These results remain statistically significant after we apply a False Discovery Rate (FDR) correction: scenario of 'Threat from High-Power State' ($p < 0.01$) and scenario of 'Threat from a Low-Power State' ($p = 0.016$). For the full results of FDR correction tests, see Appendix Item 4.

1 that a deterioration in the external security environment markedly increases public support for nuclear proliferation in our sample.^{††}

Figure 1: *Support for Proliferation under Different Types of External Security Environment*



Note: The points are estimates and the horizontal bars are 95% confidence intervals.

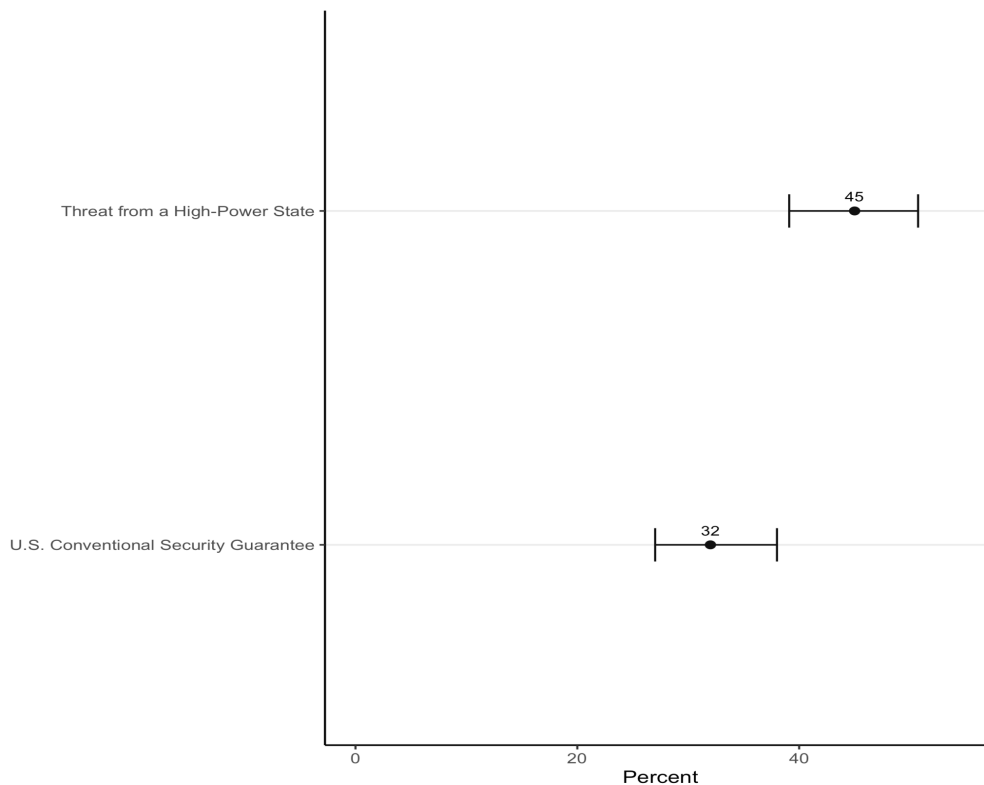
Support for Proliferation and U.S. Conventional Security Guarantees

Brazilians are sensitive to American promises of protection. When respondents confronting a threat from a high-power state hear that U.S. conventional security guarantees are in place, support for proliferation is 13.1 percentage points less popular than in an equally threatening scenario that lacks security guarantees from the U.S. (Figure 2). More specifically, the introduction of conventional security guarantees shrinks support for proliferation from 45.2

^{††} In Appendix Item 5 we present additional iterations of high-threat treatments with other specifications.

percentage points to 32.1 percentage points among respondents in this group of comparison. The effect is statistically significant at the $p < 0.05$ level and robust to a number of control variables (Appendix Item 3.2). Importantly, the significance of this result is maintained after we apply a False Discovery Rate correction ($p < 0.01$) (Appendix Item 4). Our experimental results therefore confirm hypothesis 2 on the effect of the presence of U.S. conventional security guarantees on public support for nuclear-weapon acquisition.

Figure 2: *Support for Proliferation with and without U.S. Conventional Security Guarantees*



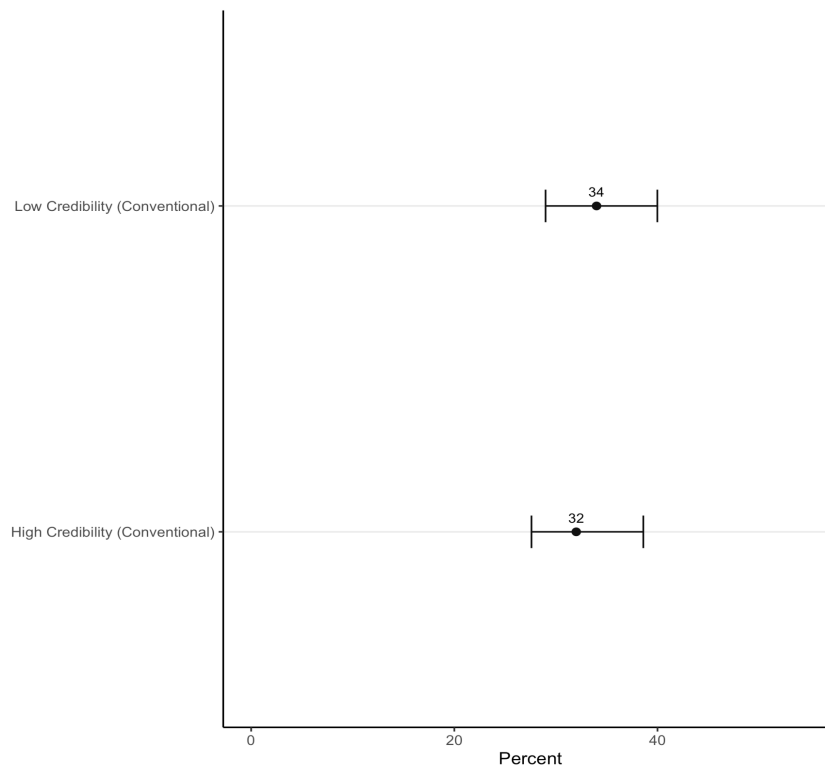
Note: The points are estimates and the horizontal bars are 95% confidence intervals.

Support for Proliferation and the Credibility of U.S. Conventional Security Guarantees

Conventional security assurances from the U.S. dampen Brazilians' support for nuclear proliferation irrespective of how credible they are. Different levels of credibility do not

moderate the critical effect of assurances on public demand for nuclear weapons. Average support for proliferation is only slightly higher (1.8 percentage points) in the low credibility scenario (34%) than in the high credibility one (32.2%), but these results are statistically insignificant at conventional levels ($p < 0.1$). These results therefore disconfirm hypotheses 3 and 4.^{§§}

Figure 3: *Support for Proliferation and the Credibility of U.S. Conventional Security Guarantees*



Note: The points are estimates and the horizontal bars are 95% confidence intervals.

^{§§} Simulations in the Appendix (Item 3.1, Table 12, Model 4) dispel the possibility that these findings are driven by lack of power in the experiment..

Conclusion and Discussion

The widespread availability of dual technologies among non-nuclear weapons states is a source of constant concern for those who fear that nuclear acquisition might have a destabilizing effect on world politics. As the international system becomes more competitive, scholars and policy-makers alike will have to grapple with the renewed prospects of nuclear proliferation. We used a survey experiment to investigate the core security dynamics that could affect public support for nuclear proliferation in Brazil, a highly latent nuclear state. The experimental results we report broaden our understanding of the proliferation process among latent nuclear states, offer important messages for the non-proliferation community, and suggest potentially valuable openings for future research.

First, a marked decline in international security may dramatically expand public support for the acquisition of nuclear weapons. We find that a deterioration in the external security environment – even when the nature of the threat is non-nuclear – drives support for proliferation from a low minority to a high minority of the Brazilian population, splitting the sample in two roughly equal camps, one supporting proliferation, another one opposing it. These findings are in line with a long-standing tradition in the study of nuclear politics that posits the centrality of security considerations in processes of nuclear-weapon acquisition (e.g., Sagan 1996/1997). The fact that acute external threats profoundly polarize domestic society over the development of a nuclear deterrent is worrisome because political leaders bent on proliferating might be emboldened to pursue nuclear weapons in the knowledge that a large minority of the public is likely to have their back. If hawkish minorities can be highly consequential for the decision to use nuclear weapons (Haworth et al. 2019), our findings suggest that they too can play a role in shaping up public sentiment around proliferation.

Second, it is time for policy-makers, scholars, and activists the world over to seriously explore the potential contribution of conventional security guarantees as a non-proliferation instrument. We find that conventional security guarantees provided by the U.S. in scenarios of acute insecurity can be valuable tools to help large pro-proliferation minorities dissipate. This is not to suggest that the conventional wisdom in the scholarly and policy communities according to which conventional security guarantees are ill-equipped to reassure non-nuclear weapons states is wrong. Rather, our findings suggest that it might be incomplete. Security commitments from the United States may have different effects on public demand for nuclear weapons under different external security conditions. That American conventional security guarantees reassure citizens in a protégé confronting acute but non-nuclear threats should give us pause and prompt us to find out whether these dynamics from Brazil travel elsewhere.

Third, the level of credibility of U.S. security guarantees does not shape demand for proliferation in a context marked by conventional threats and conventional protection. We show that low credibility guarantees by the U.S. do not in themselves drive support for proliferation, while high credibility guarantees are not in themselves reassuring. What the explanation for our findings might be remains unclear. It might be the case that leaders in the U.S. and other major powers are able to communicate with mass publics in their protégés without the mediating endorsement of local authorities, echoing empirical research showing that leaders can be effective cue givers to public opinion in general (Hayes and Guardino 2011) and in issues pertaining to nuclear politics in particular (Herzog et al. 2022). Alternatively, it might be the case that our results are driven by low levels of public trust in Brazilian government authorities.^{***} To test the robustness of our findings, future work could test

^{***} Datafolha Institute. 2019. “Grau de confiança nas instituições”.

<http://media.folha.uol.com.br/datafolha/2019/07/10/9b9d682bfe0f1c6f228717d59ce49fdpci.pdf>

endorsement by domestic players who are held in higher esteem by the public, such as the Armed Forces.

Moving forward, scholars should also strive to fill the voids our experimental design has left behind. Our contribution to the understanding of public support for proliferation in this research note is limited by the fact that we do not experimentally vary the behavior or the identity of the threat. For example, we could have created a scenario in which the source of external threat has the capacity to preemptively strike Brazil's existing nuclear facilities in anticipation of a decision to proliferate. We could have also introduced a scenario in which the source of external threat is a nuclear-weapons state. Furthermore, our design did not include an assessment of how publics might react to the information that any indigenous nuclear-weapon program might incur in sanctions, abandonment, or a preventive attack from the U.S.. Experimental work in the future should add these variations with a view to induce respondents to more clearly take into account the costs of proliferating.

Together, these results help advance our stock of knowledge on the political processes behind the acquisition of nuclear weapons. They provide empirical validation at the level of the individual to recent theoretical work positing that actors approach nuclear proliferation strategically, engaging in calculations typical of rational choice (Monteiro and Debs 2014; Debs and Monteiro 2017). Members of the public confronting the option to proliferate gauge whether their adversaries pose a dire threat or not, and they estimate whether a powerful ally can provide them with a modicum of protection. Whether a domestic public coalition forms in favor of nuclear weapon acquisition or not depends on the dynamics of conflict and cooperation among a country's rivals and patrons. Crucially, neither threat or protection have to be nuclear in order to trigger the dynamics we describe. Armed with the experimental insight that mass

publics are capable of thinking strategically about nuclear acquisition, the evolving research program on the micro-foundations of support for nuclear proliferation has the potential to contribute to a future world where the spread of nuclear technologies may well be unavoidable, but the spread of nuclear weapons need not be.

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