

# What shapes public preferences over nuclear proliferation? Experimental evidence from Brazil

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## Abstract

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. We find that individuals approach nuclear proliferation strategically: when external security is plentiful, only a small minority of the public supports proliferation, but a deterioration of conditions making security scarce engenders a high minority in support for nuclear weapon acquisition. Crucially, and in contrast to previous experimental findings in the literature, the provision of security assurances by the United States does dampen support for a deterrent, restoring a majority view opposing proliferation. American security assurances in our study shape public preferences irrespective of how credible they are. Together, these results carry important implications in an era of renewed security competition and at a time when domestic polarization may embolden pro-proliferation leaders in their pursuits.

## 1 Introduction

In this research note 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 (Sagan and Valentino 2017; Carpenter and Montgomery 2020; Sukin 2020b; Allison et al. *Forthcoming*). 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 around 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). We therefore tackle three sets of issues. First, we explore whether and how changes in the external security environment drive public preferences in nuclear latent states. Second, we ask whether the provision of security assurances by the United States helps mitigate public support for proliferation in scenarios of security scarcity. Third, we explore whether local elite trust in the credibility of U.S. security assurances affects public attitudes toward proliferation.

We address these questions using a survey experiment in a national sample in Brazil. Our survey respondents are presented with scenarios that vary information about levels of external security threat, the presence or absence of U.S. security guarantees, and the presence or absence of government expressions of trust in such guarantees. Respondents are then asked whether they support nuclear weapons acquisition. We consider Brazil 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. The country has 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). Nuclear-technology capabilities have coexisted with heated domestic contention around nuclear choices for decades, reinforcing the plausibility of a scenario in which the decision to explore nuclear-weapon acquisition is made (Spektor 2016; 2019). Contemporary Brazil is a particularly good case for experimental treatment 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). Furthermore, Brazil is a good setting to test the effect of U.S. protection because the country has for generations lived under the shadow of U.S. hegemony in the Western Hemisphere. At least since World War II and the Rio Pact that embedded it in the U.S. alliance system in 1947, Brazil’s main source of protection against potential or actual hostile powers has been the United States. Together, these features allow

for great variation on our dependent variable of interest – i.e., support among mass publics for an indigenous nuclear deterrent. This study contributes to the effort currently unfolding in the scholarly community to make sense of how citizens outside the United States think through issues of nuclear proliferation, particularly in advanced nuclear latent states (Sukin 2020a; Ko 2019). To the best of our knowledge, ours is the first experimental data on nuclear politics from Brazil – an understudied case of nuclear latency.

We obtain three sets of results. First, we find empirical backing for the long-standing theoretical intuition that support for nuclear proliferation turns on the nature of the external security environment (Sagan 1996/1997): in our experimental setting, when international security is plentiful, support for proliferation is limited to a low minority of the public (26,4%). However, a turning of the tide that leads the public to believe international security is scarce expands the pool of individuals who support nuclear-weapon acquisition to a high minority of the public (45,1%), polarizing domestic society. Second, however, in a scenario where security is scarce the provision of U.S. protection markedly shrinks domestic support for proliferation (32,1%). In showing that security guarantees operate as a substitute for proliferation, this study goes into the opposite direction of recent experimental literature on the relationship between U.S. security assurances and nuclear proliferation. By looking at the case of South Korea, this literature has called into question the notion that U.S. protection improves the odds of nuclear forbearance (Sukin 2020a; Ko 2019). While research design choices prevent us from making direct comparisons with those findings, our results suggest that the scope conditions that apply in South Korea might not apply elsewhere.

Third, in our study U.S. security assurances have a dampening effect on public support for proliferation irrespective of whether their representatives attest to the credibility of U.S. assurances or not. This is in line with the finding from Sukin (2020a) on South Korea according to which high-credibility guarantees may not be reassuring. Furthermore, the finding that U.S. security assurances shape public preferences without the mediation of local government officials suggests political leaders in nuclear latent states may have a hard time manipulating domestic-audience beliefs and expectations about the utility of a nuclear deterrent.

Overall, our findings provide empirical validation at the level of the individual to recent theoretical work positing that actors approach nuclear proliferation strategically (Debs and Monteiro 2017). The results we advance therefore sound a cautionary note to the notion typical of

behavioral IR according to which individual-level behavior departs from the logic of rational choice (Hafner-Burton et al. 2017).

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.

## 2 Theoretical Expectations

States do not acquire nuclear weapons lightly. Not only are sensitive technologies hard and expensive to develop, but great-power patrons can turn against the proliferating plans of their weaker clients as much as adversaries can attack a potential proliferator preemptively before nascent capabilities become fully operational (Knopf 2012; Debs and Monteiro 2017). Under such conditions, scholars have argued that states living in benign external security environments have less incentive to pursue nuclear weapons than their peers confronting major security threats (Sagan 1996/1997; Jo and Gartzke 2007; Bleek and Lorber 2014). Following the same logic, previous research has also argued that states confronting major threats will be less inclined to proliferate if and when a powerful ally offers them credible protection to attenuate the insecurity (Bleek and Lorber 2014; Debs and Monteiro 2017; for contrasting arguments, see Jo and Gartzke 2007). While the bulk of the literature focuses on nuclear threats and the provision of nuclear-umbrella protections, here we test whether these dynamics apply to settings where both threats and protection might be conventional. To create the conditions for our experimental test, we hypothesize that these logics operating at the level of the state will also obtain at the level of the individual.

**[H1:]** Public support for nuclear proliferation will be higher in the presence of a high-security threat than in the absence of such a threat.

**[H2:]** Given a high-security threat, public support for proliferation will decrease in the presence of security guarantees from a powerful ally compared to the absence of security guarantees.

Do security guarantees have to be credible in order to shape public preferences? To find an answer, we assume that the credibility of foreign security guarantees turns at least to an extent on the attitude of national authorities. National elites, after all, 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). National authorities in a nuclear aspirant might seek to influence public preferences for nuclear proliferation by either expressing trust or mistrust in a patron's security assurances. A Brazilian leader bent on developing nuclear weapons might, for instance, publicly question the credibility of U.S. security guarantees in an attempt to rally public support for her endeavor. We therefore hypothesize:

[H3:] Given a high-security threat, public support for proliferation will decrease in the presence of government expressions of trust in the security guarantees of a powerful ally.

[H4:] Given a high-security threat, public support for proliferation will increase in the presence of government expressions of mistrust in the security guarantees of a powerful ally.

### 3 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.<sup>1</sup> 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 respond to a hypothetical situation about their country's acquisition of nuclear weapons. Finally, respondents were randomly split into seven groups before responding to the outcome measure.

In the first group (N = 288), respondents heard that Brazil “does not have an enemy country strong enough to threaten its security” (*no security threat scenario*). They were then asked about their support for the acquisition of nuclear weapons. This treatment 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” (*low-security threat scenario*), and a third group (N = 285) heard that “a powerful enemy country poses a major military threat to Brazil's security” (*high-security threat scenario*), before being asked whether or not they support the acquisition of nuclear weapons. In these scenarios the threat is conventional rather than nuclear. Although by doing this we depart from the bulk of the scholarly literature which focuses

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<sup>1</sup>See items 1 and 2 in the Appendix for sample composition, sampling strategy, and balance tests.

on nuclear rather than conventional threats, our choice makes sense for reasons of ecological validity. A hypothetical scenario where Brazil confronts a nuclear threat would be so implausible that respondents might be put off by the experiment. Indeed, only once since the onset of the nuclear age has a nation in Latin America confronted the possibility of a nuclear attack (Cuba during the missile crisis of October 1962). At the same time, our choice of wording creates a hard test for our study: if conventional threats succeed to induce support for proliferation, then it is reasonable to expect the hypothetical mention of nuclear threats to intensify such an effect. Overall, this first set of treatments results in three different ways of measuring support for proliferation by allowing comparisons between the baseline and a low-threat scenario, the baseline and a high-threat scenario, and the high- and low-threat scenario. We acknowledge that these treatments differ in more than one respect by bundling together the level of threat and type of country that poses the threat, making it impossible for us to precisely identify which of these factors is driving support for proliferation. Despite this design limitation, we are still able to capture how different external security environments on a scale from plentiful to scarce yield differential effects in support for proliferation.

To increase the experimental control over the respondents' assumption about the scenario of acute external insecurity, we informed a fourth group of respondents (N = 283) that Brazil faces a scenario of high threat without the protection from a powerful ally ("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, in a condition of high threat without an explicit cue of the absence of ally protection (the condition of the third group), many respondents might inadvertently assume that a powerful ally would protect the country in such a scenario, potentially biasing our results. More generally, 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 protection of a powerful ally, 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. protection scenario*). We then asked respondents to indicate their level of support for the decision to proliferate. We primed the United States as the powerful ally in the vignette to increase its external

validity: the United States 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 United States rather than any other country to boost its security commitment to Brazil, thereby mitigating Brazil's potential disposition to nuclearize. Indeed, in a separate study two of us fielded an observational question asking what country would most likely act as Brazil's security patron: a clear majority spontaneously chose the United States (51,29%), with China trailing in the second position far behind (5.5%) (Spektor and Fasolin 2021). This empirical finding attenuates potential concerns that respondents perceive the choice of actor inconsistent with the treatment being manipulated (Brutger et al. *Forthcoming*).<sup>2</sup> We acknowledge that our choice of wording does not specify whether the nature of the American protection is conventional or nuclear, thereby limiting our ability to measure the distinctive effects of each type of protection.

Finally, the remaining respondents were assigned to treatments that sought to determine whether in a scenario of acute external insecurity, expressions by Brazil's government of trust in the American security guarantee affect support for proliferation. Government trust in the U.S. security guarantee in this case is an index of the guarantee's credibility. Respondents assigned to the trust treatment (N = 284) heard, "Consider that a powerful enemy country poses a major military threat to Brazil's security. The United States says it will protect Brazil, and the Brazilian government says it trusts this promise". Those assigned to a mistrust condition (N = 290) heard, "Consider that a powerful enemy country poses a major military threat to Brazil's security. The United States says it will protect Brazil, and the Brazilian government says it does not trust this promise." After administering these vignettes, we asked participants whether they support a government policy to proliferate or not.

## 4 Experimental Results

### 4.1 External Security Environment and Support for Proliferation

Figure 1 shows how individuals responded to three different levels of external security threat: no threat, low threat, and high threat. Overall, we find that when levels of external threat grow

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<sup>2</sup>One limitation of this treatment is that choosing the U.S. as the source of protection excludes the possibility that the United States is the source of threat itself, complicating our ability to compare the 'U.S. protection' scenario to the 'high threat' scenario.

markedly, support for proliferation also increases. More specifically, support for proliferation in the ‘no threat’ scenario is limited to a low minority of 26.4%. In the ‘low threat’ scenario, low minority support for proliferation was maintained with a minor, statistically insignificant increase of 2.5 percentage points when compared to the no-threat scenario, reaching 28.9%. Conversely, in the ‘high threat’ scenario, support for proliferation is 18.7 percentage points higher than the baseline (‘no threat’ scenario), reaching a high minority of 45.1%. This result is statistically significant at  $p$ -value  $< 0.01$ , and it is robust to a number of control variables (Appendix Item 3.2). Results were also stable when we changed the baseline scenario of comparison: support for proliferation rose 16.2 percentage points ( $p < 0.05$ ) when levels of security moved from the ‘low threat’ to the ‘high threat’ scenario.<sup>3</sup> We therefore conclude in line with hypothesis 1 that a deterioration in the external security environment markedly increases public support for nuclear proliferation in our sample.<sup>4</sup>

## **4.2 U.S. Security Guarantees and Support for Proliferation**

Our experimental results confirm hypothesis 2 on the effect of U.S. security assurances on public support for nuclear-weapon acquisition. As Figure 2 shows, when respondents heard that American protection was in place in a context of high threat, support for proliferation was 13.1 percentage points less popular than in the baseline scenario of comparison (‘high threat’). Security assurances from the United States shrink support for proliferation from 45.2% to 32.1% among respondents in this group of comparison. The effect was 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 was maintained after we applied a False Discovery Rate correction ( $p < 0.01$ ) (Appendix Item 4).

## **4.3 Government Trust in U.S. Security Guarantees and Support for Proliferation**

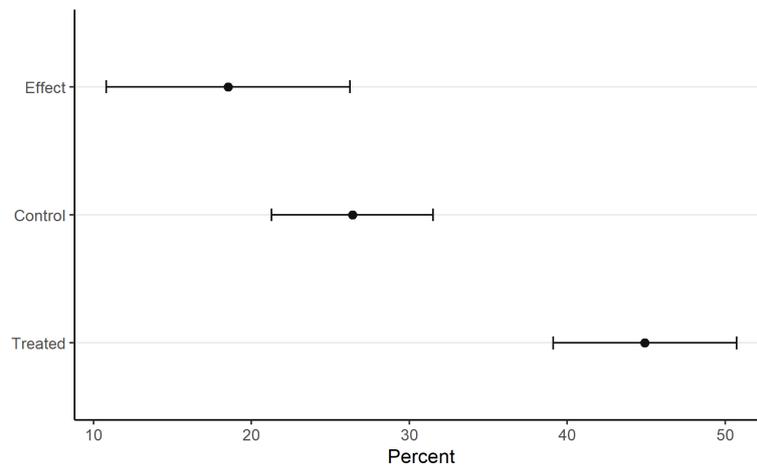
Finally, we estimate whether the effect of U.S. protection on public support for proliferation is moderated by Brazil’s government indication of credibility of such assurance. Figure 3 shows that the presence or absence of government trust in U.S. promises of protection in a ‘high threat’ scenario

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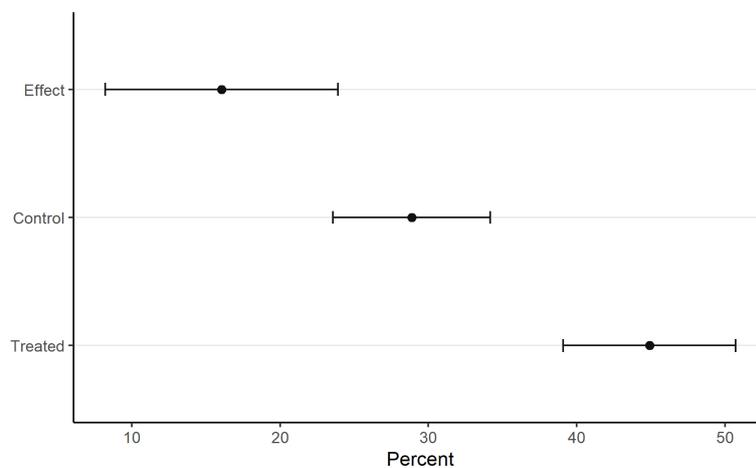
<sup>3</sup>These results remain statistically significant after we apply a False Discovery Rate (FDR) correction: high-threat scenario ( $p < 0.01$ ) and low-threat scenario ( $p = 0.016$ ). For the full results of FDR correction tests, see Appendix Item 4.

<sup>4</sup>Appendix Item 5, we present more iterations of high threat treatments with other specifications.

**Figure 1: Estimated Effect of Level of External Security Threat on Support for Proliferation**



**(a) High Security Threat vs No security Threat**



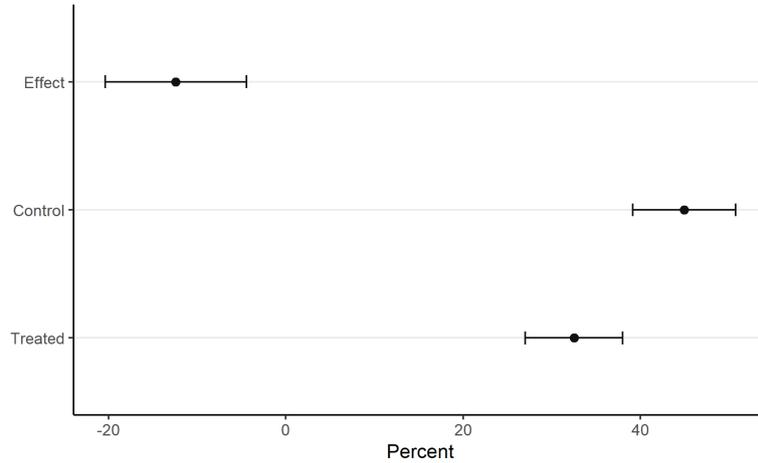
**(b) High Security Threat vs Low Security Threat**

*Note:* In Panel 1a the control group is “No Security Threat”, and in Panel 1b the control group is “Low Security Threat”. In both panels the treatment group is “High Security Threat”. The points are estimates and the horizontal bars are 95% confidence intervals.

does not affect public attitudes in any significant way. Average support for proliferation is only slightly higher (1.9 percentage points) in the absence of government indication of trust (34%) than in its presence (32.2%), but these results are statistically insignificant at conventional levels ( $p < 0.1$ ). These results therefore disconfirm hypotheses 3 and 4.<sup>5</sup>

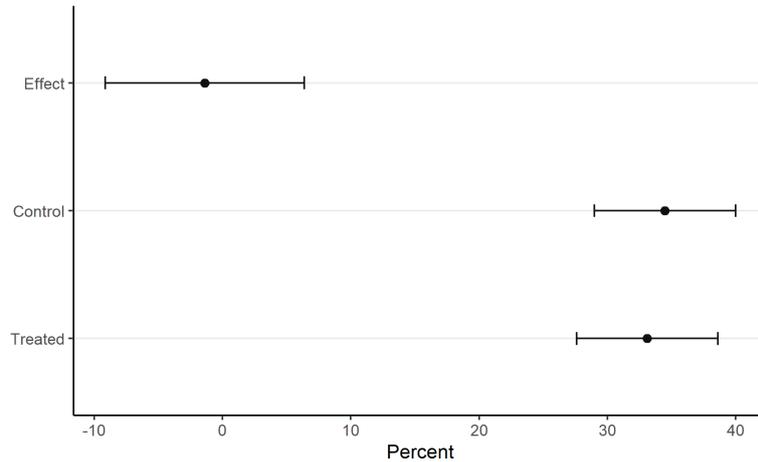
<sup>5</sup>Our simulations confirm that these results are not because the survey is underpowered. See Appendix Item 3.1 (Table 13, Model 4) for simulations.

**Figure 2: Estimated Effect of U.S. Security Guarantees on Support for Proliferation**



*Note:* The control group is “High Security Threat”, and the treatment group is “High Security Threat and U.S. Protection”. The points are estimates and the horizontal bars are 95% confidence intervals.

**Figure 3: Estimated Effect of Gov. Trust in U.S. Security Guarantees on Support for Proliferation**



*Note:* The control group is “High Security Threat and U.S. Protection without Government Trust”, and the treatment group is “High Security Threat and U.S. Protection with Government Trust”. The points are estimates and the horizontal bars are 95% confidence intervals.

## 5 Discussion, Implications, and Future Research

Although research on the role of public opinion in nuclear politics is expanding fast, we still know little about how citizens think about nuclear proliferation outside the United States. Given the widespread availability of dual technologies across non-nuclear weapons states, it is important to explore the conditions under which national publics might come out in support for nuclear acquisition. In this research note, we used a survey experiment to investigate the core security dynamics that could affect the public support for nuclear weapons acquisition in Brazil - a highly latent nuclear state. The experimental results we report significantly broaden our understanding of

the proliferation process among nuclear threshold states.<sup>6</sup>

The first set of results in this study suggests that changes in the external security environment shape public support for nuclear proliferation. While our experimental design does not allow us to disentangle the degree to which effects are caused by the source of the threat or the intensity of that threat, our 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 (Sagan 1996/1997). A marked deterioration in the external security environment drives support for proliferation from a low minority to a high minority of the population, splitting the sample in two roughly equal camps – one supporting proliferation, another opposing it. This 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 has their back. Previous research shows, for example, that hawkish minorities can be highly consequential for the decision to use nuclear weapons (Haworth et al. 2019). In the case of Brazil, it is plausible to imagine a scenario of deep social polarization where leaders chose to side with a high pro-proliferation minority as much as a scenario where a pro-proliferation leader tries to energize a minority to legitimize her plans. A caveat applies to this first set of results. In this study, we focused exclusively on conventional rather than nuclear military threats. The downside of this choice is that we cannot fully compare our findings to those of the extant literature, which has by and large focused on nuclear threats alone. The upside of this choice is that we add to the literature by accounting for nuclear latent states that do not confront a nuclear threat.

Our second set of results points to the role that protection from the United States has on hindering public support for nuclear proliferation. We found that the availability of U.S. protection markedly mitigates such support, making the large pro-proliferation minority dissipate. The implication is that the effect of U.S. protection on public preferences for proliferation is highly consequential since it makes it more difficult for pro-proliferation leaders and individuals across society to build social legitimation for a nuclear-weapons program. Under conditions of acute external insecurity, promises of protection by the great powers can be a valuable non-proliferation tool in a world where protégés may lack nuclear weapons but possess sensitive nuclear technologies. Our finding also implies that citizens make up their minds about the desirability of acquiring

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<sup>6</sup>For a summary of main findings and its connection with the theoretical expectations outlined in the manuscript, see Appendix Item 6.

nuclear weapons by assessing the dynamics of protection and abandonment that are typical of patron-protégé relationships (Debs and Monteiro 2017).

Our finding connecting U.S. security assurances to a reduction in support for nuclear-weapon acquisition is relevant because it points in the opposite direction of recent experimental research. Scholars focusing on South Korea have found cause to question the notion that patron protection always improves the odds of nuclear forbearance, albeit for different reasons and through different mechanisms. Ko (2019), for example, finds that the dampening effect of U.S. security assurances on support for nuclear weapons is heterogeneous across different social groups. In her turn, Sukin (2020a) shows that U.S. security assurances can backfire: American protection may awaken public feelings of entrapment when individuals fear the United States may precipitously escalate a conflict or may even use nuclear weapons in an unnecessary preventative attack. Under such circumstances, U.S. security assurances might counterintuitively incentivize mass publics to support for nuclear weapons acquisition. Although our research design does not allow for a systematic comparison with the South Korea case (because we excluded the possibility that the source of the threat is the United States itself and because we did not specify whether U.S. protection would be dispensed through nuclear or conventional means), the differences in the direction of findings are significant. More specifically, they raise the issue of scope conditions, that is, the boundaries determining the types of empirical phenomena to which theory applies. It might be the case that the effects of U.S. protection turn on whether threat environments are marked by the possibility of nuclear war or not. Or it might be the case that the impact of American protection turns on whether the nature of protection is nuclear or conventional. These are questions that future research will have to address.

Our third set of findings – that American security assurances dampen support for proliferation independent of the protégé government's trust in such assurances – suggest that the credibility of security guarantees might not be critical in shaping public preferences for proliferation. The implication of our finding is that high-credibility guarantees by the United States are not in themselves reassuring, while low-credibility guarantees are not in themselves driving support for proliferation. In a previous study on South Korea where high-credibility guarantees are not reassuring, Sukin (2020a) offers two explanations: feelings of entrapment in the face of potential nuclear war and widespread aversion to the use of nuclear weapons. In the case of Brazil, these mechanisms are unlikely to carry much explanatory weight, given the conventional nature of both

threat and protection. What the explanation for our findings might be, however, remains unclear. It might be the case that expressions of trust by the sitting government have no effect on public appraisals of the American commitment due to dismal levels of public trust in politicians and domestic political institutions. Indeed, previous survey work has shown Brazilians to profoundly distrust their authorities, raising the possibility that expressions of government trust in U.S. security guarantees fail to affect how individuals perceive American security commitments in the first place.<sup>7</sup> To test these ideas, future work could assess the effect of expressions of trust in U.S. security protection by players whom mass publics hold in high esteem (e.g. the Armed Forces).

An important implication that follows from our experiment is that elites who govern protégé societies that count on U.S. protection may be curtailed in their ability to manipulate public preferences for nuclear proliferation. If this is indeed the case, leaders in the United States and other major powers may be able to communicate with mass publics in their protégés with a view to enhancing the odds of nuclear forbearance. This implication echoes empirical research in public opinion (Hayes and Guardino 2011) and nuclear politics (Herzog et al. 2022) showing that leaders (including foreign leaders) can be effective cue givers.

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 (including the United States), and a scenario in which the nature of U.S. protection varies between nuclear and conventional. 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 United States. 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.

Taken as a whole, this study finds that individuals confronting the option to proliferate engage in calculations typical of rational choice. They gauge the type of threat their adversaries pose and

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<sup>7</sup>Datafolha Institute. 2019. "Grau de confiança nas instituições". <http://media.folha.uol.com.br/datafolha/2019/07/10/9b9d682bfeof1c6f228717d59ce49fdci.pdf>.

they estimate whether a powerful ally can provide their home state with protection. Whether a domestic public coalition forms in favor of nuclear weapon acquisition or a majority forms to forgo nuclear weapons depends on the dynamics of conflict and cooperation among a country's rivals and patrons. 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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