

How Geopolitical Competition and Commercialization

Shape Public Support for Space Funding

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ABSTRACT

The space sector has remained central to geopolitics since the Cold War, leading to substantial public space budgets worldwide. This study investigates how citizens' support for public space funding is influenced by geopolitically comparative rhetoric—specifically, comparing public space funding to that of geopolitical adversaries—and the increasing importance of new space companies. We collected data from 2,139 citizens from the nine most important spacefaring countries. We discover that information about public space funding from geopolitical adversaries significantly reduces support for national space budgets by nine percentage points. Most citizens show no preference for traditional space agencies over private companies, except in the U.S., where mentioning new space companies instead of NASA leads to a statistically significant decrease in approval of national space funding by 27 percentage points. The findings caution policymakers against using comparative rhetoric, as it may inadvertently reduce citizens' support for public space funding. In contrast, U.S. space stakeholders should be cautious, because public distrust in commercial space companies may reduce public support for higher space budgets.

Keywords: Geopolitics, Space Race, New Space, Public Economics, Contest Theory

“This spaceship [...] came down so gently and then it wrapped those arms around it [...] I said, ‘Who else can do that? Can Russia do it?’ ‘No.’ ‘Can China do it?’ ‘No.’ ‘Can the United States do it? Other than you [Elon]?’ ‘No, nobody can do that.’”

Donald Trump, on the successful catch of a Starship rocket, in his election victory speech (November 6, 2024)

INTRODUCTION

Political leaders around the world are increasingly justifying rising public space funding by framing it as essential for maintaining global competitiveness with geopolitical adversaries. However, it remains uncertain whether this “geopolitically comparative rhetoric” effectively persuades citizens to support increases in national space budgets (Grimard, 2012). Research has shown the perils of such rhetoric, given its potential to induce xenophobia (Gerber, 2014), hinder mutually beneficial cooperation (Gottfried & Trager, 2016) and increase audience costs in conflicts (Leventoğlu & Tarar, 2005). Beyond continued (geo)politicization, space has also undergone increased commercialization in recent years, with private companies now possessing space capabilities formerly exclusive to states. This study examines how geopolitically comparative rhetoric and rising commercialization in the space sector influence citizens’ approval of public space funding, a key factor in the implementation of future space projects.

Citizens’ support for public space funding is critical for countries seeking to project

geopolitical power through space capabilities (Steinberg, 2011). However, when federal budgets have to be trimmed, citizens often list space programs as among the first public programs they would like to be cut (Launius, 2017). Political leaders are therefore increasingly relying on comparisons with geopolitical adversaries to garner support for larger national space budgets. The current increase in attention to space, along with rising governmental budgets and geopolitically comparative rhetoric, is reminiscent of the Space Race of the 1960s (Grimard, 2012; Vanleynseele, 2022). Lyndon B. Johnson’s remark: “Failure to master space means being second best in every aspect [...]” (Hirsch & Trento, 1973: 107), remains relevant today, as space dominance continues to signal superpower status. Accordingly, emerging superpowers like China and India invest heavily in space (Launius, 2003), fueling the narrative of a new space race against established Western powers.

Ultimately, the Space Race of the twentieth century was decided not by military confrontation, but by economic perseverance. Under the strategic leadership of space agencies, a small group of aerospace conglomerates carried out large-scale contracts where innovation capabilities were prioritized over costs (Erickson, 2018). Although these aerospace and defense conglomerates were already considered geopolitical assets, space agencies like NASA remained central to their growth (Gregg, Stein, & Dawsey, 2020; Turkel, 1981). Today, however, the private sector has shaken up the space industry (Hornuf & Vrankar, 2025; Manotti, Cavallo, Ghezzi, & Rangone, 2021). U.S. companies

such as SpaceX sparked this transformation, with “new space” companies worldwide now possessing capabilities formerly exclusive to states. For example, as a quasi-monopolist in the rocket launch market, SpaceX can control the schedule for military satellite launches and has actively intervened in the Ukraine war through its Starlink communications network (Maidenberg, 2025; Roulette, Bryan-Low, & Balmforth; Schwartz, Ramachandra, & Maidenberg, 2025). Most new space companies nevertheless continue to rely on governmental entities as anchor customers or seed investors and are therefore ultimately sustained on public funding (de Concini & Toth, 2019).

Given the importance of public opinion regarding public space funding, both for politicians and executives of space companies, this study investigates two research questions:

***RQ1.** How does citizens’ approval of an increase in the national space budget change if they are presented with geopolitically comparative rhetoric?*

***RQ2.** How does citizens’ approval of increasing the national space budget change when tax revenue is allocated directly to private companies rather than public space agencies?*

To identify the effect of geopolitically comparative rhetoric in RQ1, one must correct for the information effect of the national space budget itself. Given prior findings on the positive effect of information treatments about national space budgets (Steinberg, 2013), we examine the isolated impact of providing citizens only with information on their nation’s public space funding.

To answer our research questions, we conducted a survey experiment with 2,139 citizens from the nine most heavily invested spacefaring countries: China, France, Germany, India, Italy, Japan, Russia, the UK, and the U.S. Participants were randomly assigned to one of five experimental conditions: one control condition and two treatments, with each of the treatments containing two separate experimental conditions. Through Treatment 1, we examine how geopolitically comparative rhetoric influences citizens’ support for public space funding. With Treatment 2, we analyze how commercialization affects citizen opinion on public space funding. For both treatments, we analyze the stated and revealed preferences of participants.

Our analysis of geopolitical competition and commercialization yields two surprising findings regarding public approval of national space budgets. First, citizens are 9 percentage points less likely to advocate an increase in the national space budget after being confronted with geopolitically comparative rhetoric (i.e., information about their national and adversaries’ space budgets). Even after accounting for political orientation, space policy preferences, and variations in the amount of public space funding, our findings related to RQ1 remain robust. As we demonstrate, government officials are unlikely to persuade citizens to support increases in the national space budget through the use of geopolitically comparative rhetoric, while still potentially inducing xenophobia and reducing the likelihood of international cooperation (Gerber, 2014; Gottfried & Trager, 2016). Politicians and aerospace managers should

therefore refrain from using this kind of comparative rhetoric in advocating for expansions of national space budgets. This discovery points the way for future research to investigate the effect of geopolitically comparative rhetoric across various non-space domains. Is the space sector uniquely prone to such a counterintuitive effect? Might comparable reductions in public approval arise in other geopolitically contested sectors like defense, AI, or semiconductors that also partially rely on public funding or subsidies (Mak, 2025; Volcovici & Renshaw, 2025)?

Second, across eight countries, citizens' support for an increase in the national space budget is not influenced by whether government agencies or private companies conduct space activities. However, in the U.S., the country with the largest commercial space sector, citizens are 27 percentage points less likely to favor an increase in the national space budget when private companies instead of legacy governmental agencies are mentioned as direct recipients of these funds. Our 2023 survey data may signal the onset of a negative "Musk effect": even though we refrained from using explicit company names, left-leaning participants were significantly less likely to support funding increases to private space companies in our incentivized measure. This is remarkable for two reasons. First, Musk's official endorsement of Trump on July 13, 2023, which alienated many Democrats, had not yet taken place when we collected our data, suggesting the effect may be even stronger today (Axios, 2025; Endres, Green, & Panagopoulos, 2025). Second, our findings indicate that negative views of prominent figures in the new space industry may impact

not just their own companies, but the entire sector.

Unlike other studies on privatization (Galiani, Gertler, & Schargrotsky, 2005; Gupta, 2005; Megginson, Nash, & van Randenborgh, 1994), we do not focus on the economic outcomes of privatization, but rather contribute to the understanding of how privatization is perceived by citizens (Di Tella, Galiani, & Schargrotsky, 2012; Legge & Rainey, 2003). Strikingly, our results suggest that while the U.S. space agency NASA is leading the shift to a market-creating, service-based procurement model (Mazzucato & Robinson, 2018; Robinson & Mazzucato, 2019), the agency has yet to persuade citizens that delegating more and more responsibilities to private companies is the right approach for governments. When lobbying for funding, U.S. space industry executives should be mindful of this public bias against new space startups. Given that private space companies challenge the geopolitical role of governments, our finding that citizens in all eight of the other countries are indifferent to the involvement of public or private entities adds to research on the evolving role of national space agencies (Do, Nguyen, Nguyen, & Truong, 2023; Klein, 2024; Mazzucato & Robinson, 2018).

Finally, as a methodological contribution to future research, we present survey measures related to the space industry that we experimentally validate and which predict incentivized field behavior.

RESEARCH SETTING

Public opinion on the space sector has been and continues to be highly idealized. Many recall widespread space euphoria in the U.S. during the 1960s (Launius, 2003). In reality, space enthusiasm existed only during and shortly after the first Moon landing in 1969, a phenomenon fittingly coined “Apollo nostalgia” (Launius, 2003). In 1966, almost 30% of Americans stated that public space funding should be reduced, an opinion that rose to 55% agreement in 1975 (Launius, 2003). A major driver of negative sentiment toward national space budgets is citizens’ overestimation of the space budget relative to total federal spending (Steinberg, 2013). More recent reports, however, have found that 85% of Americans are in favor of increasing NASA’s budget (Mosher & Lee, 2018). At the same time, scholars have provided evidence that space still ranks among the least important programs to citizens when government resources are constrained, especially compared to areas like health care (Lehming et al., 2010). Given its distinct geopolitical role, however, it is difficult to lump space together with other public policy areas (OECD, 2022).

Geopolitical Implications of Space

Geopolitics and space have been intertwined since the Cold War, with space’s geopolitical implications becoming more evident to citizens through recent conflicts (Hines, 2022). For example, hours before Russian troops crossed the Ukrainian border on

February 24, 2022, Russian hackers targeted American satellite communication company Viasat (United States Department of State, 2022), disabling thousands of satellite terminals in Europe, likely targeting terminals used by the Ukrainian military (United States Department of State, 2022). Additionally, a recent review of SpaceX contracts amid the Musk–Trump fallout found that none could be terminated, as most were deemed critical to national security (Schwartz et al., 2025). On an institutional level, global powers such as China, France, Germany, Russia, and the U.S. also increasingly demonstrate their military ambitions in space by establishing dedicated space commands (Defense Intelligence Agency, 2022)¹. In addition to tangible strategic advantages on the battlefield (OECD, 2022), a strong footing in space also yields considerable prestige and soft power (Hirsch & Trento, 1973).

Presumably, driven by such strategic and soft power considerations, politicians have increasingly adopted comparative rhetoric to justify increased public space funding, echoing the Cold War-era Space Race. Geopolitical rhetoric appeals to citizens’ sense of competition, emphasizing the urgency of taking specific measures to avoid falling behind a given adversary. Table 1 illustrates the phenomenon of comparative public rhetoric across all countries included in the study. Across countries, top officials, including

¹ For details on the inception of the French space command, see the order “Arrêté du 3 septembre 2019 portant création et organisation du commandement de l’espace” of the French Ministry of Armed Forces. For

Germany, see <https://www.bundeswehr.de/de/organisation/luftwaffe/aktuelles/das-weltraumkommando-der-bundeswehr-5443406> on the website of the armed forces of Germany.

heads of state, consistently employ geopolitical comparisons in their space-related rhetoric.

 Insert Table 1 about here

Geopolitically comparative rhetoric always builds up an adversary, which can come at a steep cost. First, in conflicts where prior rhetoric has strongly shaped perceptions of adversaries as enemies, citizens perceive compromises as concessions rather than mutually beneficial collaboration (Gottfried & Trager, 2016). As a result, ambitious projects such as the International Space Station that rely on cooperation between erstwhile competitors become less feasible (Grimard, 2012). Second, public rhetoric raises audience costs, increasing the likelihood that leaders end up in an irreconcilable dilemma (Leventoglu & Tarar, 2005). Finally, constant reference to an adversary can nurture xenophobia (Gerber, 2014). Given the potential costs associated with geopolitically comparative rhetoric, it is remarkable that scholars have yet to determine its effectiveness in persuading citizens to support increased public space funding.

Commercial Space Companies

Space's geopolitical significance extends beyond state actors. In contrast to other geopolitical sectors such as the oil industry (Gamso, Inkpen, & Ramaswamy, 2024), the space industry is increasingly acknowledged

by citizens, investors, and policymakers for its geopolitical importance (Burbach, 2019; Do et al., 2023; Hines, 2022; Klein, 2024). For example, a vast majority of Chinese citizens consider a space race between China and the U.S. to be inevitable (Hines, 2022). On the stock market, the volatility of aerospace stocks rises with geopolitical headlines (Klein, 2024), and adversarial satellite launches divert traders' attention away from the market (Do et al., 2023). In policy debates, foreign policy hardliners ("hawks") generally advocate for a larger national space budget, in contrast to those who favor a more moderate geopolitical rhetoric ("doves") (Burbach, 2019). Reflecting the paper's opening quote, new commercial space companies have only intensified awareness of the space industry's geopolitical importance (Lipton, 2024; Satariano & Khurana, 2023; United States Department of State, 2022).

Compared to aerospace conglomerates led by space agencies, new space companies significantly reduce the marginal cost of space efforts.² A new organizational culture, influenced by Silicon Valley investors such as Jeff Bezos and Elon Musk, has encouraged greater risk-taking, iterative development, and the use of off-the-shelf components in the space industry (Hornuf & Vrankar, 2025; Manotti et al., 2021). These new approaches have fostered technical innovations such as reusable rockets, enabling new space companies to sell services to multiple

² A famous example of the cost difference between new space companies and projects traditionally managed by NASA appears in NASA's 2011 Commercial Market Assessment. The report estimated a \$1.7–4 billion price

tag for NASA to develop a rocket like SpaceX's Falcon 9, which was later revised to \$0.4–1.4 billion by NASA (2011a, 2011b). In contrast, SpaceX developed the Falcon 9 for \$390 million, according to NASA (2011a).

customers rather than a customized product to a single government customer (Mazzucato & Robinson, 2018; Weinzierl, 2018).

The rise of new space companies in economic and geopolitical importance is only possible because space agencies have undergone an institutional transformation in the space ecosystem, either voluntarily or due to budget constraints. Space agencies like NASA were historically viewed as “a response to classic market failures” (Weinzierl, 2018: 184), tasked with supplying underprovided public goods (Weinzierl, 2018). Such goods include but are not limited to scientific discoveries, national prestige, and even national security (Launius, 2006; Weinzierl, 2018). As a result, space agencies have often relied on long-term, less competitive procurement practices to ensure delivery of key public goods (Carter & Pezeshkan, 2023; Robinson & Mazzucato, 2019; Weinzierl, 2018). NASA has also retained critical technological capabilities, shaping the specific design of public goods like space telescopes or spaceships (Roy, 2025; Weinzierl, 2018).

By the early 2000s, criticism intensified towards space agencies as institutional embodiments of a market-fixing approach (Chapman, 2015). Justifying public space funding solely through intangible public goods such as scientific advances and national prestige no longer convinced citizens, who increasingly demanded measurable societal and economic returns (Robinson & Mazzucato, 2019). At the same time, legacy programs of space agencies like the Space Shuttle and Constellation programs were costlier and less efficient than expected, further fueling debate over a transformation of space agencies (Carter

& Pezeshkan, 2023; Weinzierl, 2018). As a result, space agencies, beginning with NASA, started redefining themselves as “market creators or shapers,” increasingly focusing on connecting space innovation with other sectors, supporting emerging commercial actors, and merely overseeing space infrastructure with public-good characteristics (Carter & Pezeshkan, 2023; Mazzucato & Robinson, 2016, 2018).

Agencies also began fostering innovation ecosystems in the new space economy, where collaboration among companies, investors, public institutions, and research institutes created complementary benefits that are greater than the sum of all individual contributions (Carter & Pezeshkan, 2023; Mazzucato & Robinson, 2018). Companies in the new space industry accepted value diffusion within the ecosystem, anticipating benefits from customer diversification and operational efficiencies once the ecosystem matured (de Concini & Toth, 2019). Yet space ecosystems mature slowly, given the sector’s long development cycles and capital intensity (de Concini & Toth, 2019; Robinson & Mazzucato, 2019). This creates a chicken-and-egg problem: Earth observation startups would book satellite launches if other launch service startups offered lower launch prices enabled by economies of scale. But without initial orders, launch service startups cannot reduce costs, leaving earth observation satellites stuck on the ground and launch costs in the stratosphere (Weinzierl, 2018). A key policy change for market-creating space agencies hence concerned their role as anchor customers, using commercially competitive contracts while granting companies greater autonomy in

designing and delivering solutions (NASA, 2022). These early market commitments by agencies improved cost structures of space start-ups, triggering further B2B transactions among ecosystem participants (de Concini & Toth, 2019). Once this market-creating approach proved successful in the U.S., other space agencies like ESA faced growing pressure to transform their institutional models as well, in order to enhance the international competitiveness of their domestic space sectors (de Concini & Toth, 2019; Robinson & Mazzucato, 2019).

While this policy shift has supported economic success in the new space ecosystem, it has also transferred creative control and technological expertise to private companies, raising concerns among some actors in the space sector (NASA, 2014; Weinzierl, 2018). For example, it remains unclear whether new space companies have sufficient incentives to address negative externalities caused by space endeavors (Weinzierl, 2018). Because space treaties from the 1970s address countries rather than private companies (Genta, 2014), they fall short in regulating concerns like space debris. The space sector is therefore embroiled in a debate similar to other industries undergoing privatization. While there is ample evidence of positive effects of privatization on company performance (Galiani et al., 2005; Gupta, 2005; Lähdemäki, 2024; Megginson et al., 1994), research continues to identify confounding variables (such as various political and organizational factors) explaining the success of privatization, and has highlighted numerous potential negative externalities (Estrin, Hanousek, Kočenda, & Svejnar, 2009; Villalonga, 2000).

While the academic debate on privatization focuses on company performance and macroeconomic impact, the discussion often neglects the opinions of citizens, whose voices (at least in democracies) are needed to legitimize privatization (Legge & Rainey, 2003). Here, the space industry serves as a compelling object for research. On the one hand, institutional reforms of space agencies have enabled new space companies to achieve low marginal costs across most space domains, surpassing agency-led conglomerates and reflecting efficiency gains in other privatized sectors (Weinzierl & Sarang, 2021). On the other hand, the concentration of (geo)political power in private space companies and the risk of negative externalities could cause public concern, echoing debates on the privatization of vital infrastructure, for example water supply (Galiani et al., 2005). In light of space's rising economic and geopolitical significance, stakeholders must evaluate whether the privatization path in space is indeed a reflection of public preferences.

METHOD AND DATA

Experimental Design and Empirical Strategy

To answer our two research questions, we conducted an online experiment, which was preregistered at the AEA RCT Registry (Appendix A1). Figure 1 outlines the experimental setup, featuring five experimental conditions: one control condition and two treatments, with each of the treatments containing two separate experimental conditions. Balance checks confirmed a random assignment of demographic variables

across the five experimental conditions (Appendix B1).

 Insert Figure 1 about here

First, we asked participants to estimate their nation's space budget to assess the extent to which participants' overestimation of their national public space funding influenced RQ1 outcomes. Answers were solicited in percentage points from 0 to 100 of the country's overall federal budget. Participants were then randomly assigned to one of the five experimental conditions.

Treatment 1, which investigates RQ1, assesses the effect of geopolitically comparative rhetoric. All participants assigned to Treatment 1 or the control condition ranked spacefaring countries by how strongly they opposed a given country and guessed the budgets of their top three adversaries. Participants were then randomly provided either no additional information (control), their national space budget, or their own *and* adversaries' national budgets (geopolitically comparative rhetoric).

Participants assigned to the national space budget condition of Treatment 1 (geopolitically comparative rhetoric) viewed text noting that "[Your nation] spends about [national space budget] of its federal budget on space exploration." We chose to present the national space budget, as it directly reflects the country's main effort in space activities and is the key variable in measuring the impact of political rhetoric. Citizens in the adversary budget condition were additionally told that "[Adversary] spends about [adversary budget]

of its federal budget on space exploration." The condition aims to imitate geopolitically comparative rhetoric, as seen in the quote at the beginning of this article and the quotes in Table 1.

Treatment 2, addressing RQ2, investigates whether citizens' support for the national space budget varies based on whether it is highlighted that the funding went to public agencies or directly to private new space companies. Participants assigned to the private-sector condition learned about cost efficiency through reusable launch systems. We explicitly refrained from using specific company names in order not to induce unwanted effects associated with a participant's attitude towards a particular company. Participants assigned to the public-sector condition learned about their national space agency's experience. Preserving important expertise at public institutions is an often-cited justification for restricting the amount of public space funding benefiting private companies (NASA, 2014; Weinzierl, 2018).

After exposure to one of our five experimental conditions, participants were asked whether their country's space budget should increase, decrease, or stay the same, based on a question adapted from Lergetporer et al. (2018). Responses were given on a five-item Likert scale ranging from "Greatly decrease" to "Greatly increase," which we dummy coded as one if citizens chose "Increase" or "Greatly increase" and zero otherwise. We focused on approval of national space budget increases, reflecting recent policy trends and political rhetoric.

Information effects often weaken when citizens realize that their decisions will entail real costs, such as debt or budget cuts in other governmental sectors (Abel, Byker, & Carpenter, 2021; Cattaneo & Grieco, 2021). Therefore, we also measure revealed preferences by offering each participant the opportunity to allocate a \$1 donation across three organizations: the Planetary Society (which promotes space through advocating for funding and also finances space-related projects), the Red Cross (which provides humanitarian aid), and Atmosfair (which offers carbon compensation), allowing us to assess the relative priority given to space. Donations are commonly used to elicit revealed preferences through incentivized measures (Abel et al., 2021; Cattaneo & Grieco, 2021).

Finally, we surveyed participants about their demographics and other space-related questions to construct control variables for our robustness checks. We adapted the experiment for each country by modifying the language and inserting the specific budget values for that country. Each text was translated forward and backward, first from English into the respective language of a given country and then by another translator back into English, to ensure the validity of the translation. To analyze the effect of our experimental conditions, we use a logit estimator and include a dummy variable for the respective experimental condition.

Data

Our sample consists of citizens from all countries whose national space budgets exceeded \$1 billion in 2022 (Vanleynseele, 2022). The surveyed countries accounted for

over 90% of worldwide public space funding in 2022. The required sample size was calculated beforehand using the software G*Power with the assumption of a medium effect size of 0.5 (Faul, Erdfelder, Lang & Buchner, 2007). Due to occasional over-delivery by the survey distributor, the final sample included 24 additional respondents, bringing the total to 2,139 completed surveys.

We drew our sample using the “Audience” feature on SurveyMonkey, an online recruitment platform. Samples provided via “Audience” are comparable in response quality to other commonly used online samples (Ameri, Rogers, Schur, & Kruse, 2020; Bentley, Daskalova, & White, 2017; Cho, Morris, & Dow, 2018). We found that SurveyMonkey offered greater demographic diversity than other platforms, prompting us to select it for sampling. Participants were recruited between the end of April and early May 2023, with country-specific quotas based on age and gender data from the U.S. Census Bureau International Database.

FINDINGS

Figure 2 presents an overview of the approval rating for the five experimental conditions. Approval of an increase in public space funding varies considerably across countries in the control condition, where citizens receive no additional information. While approval of a budget increase is roughly 74% in China and 92% in India, approval is only 26% in the UK and 41% in France.

Insert Figure 2 about here

Figure 3 shows the average treatment effects for our experimental conditions. The effect size at the top of the graph reflects the impact of revealing the actual national space budget versus giving citizens no information. The second effect size shows how public opinion shifts when the adversary’s space budget is shown in addition to the national space budget. The bottom effect size reflects how mentioning private companies instead of public agencies impacts support for national space budgets.

We find a 7-percentage-point increase in public space funding approval when informing citizens about their national space budget, although this is only significant at the 10% level. We noticed that approval levels for public space funding differed significantly among the surveyed countries. Therefore, we performed an additional analysis with country dummies and standard errors clustered at the country level. The coefficients identifying our research question from this country-specific analysis are qualitatively and statistically similar to those presented in Figure 3 (Appendix B2). We had not preregistered an analysis accounting for inter-country variation as we did not foresee such significant cross-national variation in our control condition (i.e., when providing citizens with no additional information). However, the effect of national space budget information on citizens’ approval of increases in public space funding is now significant at the 5% level. Therefore, identifying the effect of geopolitically comparative rhetoric on citizens’ approval of increasing public space funding requires a

comparison to citizens already exposed to information about their national space budget. Otherwise, the rhetoric’s impact would be confounded with a basic information effect.

We also find that citizens massively overestimate both their own and the adversary’s national space budget. On average, citizens overstated their national space budget’s share of total federal spending by 28 percentage points. Citizens in India and China overestimated their national space budgets the most, with average guesses exceeding the real figures by 42 and 24 percentage points, respectively. In contrast, respondents in the UK and Japan provided the most accurate estimates, still overestimating the amount of public space funding by about 20 percentage points. In all countries, average overestimation is influenced by participants with exceptionally high guesses, resulting in a right-skewed distribution. When asked about the national space budgets of their top three adversaries, citizens overestimate adversary funding by an average of 18 percentage points. Indian and French participants show the largest overestimations, averaging 23 and 22 percentage points, respectively. Japanese and Russian respondents are the most accurate, with overestimations of around 15 percentage points.

Insert Figure 3 about here

The Impact of Geopolitically Comparative Rhetoric

To investigate RQ1, we confront citizens with geopolitically comparative rhetoric. We discover that citizens reduce their approval of expanding the national space budget by 9

percentage points when informed about their own and adversaries’ national space budgets instead of only about their national space budget (Figure 3). The treatment effect is significant at the 1% level. The difference in revealed preferences between citizens who are only confronted with their national space budget and those who are also confronted with the adversary’s budget is not statistically significant. Due to the surprising direction of our measured treatment effect, we conducted multiple additional sub-analyses for revealed and stated preferences to investigate the robustness of our results. Previous research shows broad variation in how citizens value different priorities and issues in space (Fehrer, Hornuf & Vrankar, 2025). We account for potential confounding by controlling for space-related factors of varying personal relevance.

Overall, we conducted eleven sub-sample analyses. Six of these eleven sub-samples focused on individual political views and space policy preferences. Sub-sample *Real Adversary* contains only citizens who state that they did not want to cooperate with their adversary. Sub-samples *Military Priority/Military Lowest Priority* contain only citizens who identify militarization as their top/lowest priority in space. Sub-samples *Concern Militarization/No Concern Militarization* contain only citizens who identify militarization as their greatest/least concern in space. Sub-sample *Not Law Abiding* contains only citizens who state that their country should not abide by international space law.

Finally, we conducted five robustness checks that addressed variations in the actual amount of public space funding shown to

participants in the respective experimental condition. Sub-samples *Above Median Overestimation National Budget/Above Median Overestimation Adversary Budget* contain only citizens who overestimate their national/adversary’s space budget by an above-median amount. Sub-sample *Underestimation Adversary Budget* contains only citizens who underestimate their adversary’s space budget. Sub-samples *Lower Adversary Budget/Higher Adversary Budget* contain only citizens confronted with a lower/higher adversary space budget. Figure 4 shows the effect sizes for these eleven robustness checks and a detailed description of each robustness check.

 Insert Figure 4 about here

The treatment effect for stated preferences is negative in all but one sub-sample, with varying significance levels likely influenced by reduced sample sizes. Most notably, we can confirm a statistically significant, negative effect in approval of public space funding for citizens who did not want to cooperate with their stated adversary (*Real Adversary*), citizens who are not concerned about the militarization of space (*No Concern Militarization*), citizens who overestimated their national space budget by an above-median amount (*Above Median Overestimation National Budget*) and finally citizens who were confronted with an adversary budget that was higher than their national space budget (*Higher Adversary Budget*). An increase in approval of public space funding, significant at the 10% level, was found only among citizens who ranked space militarization as the lowest of eleven priorities

(*Military Lowest Priority*). However, the sub-sample includes just 54 individuals, so the result should be interpreted with caution. For stated preferences, only negative effect sizes were statistically significant, in line with our main results (Figure 3). We therefore conclude for RQ1:

Result 1. Citizens exposed to geopolitically comparative rhetoric are less likely to support increases in their national space budget.

The Impact of Commercial New Space Companies

Figure 3 shows that allocating parts of the national space budget to private companies instead of agencies has no statistically significant impact across the entire sample. Robustness analyses controlling for different confounders confirm the absence of significant effects on public approval of public space funding across the whole sample and sub-samples (Figure 5), except for one case. Left-leaning respondents reduce support for an increase of the national space budget by 14 percentage points in the incentivized measure, which is significant at the 5% level.

We make another noteworthy discovery when calculating effect sizes separately by country. Figure 6 shows that the null-effect on citizens’ opinion regarding public space funding is moderated by country. Most importantly, in the U.S., providing information about private companies instead of the established national space agency, NASA, reduces approval of an increased national space budget by 27 percentage points. In all other countries, the effect on approval of increases in

public space funding are not statistically significant. We therefore conclude:

Result 2. Citizens are indifferent whether public agencies or private companies profit from public space funding. Only U.S. citizens are significantly more likely to prefer public space agencies over private entities as potential beneficiaries of increases in their national space budget.

 Insert Figure 5 about here

 Insert Figure 6 about here

DISCUSSION

In line with the literature (Steinberg, 2013), we find that citizens largely overestimate national and adversary space budgets. Confronted with the actual national space budget, citizens’ approval increases. Surprisingly, we find a robust, negative effect on public space funding approval when confronting citizens with geopolitically comparative rhetoric.

At first glance, this result appears counterintuitive. However, the Tullock contest offers a plausible explanation (Tullock, 1980). In a Tullock contest, each participant’s chance of winning the contest corresponds to their share of the total effort exerted. The Cold War Space Race is a perfect example of a Tullock contest. The contest’s prize was to be the first country to put a citizen on the Moon and thus demonstrate technical and systemic leadership. However, to have a chance of reaching the Moon first, each country had to exert a certain

amount of effort, represented by massive national space budgets. The U.S., for example, spent over 3% (Launius, 2003) of its federal budget on NASA, which is significantly more than the 0.69% of the present federal budget being spent on all space activities, including military space projects, today (IMF, 2023; Vanleyensee, 2022). The U.S. ultimately won the Space Race by putting American boots on the Moon, rendering all previous achievements by the USSR irrelevant with regard to the larger contest.

The specific goal-defining victory in today's space race remains to be determined; however, at the time of early human spaceflight in the 1960s, the goal was also vague until President Kennedy declared the race to the Moon. Supposing citizens interpret public space funding through a geopolitically comparative lens, they might react as in a Tullock contest, supporting larger budgets to achieve the goals set forth by their politicians in service of ultimately winning. However, when faced with an adversary with a far greater national space budget than one's own country, citizens might realize their country has little chance of winning the contest for space supremacy at current effort levels (Cason, Masters, & Sheremeta, 2020). If the difference between the national space budget and that of the adversary is so large that it would require unfathomable resources to match the

opponent's efforts, citizens might reduce their support for further increases in funding or even advocate cutting funding.³ With this strategy, citizens could maintain a non-zero chance of winning the contest while minimizing their effort levels.

Our findings might also partially be explained by prospect theory because raising the national space budget is experienced as a *certain* fiscal loss with only a tiny *chance* of catching up (Kahneman & Tversky, 1979). If the catch-up probability looks hopeless, citizens prefer not to incur the sure cost at all, and hence they show lower approval. To test our reasoning, we examine the interaction between the relative budget size (i.e., whether the national space budget is smaller or larger than the adversary's) and the magnitude of the difference (i.e., whether the budgets are close or vastly different).

Table 2 confirms an effect consistent with a Tullock contest, demonstrating that approval of national space budgets declines most sharply and significantly (−15 percentage points) when citizens are confronted with adversary budgets that far exceed their own. Table 2 shows that our effect is also not symmetric, with approval rising when adversary space budgets only slightly exceed national space budgets (+2 percentage points). Second, when the adversary's space budget is smaller than the national space budget, effects are consistently

³ The central feature of a Tullock contest is that a participant's probability of success is proportional to their invested resources and relative to the total investment of all participants. For example, the expected payoff function of a two-player Tullock contest for country i is given by $U(x_i) = P_w^i W - x_i$ with a probability P_w^i to win prize W , with x_i being the invested

amount. In the simplest and most prominent version, P_w^i is given by $P_w^i = \frac{x_i}{x_i + x_j}$. Maximizing expected utility with respect to x_i yields $x_i = \sqrt{Wx_j} - x_j$, which is a concave function peaking at $x_j = \frac{W}{4}$. Hence, for $x_j > \frac{W}{4}$ the optimal investment is decreasing in x_j .

negative, but the drop in approval is six times larger when national space budget far exceeds adversary space budget (−12 percentage points) compared to when national space budgets only slightly exceed adversary space budgets (−2 percentage points). Consistent with prospect theory, we find that citizens are more responsive to falling behind the adversary country than to leading in public space funding.

Politicians and other space industry stakeholders might therefore induce the opposite of the intended effect when using comparative rhetoric, with citizens lowering their approval of higher national space budgets. Accounting for the social and diplomatic risks of aggressive rhetoric (Gerber, 2014; Gottfried & Trager, 2016; Leventoglu & Tarar, 2005), our findings caution space stakeholders against relying solely on comparative appeals for increasing public space funding approval.

 Insert Table 2 about here

Given the proclamation of a new space race by state officials (Table 1; see also Hines, 2022), countries that are home to efficient new space companies could increase their chances of winning a Tullock contest at lower costs, potentially justifying higher national space budgets.⁴ Yet, despite widespread enthusiasm for the new space sector among scholars (Weinzierl & Sarang, 2021), investors, and policymakers (de Concini & Toth, 2019), citizens in our sample remain indifferent whether space efforts are led by public or

private actors. This indifference may reflect tacit approval of funneling space efforts through new space companies, suggesting that public space agencies should continue emphasizing market creation over market fixing (Mazzucato & Robinson, 2018). Our results nevertheless show that the enthusiasm of space stakeholders in advocating for new space over public space agencies has yet to spill over into actual public support for new space companies.

For the U.S., however, approval of increases in public space funding drops by 27 percentage points when citizens learn that additional funding would be allocated to private companies instead of public agencies. We suggest three possible explanations for this distinct effect. First, NASA in particular has built an established and trusted brand around its agency (Schrogl, 2017). In contrast, few new space companies have had a chance to build an actual reputation due to their recency (Whitman Cobb, 2023).

Second, citizens may believe that private new space companies can deliver the same level of space exploration more efficiently. Accordingly, rejecting an increase in the national space budget may signal support for a more cost-effective continuation of the same amount of space activities, rather than a rejection of space activities and the national space budget itself.

Third, and potentially most important, private new space companies might be

⁴ In Tullock contests, increasing the effectiveness of investments is equivalent to increasing the price and leads to higher equilibrium investments.

associated with eccentric and well-known founders such as Elon Musk or Jeff Bezos. It may be that citizens, who perceive these founders negatively, transfer their perception of these individuals to the overall new space industry. Unlike recent studies reporting a negative “Musk effect” (Endres et al., 2025), our research was conducted before Musk’s Trump endorsement. Remarkably, our survey also made no explicit mention of SpaceX, but rather new space companies in general. While existing studies have noted broad skepticism toward emerging space companies (Whitman Cobb, 2023), we provide further context to their findings by showing a negative effect of privatization on public opinion in the U.S. in an industry tied to specific high-profile individuals.

Given the efficiencies and other advantages companies can offer countries in a contest like the new space race, U.S. politicians should be especially concerned about the potential negative bias among their constituents towards new space companies and adapt their campaigning for space accordingly. Ultimately, stakeholders of new space companies must be aware of possible biases, given that their income is also based to a non-negligible extent on state funding, which the citizens of the respective country ultimately legitimize. Even before new space companies can get a chance at commercial markets, de Concini and Toth (2019) estimate that for 40% of all space start-ups, public funding is a prerequisite to receiving venture capital. These results suggest the need to further explore how the presence of well-known individuals may be undermining the new space sector’s image, similar to the negative effects observed in the

cryptocurrency sector following the fall of Sam Bankman-Fried (Endres et al., 2025; Yousaf, Riaz & Goodell, 2023).

In our experiment, we also measure citizens’ revealed preferences using an incentivized measure. We find our survey measure of stated preferences for budget approval to be significantly positively related to our incentivized measure, the amount of donations forwarded to a space NGO (Appendix B3). Hence, our survey measure also has external validity and might be used in future research (Appendix B4).

Any experiment’s results depend on a representative sample. While we carefully selected a census-representative sample in terms of gender and age, we still relied on an online population. Generalization should thus be limited to countries with the greatest access to the internet (Hines, 2022). Especially for countries like India or China, selecting an online sample could lead to selection bias, representing only above-average-educated and wealthy individuals. On the other hand, the comparably low remuneration could lead to unmotivated participants in high-wage countries like the U.S., resulting in citizens not paying attention to the questions and biasing the results. To address this concern, we conducted an additional analysis, excluding all citizens who failed an attention check at the beginning of our survey. The results are identical to those in Figure 3 (Appendix B5).

CONCLUSION

We conducted a survey experiment among citizens in the nine leading spacefaring

countries to examine how exposure to geopolitical rhetoric and the emergence of space companies shapes public opinion on national space budgets.

Surprisingly, we discover that providing citizens with geopolitically comparative rhetoric concerning their own nation's and an adversary's space budget does not cause citizens to increase their approval of expanding the national space budget, as politicians seem to expect. Instead, citizens decrease their approval of public space funding, especially when confronted with an adversary's space budget much higher than their national space budget. Given that this negative effect on citizen approval persists across different robustness checks such as subsample analyses and accounting for inter-country heterogeneity, our results call into question the usefulness of geopolitically comparative rhetoric, especially given the costs such rhetoric might entail, such as increased xenophobia and damage to international cooperation (Gerber, 2014; Gottfried & Trager, 2016; Leventoğlu & Tarar, 2005).

We further show that, in the U.S., the country at the forefront of the new space economy, citizens are less willing to spend additional tax money to fund private companies, even though they may undertake space-related activities more effectively and efficiently than government-led initiatives. For new space companies in the U.S. and the politicians who back them as geopolitical assets, building public trust on par with NASA will require substantial persuasion, if it is possible at all. In other countries, we find no significant difference in preferences regarding whether private companies or state agencies

conduct space activities. The differing public perception of entrepreneurs in the U.S. in comparison to other countries may stem from the polarizing nature of prominent U.S. space entrepreneurs and the absence of comparable figures abroad.

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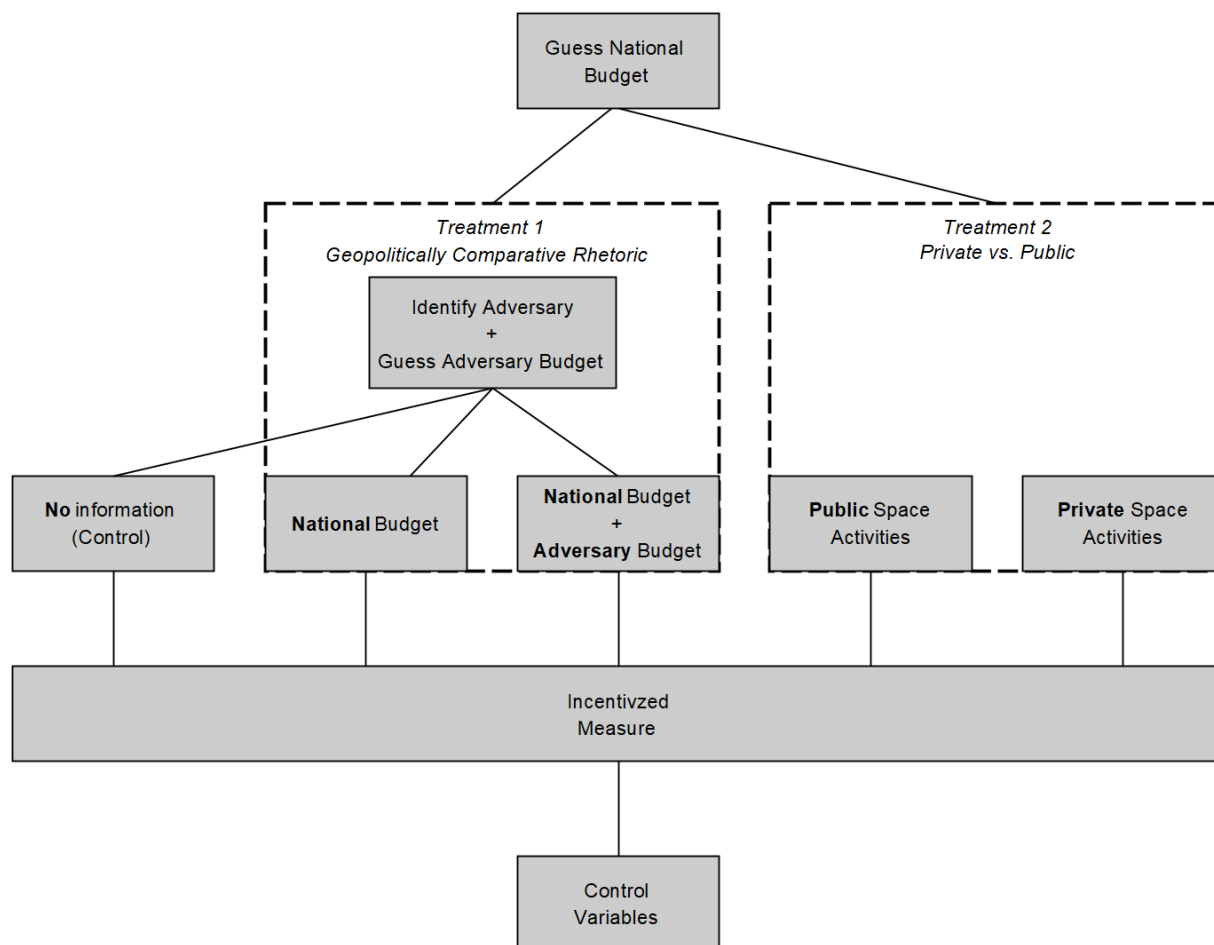
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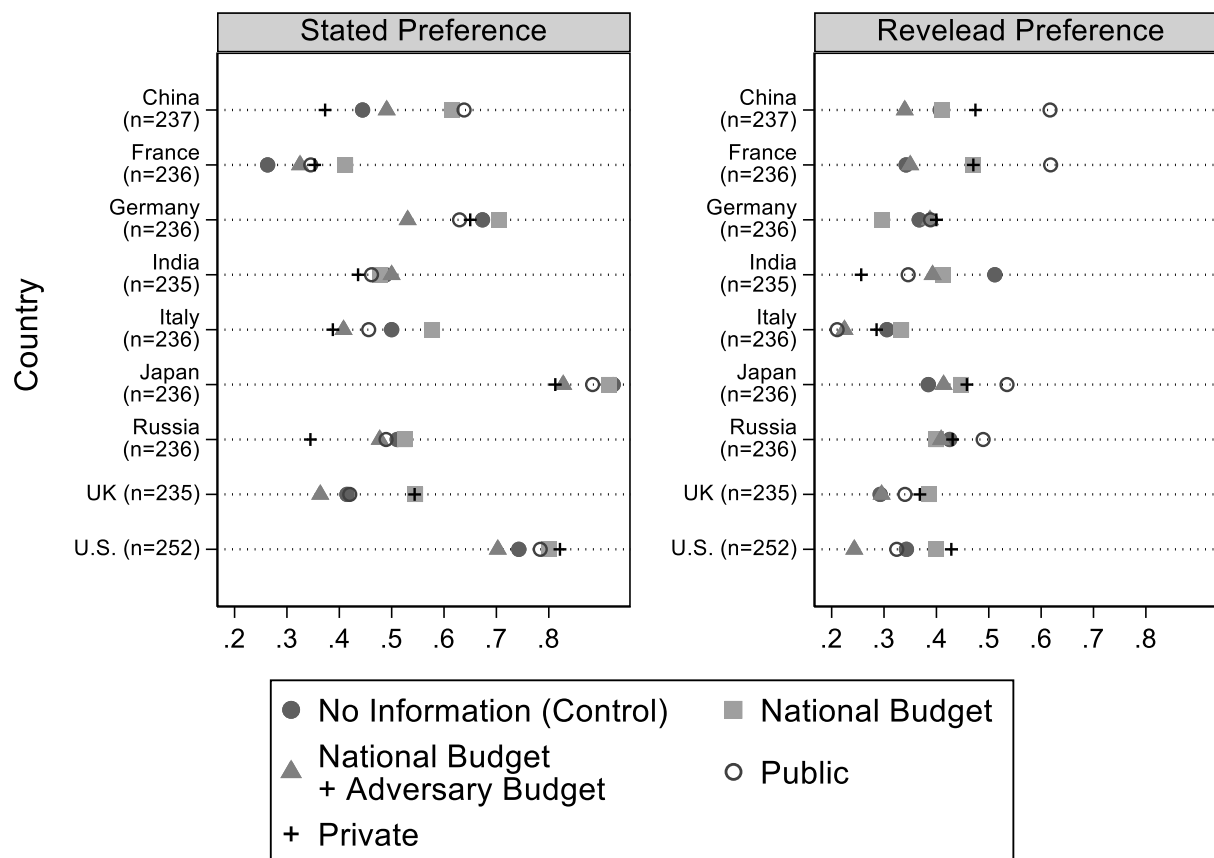
FIGURES

FIGURE 1
Experimental Design



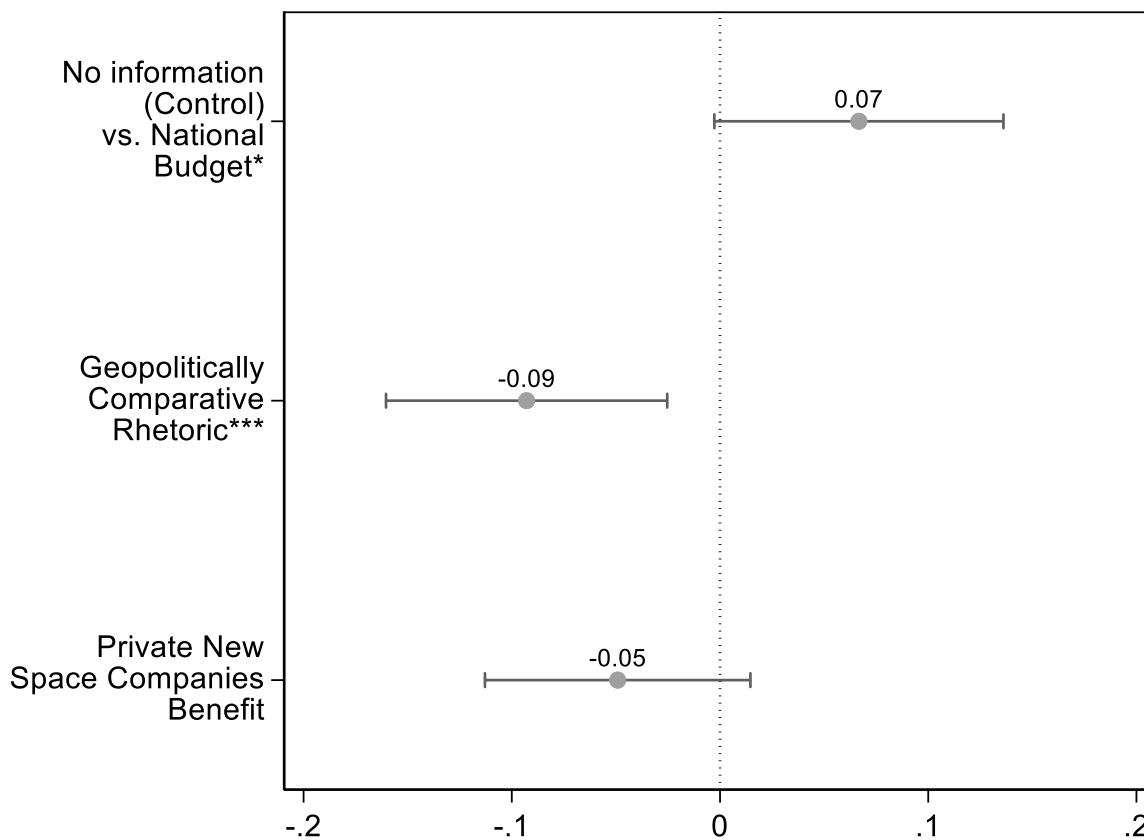
Note: The experimental design shown in this figure was preceded by an introduction and followed by a questionnaire collecting control variables. The five experimental conditions are: a control condition without information; Treatment 1, where participants received either the national space budget or both the national and adversary space budgets; and Treatment 2, where participants received information about either public or private space activities.

FIGURE 2
Treatment Effects of Experimental Conditions per Country



Note: The graph displays the percentage of citizens supporting a budget increase in the respective experimental condition.

FIGURE 3
Treatment Effects of Experimental Conditions on Approval of National Space Budget Increases



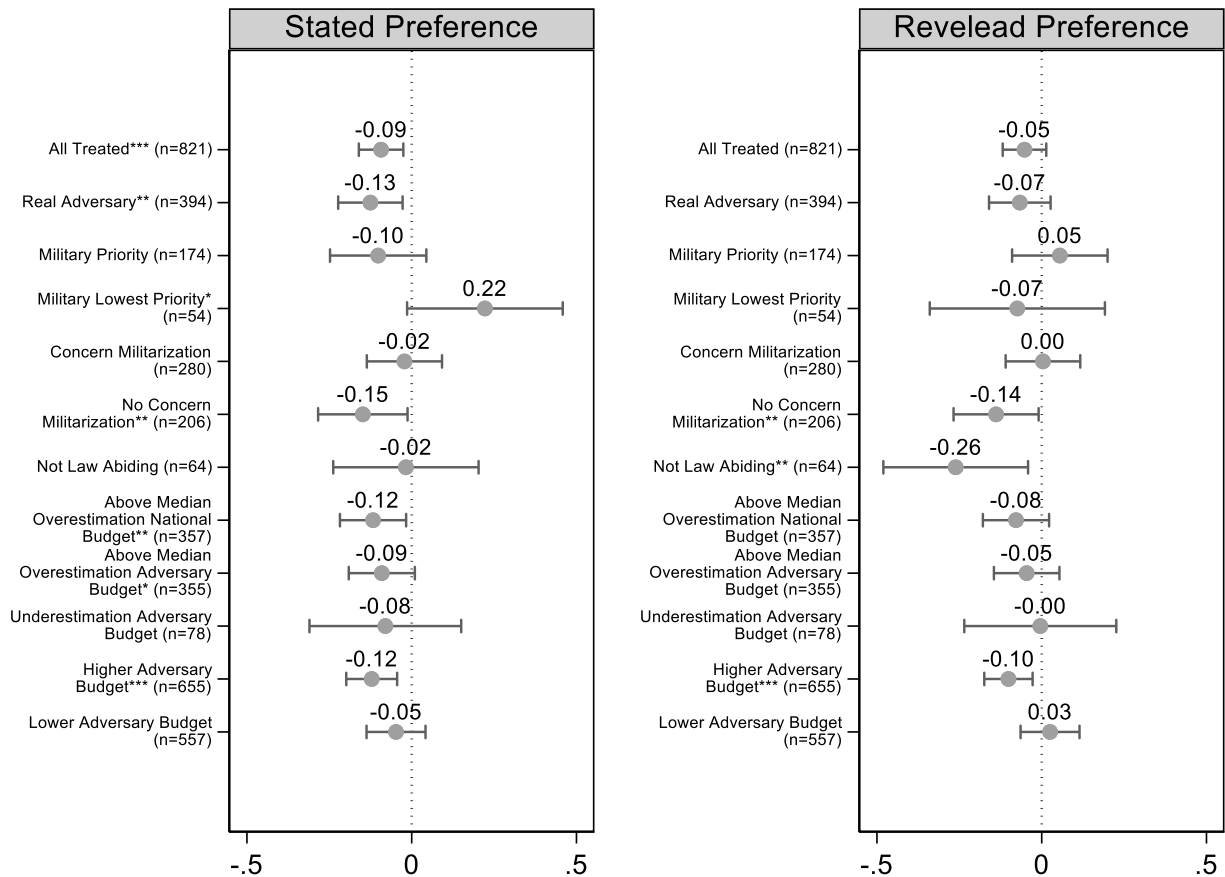
Note: Graph displays the average treatment effect size depending on the experimental condition with a 95% confidence interval.

* $p < .1$

** $p < .05$

*** $p < .01$

FIGURE 4
Robustness Analysis of the Impact of Geopolitically Comparative Rhetoric on Approval of National Space Budget Increases



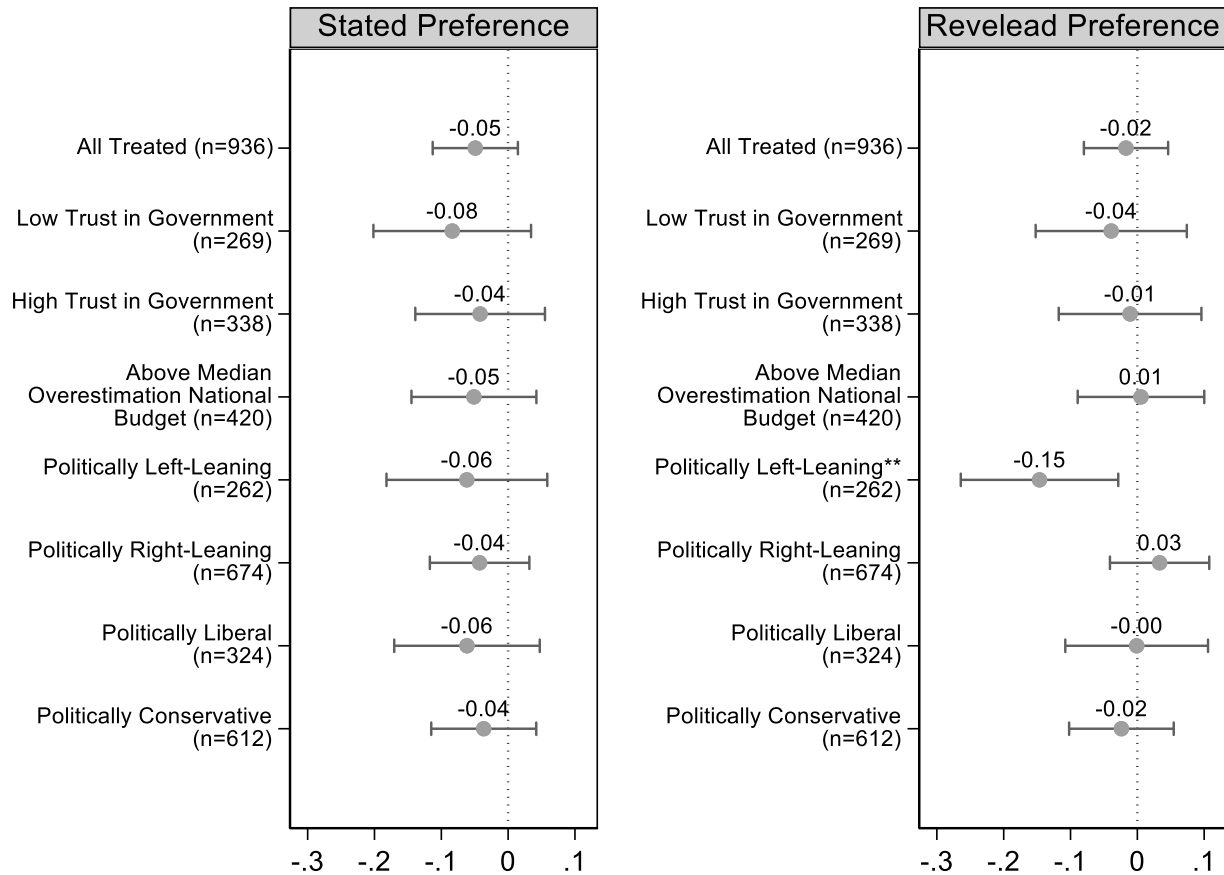
Note: Figure displays the average treatment effect for different sub-samples with a 95% confidence interval. *Real Adversary* contains only citizens who state that they did not want to cooperate with their adversary. *Military Priority/Military Lowest Priority* contains only citizens who state militarization is their highest/lowest priority in space. *Concern Militarization/No Concern Militarization* contains only citizens who identify militarization as their greatest/least concern in space. *Not Law Abiding* contains only citizens who state that their country should not abide by international space law. *Above Median Overestimation National Budget/Above Median Overestimation Adversary Budget* contains only citizens who overestimate their national/adversary space budget by an above-median amount. *Underestimation Adversary Budget* contains only citizens who underestimate their adversary space budget. *Lower Adversary Budget/Higher Adversary Budget* contains only citizens confronted with a lower/higher adversary space budget.

* $p < .1$

** $p < .05$

*** $p < .01$

FIGURE 5
Robustness Analysis of the Impact of Commercial New Space Companies Benefitting from Public Space Funding on Approval of National Space Budget Increases



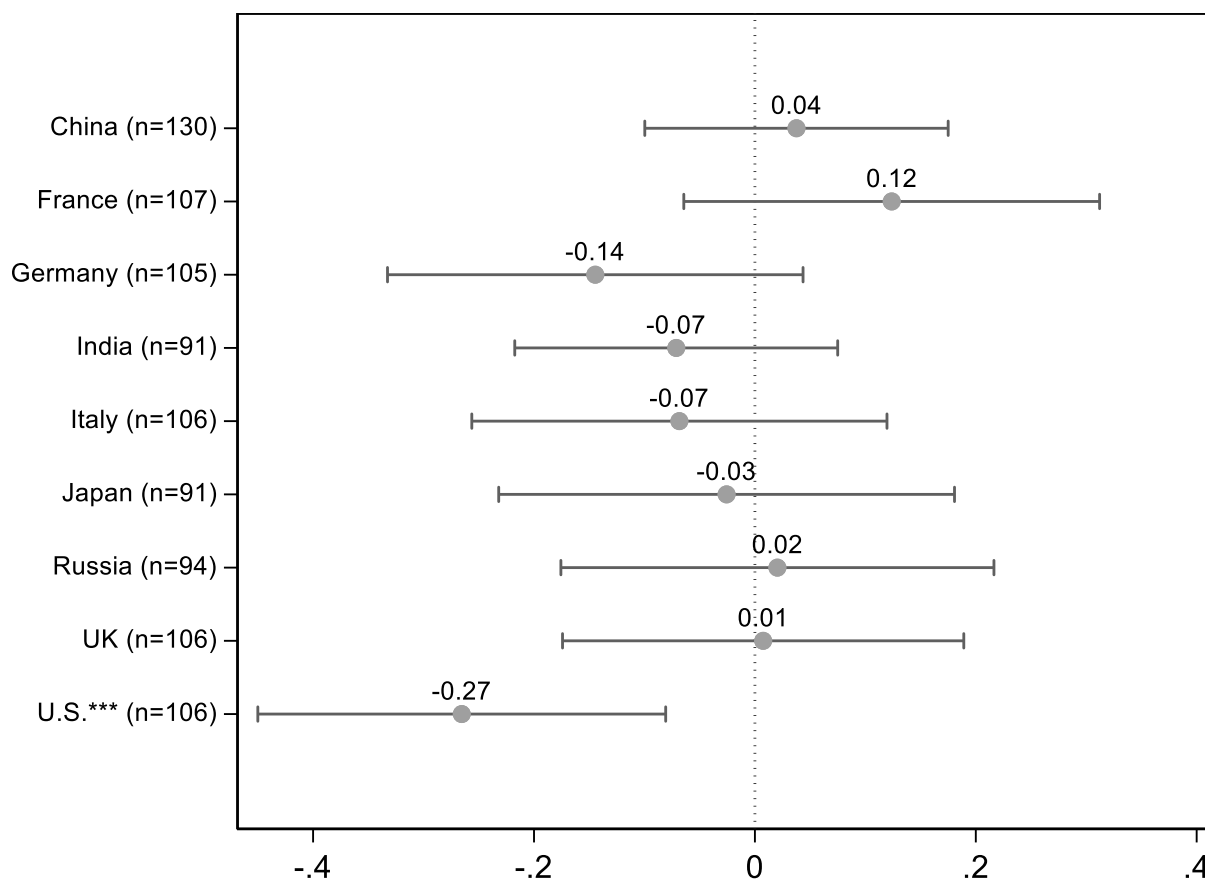
Note: Figure displays the average treatment effect for different sub-samples. *Low Trust in Government/High Trust in Government* contains only citizens who state that they have a low/high trust in the government. *Above Median Overestimation National Budget* contains only citizens who overestimate their national space budget by an above-median amount. *Politically Left-Leaning/Politically Right-Leaning* contains only citizens who assign themselves to the politically left/right spectrum. *Politically Liberal/Politically Conservative* contains only citizens who assign themselves to the politically liberal/conservative spectrum.

* $p < .1$

** $p < .05$

*** $p < .01$

FIGURE 6
Impact of Commercial New Space Companies Benefitting from Public Space Funding on Approval of National Space Budget Increases by Country



Note: Figure displays the average treatment effect for different sub-samples.

* $p < .1$

** $p < .05$

*** $p < .01$

TABLES

TABLE 1

Examples of Geopolitically Comparative Rhetoric in Relation to Space

Country	Quote	Source	Link
China	“[...] Western countries have formed space combat forces, exercised space action capabilities and even regarded (China) as a major competitor in the space field.”	Ministry of State Security, China	Link
	“As a result, the development of space technologies is both a display of a country’s technological capability and by extension a display of its military, economic, and scientific capabilities, but also a necessary move for a country that wants to strengthen its national power.”	China Dream Space Dream China’s Progress in Space Technologies and Implications for the United States	Link
France	“Space itself is becoming an area of possible confrontation in which alternative adversary strategies could be developed, below or beyond the threshold of armed conflict. [...] The major space powers are currently developing new systems capable not only of protecting their space capabilities but also of carrying out aggressive action against those of their adversaries.”	Space Defence Strategy, Armed Forces Ministry, France	Link
Germany	“We are in a strategic competition in space, in which states, but also individual companies, are competing with each other”	German Bundestag, Representative of the Federal Ministry of Defence, Germany	Link
	“Germany needs outer space. [...] By establishing the Bundeswehr Space Command, the German armed forces have responded to the increasing demands of the space domain. [...] In the event of conflict, this will ensure that the operational readiness of the Bundeswehr is maintained.”	Federal Ministry of Defence, Germany	Link
India	“India shot down one of its own satellites in low-Earth orbit with a ground-to-space missile on Wednesday, Prime Minister Narendra Modi said, hailing his country's first test of such weaponry as a breakthrough establishing it as a military space power.”	Prime Minister Narendra Modi, India	Link
	“Defence Space Agency of Headquarters Integrated Defence Staff successfully conducted the Space Table Top Exercise [...], a	Ministry of Defence, India	Link

	significant milestone aimed at bolstering the strategic readiness of the Indian Armed Forces in the domain of space warfare.”		
Italy	<p>“[...] all of them are also increasing their investments in the military space sector. It is for this reason that Italy must pursue ever wider margins of strategic autonomy, in order to make an important contribution to European technological sovereignty.”</p> <p>“Space is one of the sectors Europe must focus on to be globally competitive.”</p>	<p>Government guidelines on space and aerospace matters</p> <p>Industry Minister Adolfo Urso, Italy</p>	<p>Link</p> <p>Link</p>
Japan	<p>“We will implement [...] this strategy to ensure the autonomy of Japan's space activities and [...] to keep up with the intensifying global competition in space development.”</p> <p>“Today, space has become a major arena for geopolitical competition for national power over diplomacy, defense, economic, and intelligence, as well as the science and technology and innovation that support these national powers.”</p>	<p>Minister of State for Space Policy, Sanae Takaichi, Japan</p> <p>Space Security Initiative by the Japanese Government, Japan</p>	<p>Link</p> <p>Link</p>
Russia	<p>“The world’s leading countries fast-track the development of modern space systems of military and dual use and complement and expand technical parameters. The US military-political leadership openly regards outer space as a theater of military operations.”</p>	<p>President Vladimir Putin, Russia</p>	<p>Link</p>
UK	<p>“[Space] affords us operational advantage against potential adversaries and, as a nation, we depend on it for resilience and our way of life. [...] Adversaries understand this reliance and are increasingly able to exploit vulnerabilities, threatening our strategic stability and security.”</p> <p>“However, the UK is not keeping pace with the threat as adversaries invest more in space capabilities.”</p>	<p>Secretary of State for Defence Rt Hon Ben Wallace MP, UK</p> <p>Prime Minister Boris Johnson, UK</p>	<p>Link</p> <p>Link</p>
U.S.	<p>“[...] space is a domain that has reemerged as a central arena of great power competition, primarily with China and Russia.”</p> <p>“Russia and China are building capabilities to challenge us in space because if they can challenge us in space, they understand as dependent as we are in space capabilities that they can challenge us as a nation.”</p>	<p>Defense Space Strategy Summary</p> <p>Vice Chairman of the Joint Chiefs of Staff Air Force Gen. John E. Hyten, U.S.</p>	<p>Link</p> <p>Link</p>

TABLE 2
Interaction Effect of Relative Budget Size and Magnitude of Difference on Approval of National Space Budget Increases

Magnitude of Difference			Relative Budget Size	
			National Space Budget compared to Adversary Space Budget	
	Difference between National Space Budget and Adversary Space Budget	Above Median	Adversary Budget < National Budget	Adversary Budget > National Budget
		Above Median	-12pp	-15pp***
		Below Median	-2pp	2pp

Note: Table displays the average treatment effect for different sub-samples in percentage points (pp).

* $p < .1$

** $p < .05$

*** $p < .01$

APPENDIX A Preregistration

A1. AER Preregistration (AEARCTR-***Blinded for peer review***)

The Public Economics of Space Exploration

General Information

Initial registration date is when the trial was registered.

It corresponds to when the registration was submitted to the Registry to be reviewed for publication.

First published

April 13, 2023, 3:49 PM EDT

First published corresponds to when the trial was first made public on the Registry after being reviewed.

Locations

Country

China

Region

Country

Germany

Region

Country

France

Region

Country

United Kingdom of Great Britain and Northern Ireland

Region

Country

India

Region**Country**

Italy

Region**Country**

Japan

Region**Country**

Russian Federation

Region**Country**

United States of America

Region**Primary Investigator**

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Other Primary Investigator(s)

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Additional Trial Information

Status

In development

Start date

2023-04-20

End date

2023-04-27

Keywords

Other

Additional Keywords

Public policy, Public opinion, Cross-country comparison, Space exploration, New space

JEL code(s)

H59, L33, F50

Secondary IDs**Prior work**

This trial does not extend or rely on any prior RCTs.

Abstract

Public support is vital to the space industry because the sector still receives about one-third of its funding from governmental budgets. Therefore, research and the media have extensively investigated and debated citizens' opinions toward space expenditures. Various factors, for example, the overestimation of the actual space budget and sociodemographic characteristics have been identified as relevant determinants of public support for space funding. Existing research is insufficient for two reasons. First, research is primarily concerned with the public opinion toward government space agencies. With the emergence of the new space industry, this approach is no longer valid, as public support might change depending on whether a governmental agency or a private company receives funding. Second, while literature primarily focuses on the United States (U.S.), other nations have taken on significant roles in space exploration as well. We extend existing literature by

analyzing nine leading space nations and considering the impact of the new space industry on the public opinion of space expenditures. We will investigate the public opinion of space funding and the effectiveness of different communications strategies using statistical hypotheses testing and regression analysis. Our data will be extracted from an online experiment with over 2000 citizens.

External Link(s)

Registration Citation

Interventions

Intervention(s)

Intervention (Hidden)

Intervention Start Date

2023-04-21

Intervention End Date

2023-04-22

Primary Outcomes

Primary Outcomes (end points)

We investigate citizens' opinions on funding for space exploration. We examine if it is relevant for public opinion whether taxpayer money benefits public or private entities. We also test whether the efforts of competing nations in space influence public opinion on domestic space budgets.

Primary Outcomes (explanation)

Participants state their opinion on funding for space exploration on a five-point Likert scale. The dependent variable is the answer to the question: "In your opinion, should funding for space exploration in [YOUR COUNTRY] increase, decrease or stay about the same?". Scale: 1 = Greatly Increase; 2 = Increase; 3 = Stay about the same as it is now; 4 = Decrease; 5 = Greatly Decrease, with [YOUR COUNTRY] being a placeholder for the respective country of the respondent.

Secondary Outcomes

Secondary Outcomes (end points)

In addition to our dependent variable, we also record multiple control variables. Some of these questions are also of interest outside their function as control variables for this experiment.

Secondary Outcomes (explanation)

We ask the participants with several statements and a 5-point Likert scale about their attitudes towards specific types of space missions and global cooperation in space. We also survey citizens about their overall priorities and concerns for space policy.

Experimental Design

Experimental Design

Using an online experiment, we plan to test our hypotheses while relying on a between-subject design. The participants are divided into a total of five groups (One treatment with two scenarios and one treatment with three scenarios). After their respective treatment, participants will answer a survey to control for any relevant variables and characteristics.

Experimental Design Details

We use an online study with two treatments to test our three hypotheses. To test our first hypothesis, we ask all participants to estimate their nation's space budget as a percentage of the total budget using a slider. Participants are then assigned to one of the two treatments. For treatment 1, participants are presented with either a scenario in which the space budget benefits government agencies or a scenario in which the money benefits private space companies. Subsequently, their attitude towards space funding is queried using the Likert scale explained in the "Primary Outcomes" section.

Alternatively, those participating are assigned to treatment 2. First, participants are asked which country they consider to be in competition with their own nation. They are then randomly assigned to one of three different scenarios. These three scenarios consist of one control group and two different information treatments. Afterward they answer the same Likert scale as the other group, which received treatment 1.

After answering this question, the two groups answer various control questions as well as an incentivized question. This question is designed to control for their general attitude toward space and gives the participants a real budget that they can donate to different causes.

Our hypotheses will be tested with citizens from nine different countries. Our sample is provided by SurveyMonkey. The composition of our samples in the various countries is based on the latest census in terms of age and gender.

Randomization Method

Participants are randomly instructed by the survey program to select one of two treatment paths.

Randomization Unit

The individual participant is randomly assigned to one of the two treatments. All participants in a given treatment are then randomly assigned to a specific scenario within the treatment.

Was the treatment clustered?

No

Experiment Characteristics**Sample size: planned number of clusters**

Nine Countries with 235 participants per country.

Sample size: planned number of observations

2215 participants from 9 different countries. That number includes 100 participants for a pretest in the USA.

Sample size (or number of clusters) by treatment arms

Five scenarios with 47 participants each.

Minimum detectable effect size for main outcomes (accounting for sample design and clustering)

The calculation for our sample size is based on an expected medium effect size, which equals $d=0.5$ according to Cohen 1992 Cohen, J. (1992). Statistical power analysis. Current Directions in Psychological Science, 1(3), 98-101.

Documents**Institutional Review Boards (IRBs)**

IRB Name

IRB Approval Date

IRB Approval Number

Analysis Plan Documents**Post-Trial****Study Withdrawal**

This trial has not been withdrawn.

Intervention

Is the intervention completed?

No

Data Collection Complete

Data Publication

Is public data available?

No

Is there a restricted access data set available on request?

Program Files

Program Files

Relevant Paper(s)

Reports & Other Materials

APPENDIX B Additional Robustness Checks

**TABLE B1
Balance Checks**

Variable	χ^2 -value with ties
Age	2.08
Female	1.72
Education	3.10
Cooperation	3.17
Ethnicity	0.90
PoliticalOrientation1 (Left vs. Right)	2.93
PoliticalOrientation2 (Liberal to Conservative)	6.54

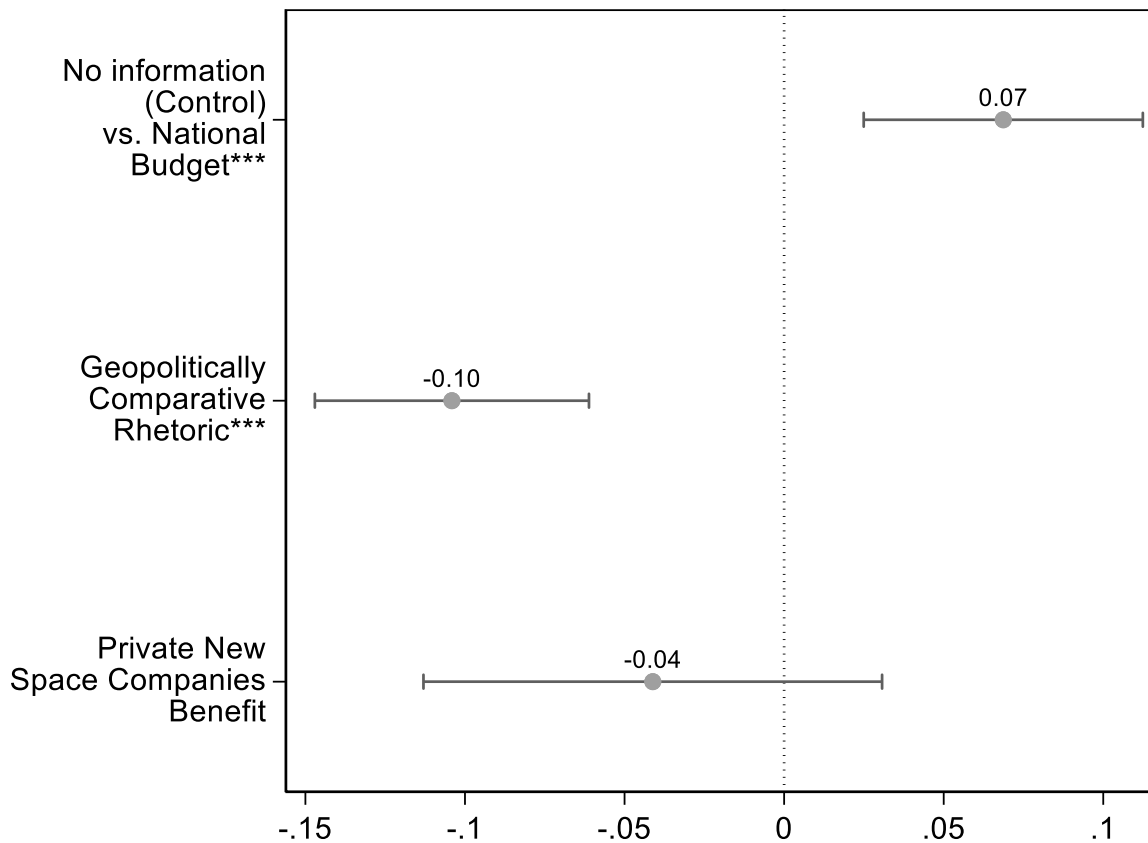
Note: Table displays the result for a Kruskal-Wallis test with the null hypothesis that all subgroups of a respective control variable originate from the same population.

* $p < .1$

** $p < .05$

*** $p < .01$

TABLE B2
Treatment Effects of Experimental Conditions on Approval of National Space Budget
Increases Matched on Citizens' Country



Note: Graph displays the average treatment effect size depending on the experimental condition with a 95% confidence interval.

* $p < .1$

** $p < .05$

*** $p < .01$

TABLE B3.1
Stated vs. Revealed Preferences Matched for Participants' Country and Treatment

Variable	Coefficient	Standard Error	[95% Confidence Interval]	
Decline increase vs. Support increase	0.12***	0.02	0.08	0.16

Note: Table gives the average treatment effect on above-median donation to the space-related charity, after participants stated that they want to increase their national public space funding.

* $p < .1$

** $p < .05$

*** $p < .01$

TABLE B3.2
Stated vs. Revealed Preferences Unmatched Analysis

Variable	Coefficient	Standard Error	[95% Confidence Interval]	
Decline increase vs. Support increase	0.13***	0.02	0.09	0.17

Note: Table gives the average treatment effect on above-median donation to the space-related charity, after participants stated that they want to increase their national public space funding.

* $p < .1$

** $p < .05$

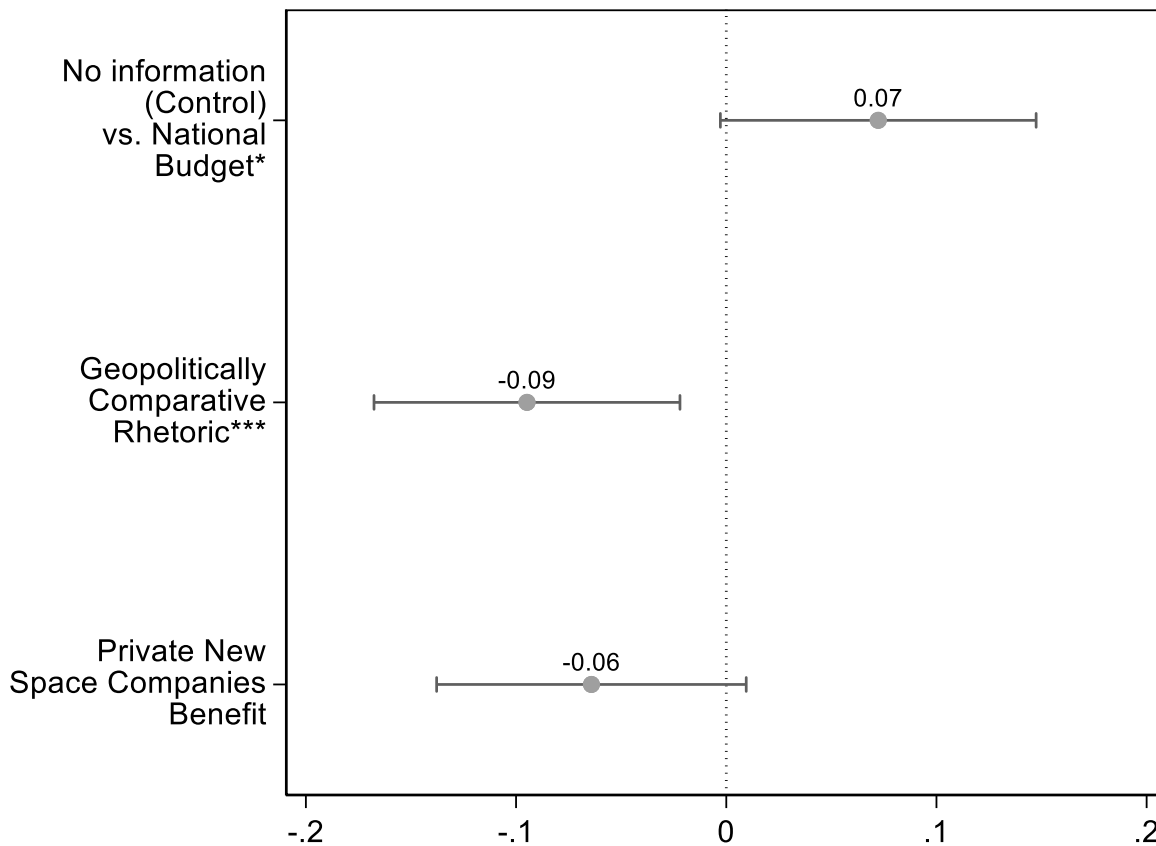
*** $p < .01$

B4. Validated Survey Measures

In your opinion, should funding for space exploration in the [your nation] increase, decrease or stay the same?

- Greatly increase
- Increase
- Stay about the same as it is now
- Decrease
- Greatly Decrease

TABLE B5
Treatment Effects of Experimental Conditions on Approval of National Space Budget Increases for Citizens Who Passed an Initial Attention Check



Note: Graph displays the average treatment effect size depending on the experimental condition with a 95% confidence interval.

* $p < .1$

** $p < .05$

*** $p < .01$