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National research, national policy: how local research fuels Brazil's policy

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Abstract

Brazil's policymaking has long relied on scientific evidence to address its socio-economic, environmental, and public health challenges. However, persistent budget cuts and political challenges, particularly during recent administrations, have severely impacted the nation's scientific research ecosystem. Despite these setbacks, the Brazilian government continues to integrate both domestic and international research into its policies, highlighting the resilience and relevance of its scientific community. This study investigates the extent to which scientific research, particularly domestic outputs, informs Brazilian government policy. By analyzing policy documents and their citations, we aim to understand the role of local and international research, key funding agencies, and research institutions in shaping Brazil's public policies. We utilized the Overton database, one of the largest repositories of global policy documents, to analyze over 100,000 policy documents published by Brazilian government institutions. These documents were cross-referenced with the Web of Science database to identify 35,000 cited research papers. Citations were categorized by language, geographical origin, funding agency, and institutional affiliation. The data were then evaluated to identify patterns and trends in the use of research by Brazilian policymakers. The analysis reveals that 95.5% of cited research in Brazilian policy documents is published in English, with only 4.1% in Portuguese. International research, particularly from the United States, dominates, accounting for 13,994 articles, while Brazilian research ranks second with 6,350 articles. Domestic institutions, such as the University of São Paulo (USP), State University of Campinas (UNICAMP), and the Federal University of Rio de Janeiro (UFRJ), feature prominently in policy citations, demonstrating their critical role in producing locally relevant research. The study also highlights the importance of funding agencies, with domestic institutions like the National Council for Scientific and Technological Development (CNPq), the Coordination for the Improvement of Higher Education Personnel (CAPES), and the São Paulo Research Foundation (FAPESP) leading in support of cited research. Despite these contributions, international agencies, including the National Institutes of Health (NIH) and the National Science Foundation (NSF), play a significant role in funding research that informs Brazilian policy.

Introduction

The Brazilian research ecosystem has experienced severe financial constraints since 2014, marked by continuous cuts in federal funding that have significantly hindered the country's capacity for scientific production. By 2017, the budget for the Ministry of Science, Technology, and Innovation (MCTIC) had been slashed by 44%, reaching its lowest level in over a decade, a trend consistent with broader austerity

measures that crippled federal and state-level research funding (Angelo, 2016, 2017; Gibney, 2015). These budgetary cuts have severely impacted ongoing research and technological projects, leaving institutions struggling to maintain operations (Moutinho, 2022).

Despite these financial challenges, science continues to play a crucial role in shaping Brazilian policies. Institutions like the Oswaldo Cruz Foundation (Fiocruz) have provided key research to guide public health responses, such as during the Zika virus and COVID-19 crises. Similarly, the Ministry of the Environment relies on research from the National Institute for Space Research (INPE) to address deforestation and environmental preservation. Meanwhile, state-level initiatives, particularly in São Paulo, have continued to drive scientific innovation, leveraging the region's unique capacity for applied and multidisciplinary research (Faleiros, 2018). The same can be said for the role of the Brazilian Agricultural Research Corporation (Embrapa) in agricultural research.

However, the broader context of science denialism, compounded by politically driven narratives under past administrations, has further undermined the credibility of scientific expertise in policymaking (Diele-Viegas et al., 2021). The current study explores how scientific evidence, both domestic and international, is integrated into Brazilian policymaking. Drawing on the Overton database, we analyze policy documents from federal institutions to trace the incorporation of research outputs, highlight the role of key funding agencies, and assess trends in the reliance on domestic versus international scientific evidence.

Method

This study utilizes the Overton policy database to analyze the integration of scientific research into Brazilian policy documents. The Overton database, established through web-crawling publicly accessible documents from over 43,000 organizations found in more than 2,000 policy sources, is one of the world's largest repositories of policy documents, encompassing governments, intergovernmental organizations (IGOs), think tanks, and charitable entities. As of May 2024, the database included more than 13 million policy documents. Each document in Overton is processed to extract bibliographic information such as title, authors, and publication date, along with cited references from academic literature and other policy documents. Overton's broad definition of policy documents includes materials primarily written for or by policymakers, such as reports, clinical guidelines, white papers, and legal manuscripts. The database's coverage spans documents from almost 200 countries written in several languages.

We conducted a search within Overton for sources in the Brazilian government. In total, Overton indexed 24 organizations in 12 policy sources in Brazil. Of those, seven are from the Brazilian government, while the others are Brazilian IGOs, and I think thanks. The search yielded 109,769 policy documents published between 1997 and 2023. We exported 60.458 unique Digital Object Identifiers (DOIs) from research cited in these policy documents and searched them in the Web of Science (WoS) database. The results yielded 35,230 research documents (58,3%), and the metadata from these documents was later exported to the VantagePoint software for

further processing and analysis. Data was cleaned and standardized, focusing on countries, organizations, journals, and funding agencies.

Results and discussion

Results from cited research in Brazilian government policy documents show that 95.5% were written in English and only 4.1% in Portuguese. Additionally, 83.4% are articles, 7% are reviews, and 5% are proceeding papers. Figure 1 shows the countries with at least 400 cited research documents in the sampled policy documents, with Brazil highlighted in black. The analysis of scientific citations in Brazilian policy documents reveals a diverse array of international influences, with the United States leading significantly. The United States' research, cited 13,994 times, indicates a substantial reliance on American scientific output, reflecting the country's global leadership in various research fields. Brazil itself ranks second with 6,350 citations, underscoring the weight of domestic research in policy formulation. The prominence of Brazilian research in policy documents indicates its relevance to certain policy areas, particularly in health and environmental sciences. These fields also benefit from the support of Brazil's well-established research institutions, such as Fiocruz, Embrapa, and INPE, which play pivotal roles in these domains as previously cited.

However, the extent to which the academic community's research agenda aligns with broader governmental priorities remains uncertain and likely varies across different fields. While some topics may reflect policy needs, others may be more influenced by academic interests, funding availability, or international research trends. Nonetheless, from a public policy perspective, the presence of research authored by Brazilian scholars is significant, as it increases the likelihood that locally relevant knowledge, methodologies, and contexts are considered in policy formulation.

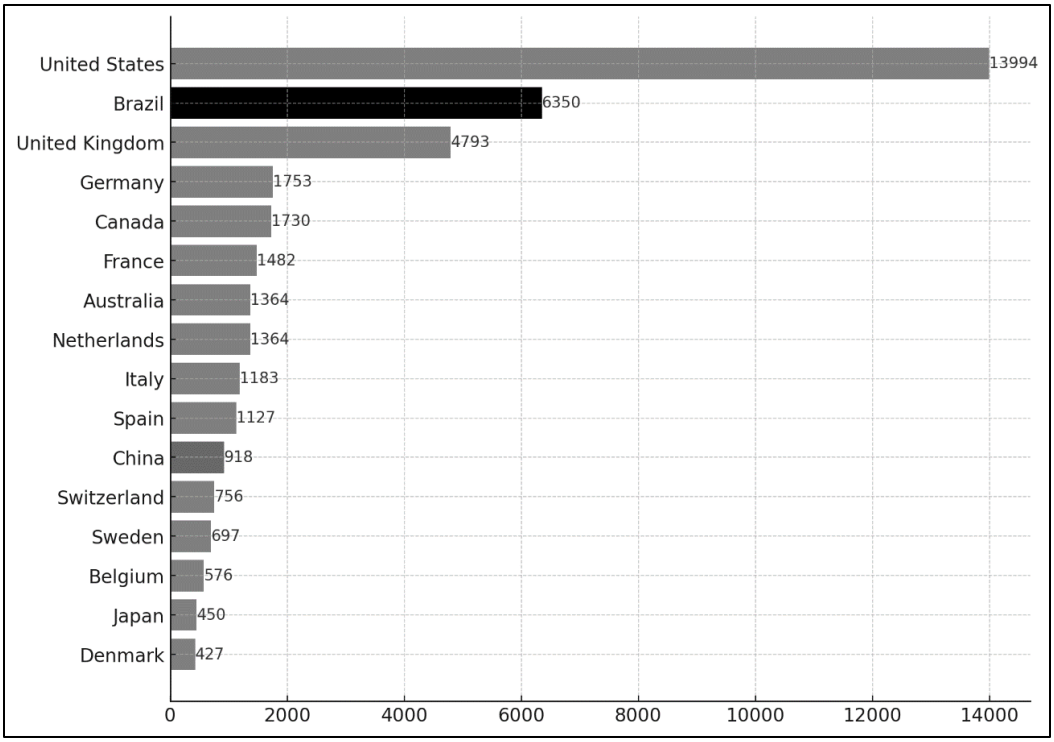

Figure 1. Most cited countries in sampled policy documents.

The dominance of the Global North is evident, with countries like the United Kingdom, Germany, Canada, and others contributing substantially. This reflects a broad spectrum of scientific collaboration and influence from developed nations. China, with 918 citations, is the only Global South country among the top 16 cited countries, highlighting a significant disparity in the sources of scientific research. Beyond China, other Global South countries such as Argentina (357 citations), India (331 citations), South Africa (312 citations), Mexico (275 citations), and Chile (218 citations) have a notable but comparatively smaller presence. This pattern underscores the dominance of research from the Global North in Brazilian policy documents while still recognizing the valuable contributions from a few key Global South nations. This aligns with previous findings that highlight the challenges faced by Global South nations in bridging the science-policy gap due to limited international collaboration (Szomszor & Adie, 2022).

The funding landscape further underscores the challenges and contributions of national and international agencies. Figure 2 highlights the pivotal roles of domestic funding bodies like the National Council for Scientific and Technological Development (CNPq) and the São Paulo Research Foundation (FAPESP). Despite significant financial constraints, FAPESP has remained resilient, maintaining its state-mandated funding to support critical research projects (Faleiros, 2018).

International funding agencies also play a significant role, with the National Institutes of Health (NIH) and the National Science Foundation (NSF) of the United States being major contributors. These figures illustrate the influence of U.S. funding

on Brazilian research outputs and its integration into policy frameworks. The Economic and Social Research Council (ESRC) from the United Kingdom and the European Union (EU) are other key international contributors. The presence of the National Natural Science Foundation of China (NSFC) highlights China's growing influence in global research collaborations.

In addition to FAPESP, other Brazilian regional funding agencies, such as the Rio de Janeiro Research Foundation (FAPERJ) and the Minas Gerais Research Foundation (FAPEMIG), showcase the significant contributions of state-level funding to the national research ecosystem. Additionally, specialized institutions like the Brazilian Synchrotron Light National Laboratory (LNLS) reflect the impact of targeted research infrastructure investments.

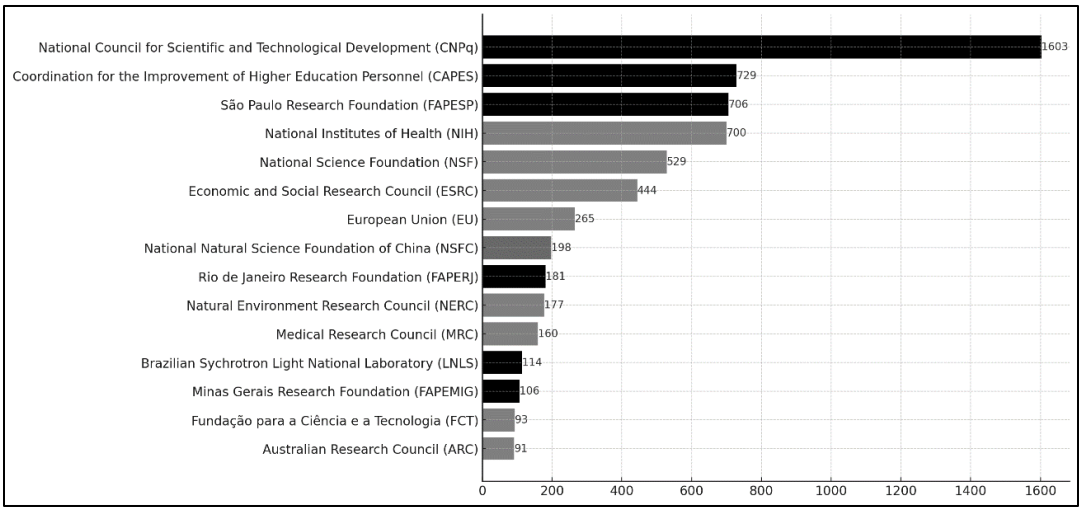

Figure 2. Main funders of cited research in sampled policy documents.

Domestic institutions also feature prominently in policy citations, as shown in Figure 3. The University of São Paulo (USP), the State University of Campinas (UNICAMP), and the Federal University of Rio de Janeiro (UFRJ) lead as key contributors to policy-relevant research. This reflects the ability of Brazilian institutions to align their research outputs with national policy priorities despite systemic underfunding (Escobar, 2022). However, the influence of research on policy is not solely determined by the volume of citations but also by the relevance and accessibility of the research outputs.

Internationally, the National Bureau of Economic Research (NBER) and Harvard University are also highly influential. These institutions, along with the University of Oxford, Stanford University, and the University of London, contribute significantly to the research base that Brazilian policymakers draw upon. This indicates a strong reliance on leading global academic and research institutions to support policy decisions in Brazil.

Beyond other Brazilian universities and research organizations, there are not many Global South organizations frequently cited. The Chinese Academy of Sciences

(CAS) and the University of Cape Town (UCT) are the most cited ones, but with only 98 and 84 citations, respectively. On the other hand, the inclusion of other Global North institutions demonstrates the breadth of international research informing Brazilian policies.

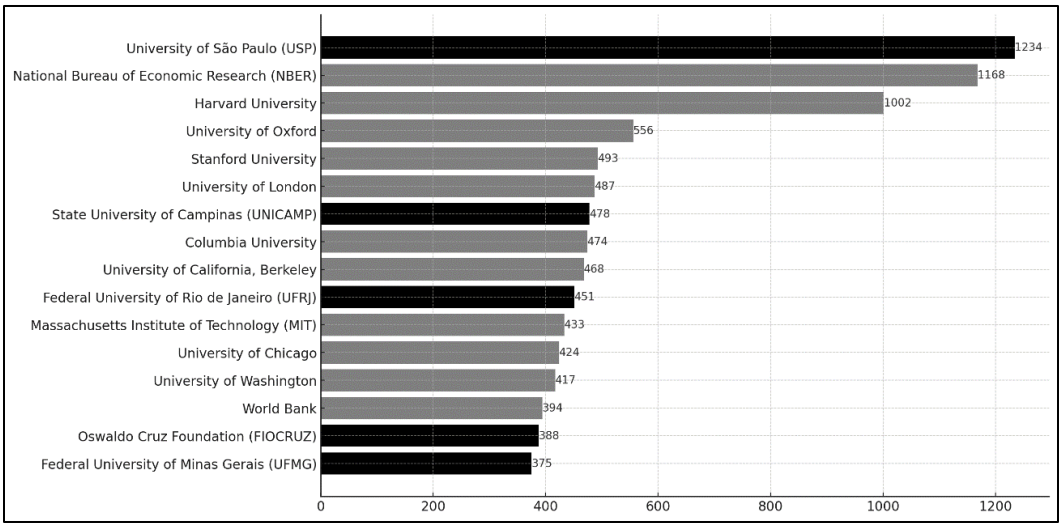

Figure 3. Organizations with the most cited research in sampled policy documents.

The analysis of the most cited journals in Brazilian policy documents and their impact factor reveals a diverse range of influential publications across various fields (Figure 4). Leading the list is the American Economic Review with 450 citations, followed by the Journal of Political Economy, the Quarterly Journal of Economics, and a range of other economics journals, highlighting the strong influence of economic research on Brazilian policymaking.

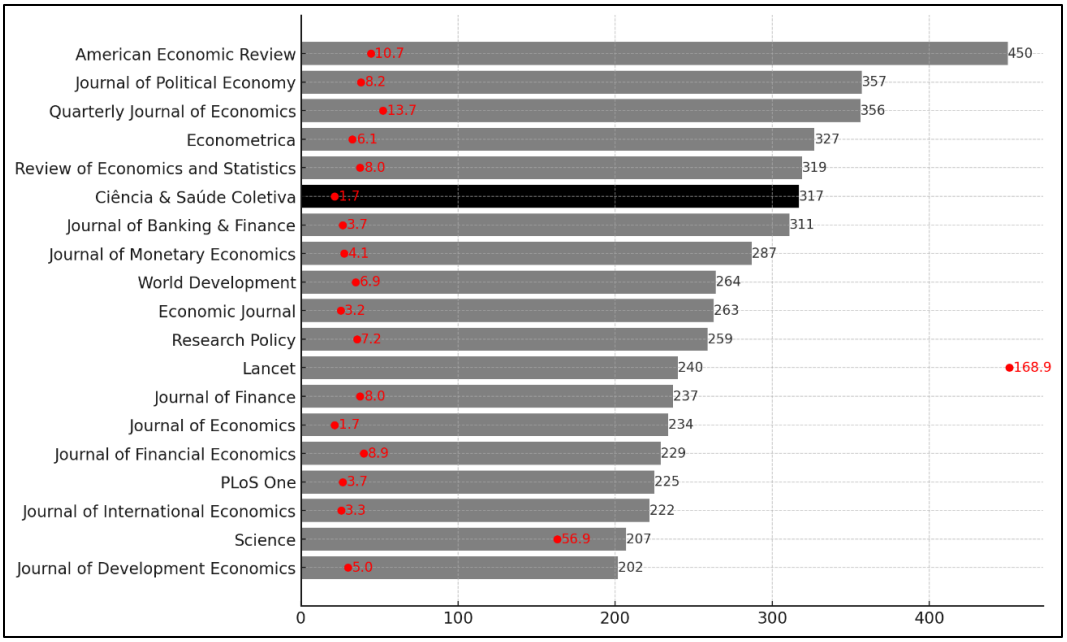

Figure 4. Journals with the most cited research in sampled policy documents.

Ciência e Saúde Coletiva stands out as the sole Brazilian journal with significant influence, accumulating 317 citations. This reflects the journal's critical role in disseminating health-related research that informs public health policies in Brazil. Despite its relatively lower impact factor of 1.7, its frequent citation underscores the practical relevance and impact of its published research on Brazilian public health policy.

Other highly cited journals include international publications like the Lancet, which, despite having a high impact factor of 168.9, indicates the integration of high-impact global health research into Brazilian policy frameworks. Similarly, Science, with an impact factor of 56.9, and PLoS One, with a more moderate impact factor, illustrate the broad scope of scientific research considered in Brazilian policymaking.

Conclusion

Despite significant financial constraints and the challenges posed by science denialism and political narratives in recent years, Brazilian science remains a relevant force in shaping evidence-based public policies. Domestic research institutions play a relevant role in aligning scientific outputs with national priorities, particularly in health and environmental management. These institutions are supported by national and state-level funding agencies that help sustain scientific production. However, the analysis also reveals Brazil's dependency on Global North research, reflecting structural inequities in global knowledge production. To strengthen the science-policy interface, Brazil must prioritize investments in research infrastructure, enhance South-South collaborations, and bolster mechanisms that promote the visibility and accessibility of domestic research. Such efforts are

essential not only to safeguard Brazil's scientific legacy but also to ensure its long-term contribution to global and national policymaking.

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