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ENGINEERING SCIENCES

Criteria for Research Productivity Grants in Brazil Applied to Civil Engineering: Reflections on Gender Differences and the Current Context

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Abstract: This article addresses gender issues in the context of the professor's productivity grants (PQ) distribution applied to Civil Engineering. It contributes with reflections on the advancement of knowledge and gender equality through the inclusion of integrity and holistic aspects. A quantitative and descriptive data analysis of public documents revealed that the number of women civil engineers is considerable, and that female professors engaged in postgraduate are capable of competing for scholarships. Nevertheless, less than 20% of PQ scholarships are awarded to female civil engineers, and the current scenario point to a gender disparity in terms of approval PQ demands. Moreover, despite the majority having already reached the pinnacle of their academic careers, only one has been designated at the highest level, and none have attained the rank of Senior. These findings can indicate segregation, structural barriers, lack of support and policies that encourage access to the highest levels of scholarships, possible subjectivity in the judgment that lead to the lack of impartiality and discrimination, and other factors that may still be understood as gender discrimination. Thus, the PQ criteria can be reviewed in light of the Brazilian National Care Policy, Sustainable Development Goal 5, and gender mainstreaming.

Key words: care policy, gender disparity, gender mainstreaming, higher education.

INTRODUCTION

In recent years, issues related to the impact of women's professional activities, both in public and private environments, have been a topic of discussion in Brazilian society and internationally. In 2023, Claudia Goldin received the Nobel Prize in Economic Sciences (Nobelprize.org 2023a) for her research on the primary factors contributing to the gender gap in the labor market. Goldin (2020) observed that, over the past century, the proportion of women in paid work has tripled in many countries. However, significant gender differences still persist. One of the aspects highlighted by the author is the fact that the salary difference between women and men in developed countries is between 10% and 20% despite the fact that many of these countries have legislation on equal pay and women have a higher level of education than men. One of the reasons for this phenomenon is parenting. In most cases, women assume greater responsibility for child care and other family responsibilities compared to men. This makes maintaining or advancing in a career, and the subsequent increase in income, a challenge. The aforementioned researcher also observed that potential changes in this scenario require time, as career choices are based on expectations that may not materialize. Furthermore, the job

market comprises individuals from different generations who faced disparate circumstances when making life choices (Nobelprize.org 2023b).

In Brazil, during the first half of 2023, the federal government established a working group with the objective of developing a National Care Policy. This initiative reflects the necessity for a more comprehensive and compassionate approach to those who take care of children, adolescents, elderly, individuals with disabilities, and those with other limitations. This policy is necessary because the responsibility for care is distributed unequally in Brazilian society, with the majority of this falling on the female population (Serviços e Informações do Brasil 2023). According to data from the IBGE (2023), women dedicate approximately 22 hours per week to domestic work and unpaid care, while men dedicate approximately half of that time. Moreover, women who are employed outside the home dedicate approximately 8.1 additional hours per week to domestic duties and childcare compared to men who are also employed outside the home. Additionally, in the same year, the topic of the "Challenges for Tackling the Invisibility of Care Work Performed by Women in Brazil" was included as a theme for the *Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira* (INEP 2023), which is used for access to higher education. This action served to highlight the issue of social perceptions in relation to gender conventions and the manner in which women are integrated into Brazilian society.

In its glossary of terms for the Sustainable Development Goals (SDGs), the *Nações Unidas no Brasil* (ONU BR 2016) highlights that in most societies, there are differences and inequalities between women and men in the responsibilities assigned to them, activities carried out, access and control over resources, as well as opportunities for decision-making (Sustainable Development Goal 5, SDG 5). Gender is a component of the broader sociocultural context, along with race and ethnicity. In Brazil, these factors contribute to the structuring of inequalities, with women and the black population exhibiting the most unfavorable socioeconomic indicators. Moverse (2022) also notes that gender transversality involves recognizing that girls and women experience specific situations and violations of structural rights, and that they require their own measures to exercise their rights on an equal footing with boys and men. Incorporating a gender perspective implies considering the rights of girls and women as essential components of all actions and in the various domains and dimensions of public policy. This document provides a comprehensive guide for gender mainstreaming in the project cycle, a strategy that has gained global recognition for its effectiveness in promoting gender equality. Strategies for mainstreaming gender equality include targeted approaches, which prioritize gender equality as a primary objective; actions to address specific gaps and challenges; and integrated approaches, where relevant gender equality issues are considered as a regular and routine part of policies. The step-by-step process consists of gender analysis, design, resource allocation, program implementation, monitoring, and evaluation.

As indicated by UNESCO (2024), although the domains of science, technology, engineering, and mathematics (STEM) are regarded as fundamental to the economy, the majority of countries, irrespective of their level of development, have not yet achieved gender equality in these areas. The proportion of women in these fields globally is 33.3%, with only 30% of countries having data on this figure. Researchers in these areas face significant obstacles in achieving gender parity, as vertical segregation, where the disparity occurs in the

same position with different statuses, and horizontal segregation, where inequality occurs across the entire labor market, persist. Azoulay (2024) highlights that, in the context of climate change, green transition, and the emergence of new technologies, the world requires a greater investment in scientific research. However, she also asserted that the scientific community must address the underrepresentation of women in the field. This imbalance has broader societal implications, as it hinders the generation of new knowledge and innovations, impedes the advancement of scientific discovery, and undermines sustainable development.

The issues have implications for all work environments in Brazil, including academic and scientific. Arêas da Silva et al. (2021) observed misogyny in the academic sphere of the Brazilian postgraduate systems, and this situation has been replicated in the politic-bureaucratic circle that manages and sponsors these systems. To facilitate the advancement of gender equality in higher education institutions (HEIs), particularly in the domains of science, technology, engineering, mathematics, and medicine (STEMM), the British Council Brazil (2022) has published a framework designed to support the implementation of gender equality in higher education and research. This framework encompasses the following topics: Principles; The Importance of Diversity in Higher Education and STEMM; Self-Assessment and Creation of a Self-Assessment Team; Communication, Consultation and Engagement; Development of Data Collection and Analysis; Effective and Measurable Action Plan; Terms and Definitions; and Intersectionality.

In 2023, the Parent in Science movement (2023) made available an informative document containing an analysis of the distribution of Research Productivity (PQ) grants in Brazil granted by the *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq), from a gender and racial perspective. The PQ grant is a fellowship granted to higher education professors from all areas of knowledge to distinguish their work and value their research production. Among the criteria for granting are scientific production, participation in the supervision of human resources and effective contribution to the research area. The aim of the Parent in Science document was to promote equal opportunities and contribute to a more diverse, inclusive, and fair academic environment for all researchers. Among the issues that require attention in this context are the low representation of women overall and the scissor effect, whereby the proportion of female representation declines as the level of the PQ grant increases. Furthermore, there is a worrying racial inequality for black and indigenous people, as well as regional and knowledge area inequalities. There is also a lack of data on people with disabilities, parenting, and other intersections. Finally, there have been very small changes in the distribution of PQ grants over a long period of time (10 years).

Oliveira et al. (2024) indicated that despite an improvement in access of women to undergraduate and postgraduate studies in the last years, women are still less likely to join in certain fields of academic research or in privileged career positions. In addition to representativeness, we also need to analyze scientific culture, i.e., the habits and customs from the practice of science that exclude women.

The field of engineering is one of the areas that requires the most improvement to facilitate true women inclusion and encourage girls and women to pursue training in this field and to welcome them to develop their careers under equal conditions. This is particularly relevant in the context of the job market as well as teaching and research institutions. A number

of projects and programs have been developed in Brazil, including *Elas na Engenharia* (USP 2019), *Conversa entre Meninas e Engenheiras* (UFG 2021), *Futuras Cientistas* (CETENE 2023) and *Mulheres em Ciência e Tecnologia* (Araripe et al. 2023) through the integration of elementary and high school students with universities. The issue must be addressed in a more comprehensive manner at all levels and environments of HEIs, as well as by the scientific community and funding agencies. This should include all career levels, the bodies involved, and different spheres of society.

Despite the availability of the majority of the references cited in the introduction to this article at the beginning of 2024, the CNPq published two notes (CNPq 2024a, b) pertaining to perceived injustices involving sensitive facts about the evaluation and concession process of PQ grants and Senior Research productivity grants (PQ-SR). At the time, the scientific community publicly denounced the existence of prejudiced *ad hoc* opinions issued within the scope of CNPq Call No. 09/2023, which included excerpts containing considerations about the maternity situations of researchers applying for PQ scholarships. The published notes indicate the advent of a transformative movement to the date, but these actions may not yet be sufficient or adequate to address the issue. Reflections should be conducted more broadly, with input from the scientific community, diagnosis, collection of information based on criteria from the current context, and the implementation of gender mainstreaming (i.e., analysis, program design, resource allocation, implementation program, monitoring and evaluation). To implement a policy or culture of gender equality that is capable of preventing conflicting and unfair situations from occurring between all agents involved, it is necessary to consider all aspects that are relevant to the matter. The objective of this paper is to examine gender differences and the current context in order to review the process and criteria for distributing PQ scholarships in Brazil applied to Civil Engineering, identified as Engineering I in the CNPq system. This area was chosen because, in Brazil, this is one of the engineering with more women representatives. The focus is on the inclusion of integral and holistic aspects for the advancement of quality knowledge and gender equality in one of the STEM areas.

MATERIALS AND METHODS

This article outlines the methodological steps involved in the current context regarding the distribution of PQ Scholarships promoted by CNPq in Figure 1. These steps include both quantitative and descriptive analyses.

In the course of data collection and examination of public documents pertaining to PQ grants and Brazilian researchers engaged in CNPq Engineering I area, with a particular focus on Civil Engineering, the following information was collated:

- The historical data between 2005 and 2023 on grants provided by CNPq (2024c) is available in the Science, Technology and Innovation Development Panel. This data can be used to analyze the amount of investment made in this line of funding and to obtain the number of PQ grants and Technological Development (DT) grants intended for researchers of Engineering I over the years;
- The historical data, between 2019 and 2023, on information registered on the Lattes Platform through the Lattes Panel (CNPq 2024d) to verify both the number of women with training and work in Civil Engineering and the general number of

Figure 1. Flowchart with the methodological steps used in the study.

all types of scholarships granted by CNPq for women;

- Number and categories of PQ Scholarships that were in force in February 2024 for the area of Civil Engineering, with a focus on female PQ scholarship holders, considering the levels names present by CNPq (2024e):
  - ◊ Senior (Sr);
  - ◊ Hight level (PQ-1A until 2023 or A since 2024);
  - ◊ Intermediate levels (PQ-1B or B, PQ-1C or C, PQ-1D or D);
  - ◊ Initial level (PQ-2 until 2023 or E since 2024).
- Historical summary of the general criteria for analysis and judgment of CNPq PQ scholarship calls made from 2016 to 2023;
- Judging criteria of the CNPq (CNPq 2023a), Advisory Committee - CA (CNPq 2023b) and the latest call for PQ scholarships (CNPq 2023c), aiming to identify and reflect on the requirements currently required;
- Number of permanent female professors in Brazilian Postgraduate Programs (PPGs) to obtain the potential demand for researchers able to compete for PQ scholarships in Civil Engineering, considering the following requirements:
  - ◊ The selection of PPGs recognized by *Fundação Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* (CAPES) in 2022 in the area of Civil Engineering and Transport Engineering that work in the training of human resources at both academic levels (master's and doctorate) is presented regardless of the CAPES grade, according to information available on the Sucupira Platform (CAPES 2022). It should be noted that the inclusion of some PPGs in the Transport Engineering area was considered because that studies in the Transport Infrastructure subarea is, in these cases, linked to this area and not to the Civil Engineering PPGs. Despite this, all PQ fellows who work in this subarea are evaluated by the CA of Civil Engineering (EC) and not by the CA of Production Engineering (EP) and Transport;
  - ◊ Consultation of the websites of the selected PPGs to find the number of female professors who work permanently in the PPGs, working in teaching and research (guidance and publications).
- Consultation of the Lattes Curriculum of PQ women scholarship holders with scholarships valid in February 2024 available at CNPq (2024f) to identify the number of maternity leave declarations and the career level of each at their home

institution to verify whether there is a relationship between these indicators and the granting of PQ scholarships;
- Data about the gender of applicants to PQ grant calls from 2013 to 2023 provided by CNPq (2024g).

In the critical analysis stage, the data obtained was presented, analyzed, and compared with other published literature in the field, with the aim of determining whether the available information is sufficient to evaluate the issue of female participation in Civil Engineering PQ scholarships. This analysis also sought to identify any gaps in the existing data and to suggest improvements to the evaluation methodologies. In addition, the analysis methodologies of proposals received by CNPq consider legislation and aspects of the current context. Furthermore, important reflections are carried out to contribute to the improvement of the entire process, with a view to considering gender differences and the perspective of the current context.

RESULTS

Historical data

When consulting the historical data between 2005 and 2023, available in the Panel for the Development of Science, Technology and Innovation (CNPq 2024c), and applying only the filters for the fields of Development Lines - Training and Research Grants and Large Area - Engineering, which includes students and professors, the platform generates the data used to plot the graph shown in Figure 2.

On the same platform, using the filters: Funding Lines - Training and Research Grants, Large Area - Engineering, Modality - PQ Grants or Technological Development (DT) Grants, it is possible to obtain the necessary data to create the graph shown in Figure 3. In this case, it is observed that, over the past 12 years, the percentage of female PQ scholarship holders (professors) in Engineering fluctuated between 31% and 39%. Between 2011 and 2023, there was a stagnation of 20% in the granting of PQ

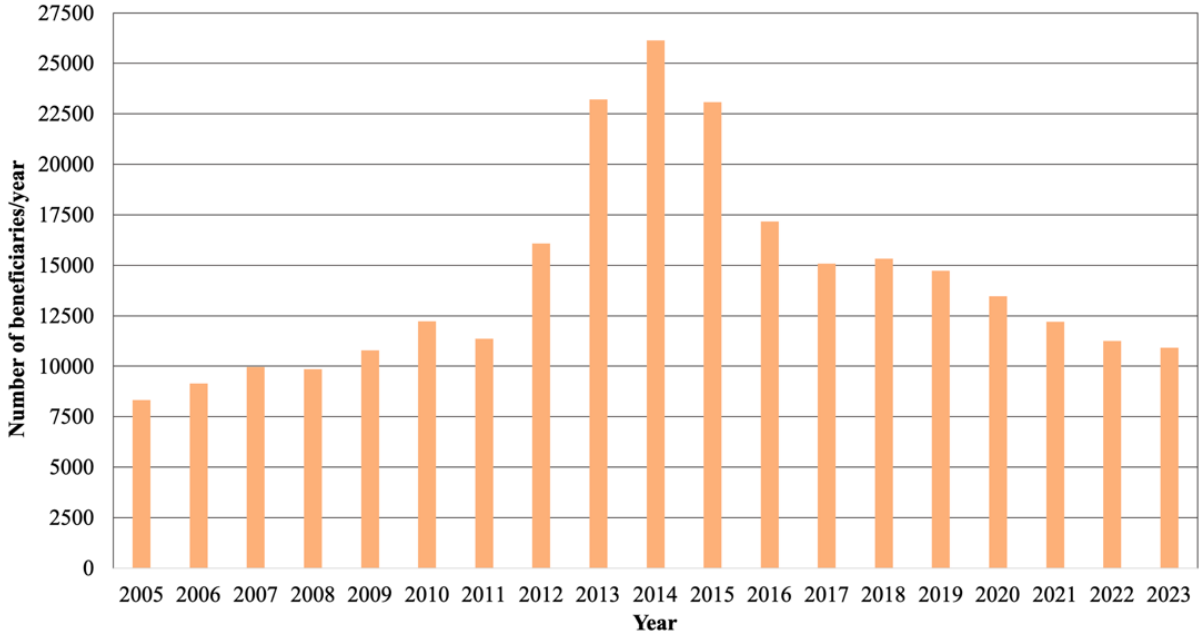

Figure 2. Number of all beneficiaries of training grants and researchers over the years (graph based in the Science, Technology and Innovation Development Panel data, CNPq 2024c).

scholarships to women professors across all Engineering fields.

The data required to prepare the graph presented in Figure 4 can be obtained from the CNPq (2024c) funding platform by using the filters: Funding Lines – Training and Research Grants, Large Area – Engineering, Area – Civil Engineering, Modality – PQ grants. This graph can show a review of historical data about the percentage of female PQ professors' fellows in the field of Civil Engineering.

CNPq recently made the Lattes Panel available (CNPq 2024d), comprising data extracted from the Curriculum of all masters and doctors registered on the Lattes Platform who updated their Curriculum in the last five years. In the area of Civil Engineering, there are 14,878 Curriculum registered, of which 4,929

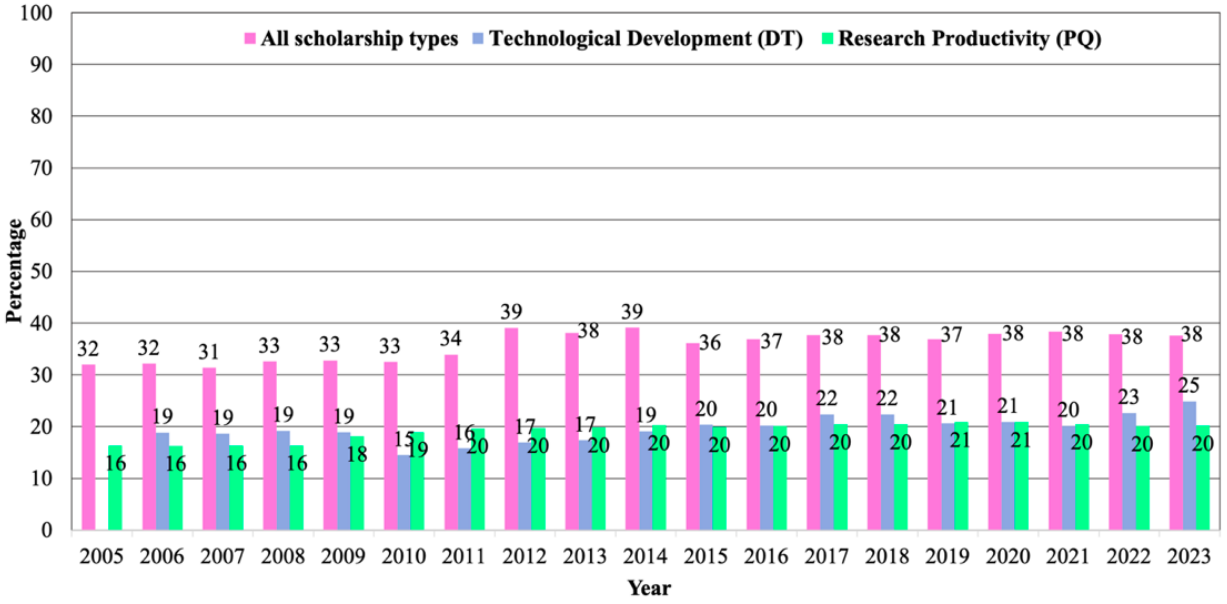

Figure 3. Percentage of female scholarship holders in Engineering.

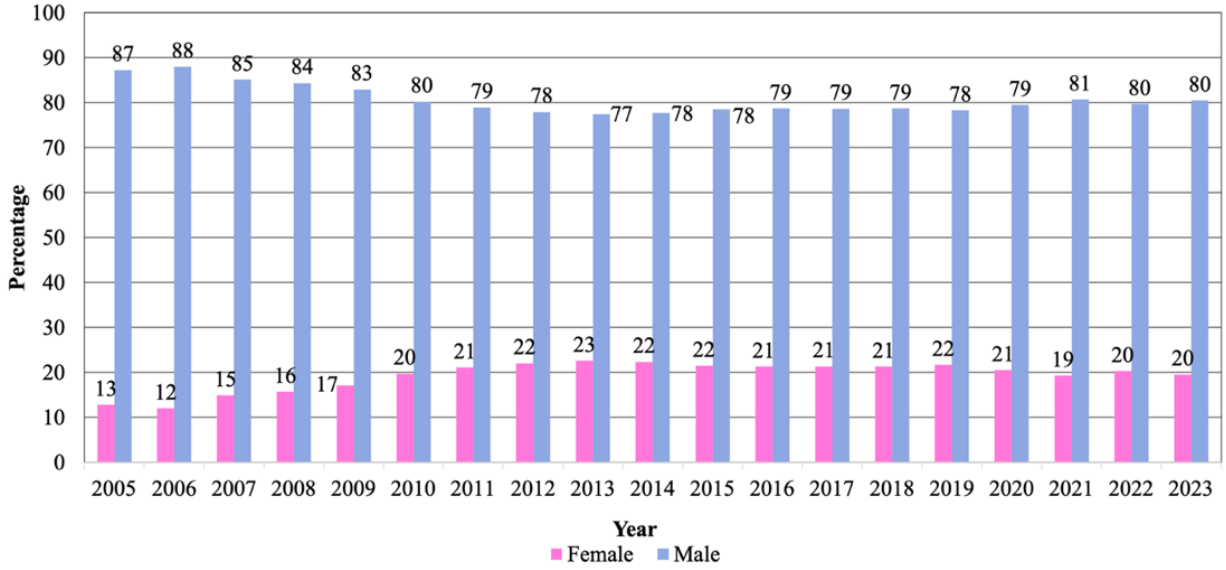

Figure 4. Percentage of female PQ and male PQ fellows in Civil Engineering.

have obtained a doctorate, 9,353 have obtained a master's degree, and 596 have obtained a professional master's degree. Of this total, 6,035 female Civil Engineering professionals currently working in the area, representing 40.56%. With regard to the academic degree criterion, the number of civil engineering-related Curriculum registered is 5,613, of which 1,250 have obtained a doctorate, 3,777 have obtained a master's degree, and 586 have obtained a professional master's degree. Of this sample, 2,252 are female, representing 40.12% of the total. These results point that nowadays for both criteria, professional and academic, approximately 40% of the Brazilian Civil Engineering are women.

In the Lattes Panel, the general data on CNPq Scholarships by opting for the filter Dimension (academic degree) – Scholarship for all areas of knowledge, considers, together, every scholarship for College Scientific Initiation, International College Experience, Master's, Doctorate, Postgraduate Doctorate, Productivity in Research and Productivity in Technological Development and Innovative Extension at all levels. A total of 6,248 scholarships were awarded between 2019 and 2023. Of these, 3,719, or 59.52%, were allocated to women.

Oliveira et al. (2024) presented similar results. They conclude that over the last few years it has been possible to observe the predominance female in the total number of scholarships awarded by CNPq, in all modalities. On the other hand, the scenario is quite different in the PQ scholarships: of the 3,935 PQ scholarships approved in 2023, 64.17% of beneficiaries were men and 35.83% were women. Not only there are fewer women than men among PQ professors of the CNPq, as this discrepancy is more serious in some areas, such as in STEM.

PQ scholarships at present

A search for information on the number of PQ professors' scholarships in February 2024 for the area of Civil Engineering (CNPq 2024e) revealed that, of the 305 scholarships, only 56 (18.4%) were for female researchers, a percentage below that observed in Figure 4 for the last 13 years. This value is also below the national average of 36.5% for all areas of knowledge, as reported by Parent in Science 2023, and the 33.3% observed by UNESCO (2024) in the field of STEM on a global scale.

For Civil Engineering PQ fellows, only 3 researchers are classified in the SR category, all of whom are men. As illustrated in Figure 5, 12.1%, more than half of Civil Engineering PQ fellows, are grouped at the PQ-2 level. At other levels, female participation is diminished, with only 0.3% of scholarship recipients reaching the PQ-1A level. In this case, of the 24 PQ-1A scholarships in force, only 1 (4.2%) was awarded to a woman researcher in the area of civil engineering. This number is less than half the overall average of 9.8% observed by Parent in Science (2023) in engineering as a whole.

During the submission process of this paper, CNPq showed further progress in the dissemination of data related to PQ scholarships by making available the Productivity Scholarship Call Panel - PQ (CNPq 2024g). Table I summarizes the data extracted directly from this panel for Civil Engineering, classifying the total number of submitted and approved demands according to gender. On average, 25.81% of proposals are submitted by women, and only 20.49% are approved; for men these numbers are 74.19% and 79.51%, respectively. Even in years when there was an increase in the number of demands submitted by women (i.e., 2017, 2021 and 2023), the number of proposals approved for them were

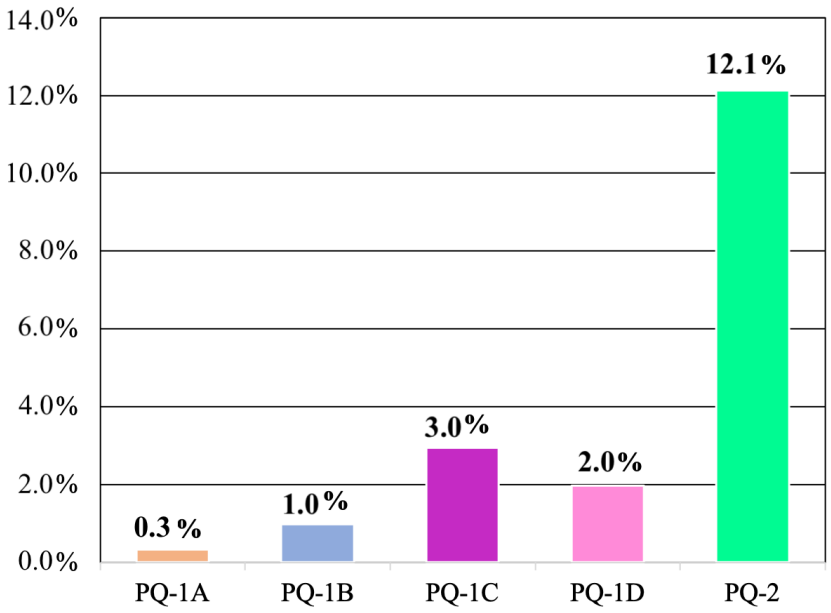

Figure 5. Distribution of PQ scholarships awarded to women, by level, in Civil Engineering in Feb/2024.

Table I. Summary of the PQ calls between 2013 and 2023 considering the total number of submitted and approved demands according to gender.

Year	Submitted proposals				Approved proposals			
	Female		Male		Female		Male	
	Amount	%	Amount	%	Amount	%	Amount	%
2013	38	24.05	120	75.95	22	23.40	72	76.60
2014	32	21.48	117	78.52	11	14.86	63	85.14
2015	41	26.97	111	73.03	25	26.88	68	73.12
2016	43	25.00	129	75.00	12	19.67	49	80.33
2017	54	28.42	136	71.58	20	20.20	79	79.80
2018	46	28.75	114	71.25	17	20.73	65	79.27
2019	41	23.70	132	76.30	17	21.25	63	78.75
2020	49	25.52	143	74.48	18	21.69	65	78.31
2021	60	27.40	159	72.60	21	20.79	80	79.21
2022	41	24.85	124	75.15	14	17.50	66	82.50
2023	57	27.80	148	72.20	18	18.37	80	81.63
Average	46	25.81	130	74.19	18	20.49	68	79.51

stagnant or decreased. In these same years, men also submitted more proposals, and the number of approved do not change or increased. Figure 6 also corroborate with these findings: along the years there is an increasing trend for proposal submitted for woman and men; however, the number of PQ grants approved for men showed a slight upward trend, a fact that was not observed for proposals approved for women.

Figure 7 shows the relationship between approved and submitted proposals according to gender over 10 years. It can be seen that only in 2013 and 2015, the ratio between approved and submitted proposals was similar for both female

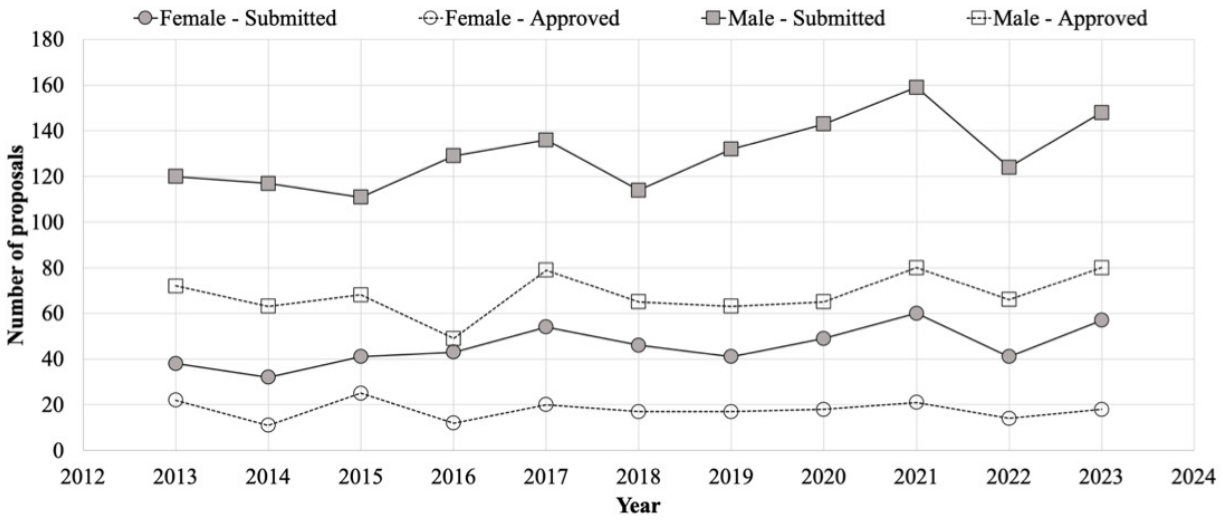

Figure 6. Number of submitted and approved proposals for female and male from 2013 to 2023.

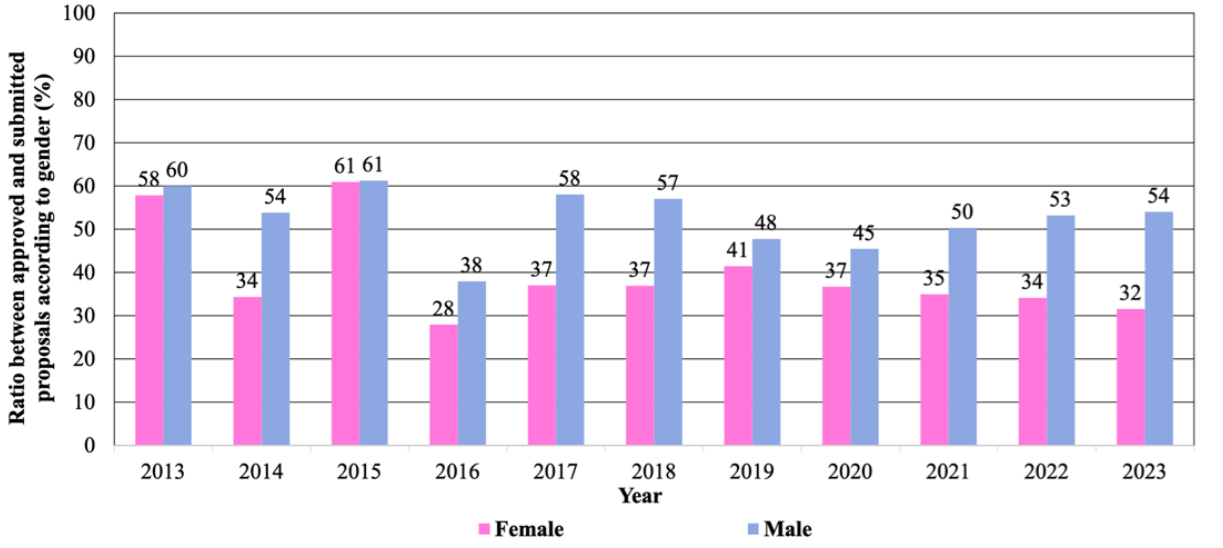

Figure 7. Ratio between approved and submitted proposals according to gender from 2013 to 2023.

and male (close to 60% for each group). However, since 2019 the disparity between these rates has been increasing, with the number of men ratio increasing, while the number of women ratio has decreased.

According to Oliveira et al. (2024), based on the Inter-American Development Bank data (BID 2022), the probability of female professors, with the same profiles of their male peers, obtain PQ grants is smaller than that of men: the difference is 3.7 percentage points (p.p.) considering all areas; and the reduction probability associated with the female gender is higher in the STEM areas, reaching 5.6 p.p.

Judging criteria PQ scholarship

This sub-item presents results of both the historical context of the evaluation criteria

considered in recent years and the criteria used in the 09/2023 call (CNPq 2023a, b).

Criteria in recent years

When evaluating the general criteria for the analysis and evaluation of the calls made between 2016 and 2023, it appears that the scores for the items in the process were calculated between 0 and 10. However, as summarized in Table II, there have been changes over the years in both the number of items evaluated (4, 5, or 6), as well as their descriptions and respective weights. The relevance of the production (point A or B) has always been the aspect with the

Table II. Summary of the general criteria for analysis and judgment of PQ scholarship for CNPq calls from 2016 and 2023.

Item	Description	Weight				
		Call 12/2016	Calls 12/2017, 09/2028, 06/2019	Call 09/2020	Calls 04/2021, 09/2022	Call 09/2023
A or B	Scientific merit, originality and relevance of the project to the scientific and technological development of the country, taking into account its potential impact, applicability and innovative character; or Scientific and intellectual merit, originality and relevance of the project to the scientific, technological or social development of the country, taking into account, in addition, its potential impact and innovative character.	1.0	1.0	1.0	2.0	2.0
B or A	Relevance, originality, impact and innovation of the applicant's scientific, technological, scholarly and artistic production, or relevance, originality and innovation of the applicant's scientific, technological, scholarly and artistic contribution throughout his/her career, with emphasis on the most recent activity (last 5 years).	4.0	4.5	3.5	3.0	3.0
C	The proponent's role in the training of human resources or the proponent's contribution to the training of highly qualified human resources and performance in undergraduate and postgraduate courses.	2.0	2.5	1.5	1.5	2.0
D	National and international integration of the applicant and its performance in activities of: scientific, technological and academic management; coordination or participation in research, development and/or extension projects and/or networks; editorial board and review of journals or collaboration with research groups or institutions in the country and abroad, and participation or coordination of research projects and networks.	2.0	2.0	1.0	1.5	2.0

Table II. Continuation.

E	Alignment with aspects relevant to the CNPq, such as: focus on major national problems; multi and transdisciplinary approaches; social impact; communication with society; interaction with the production park; environmental protection and sustainability, whenever relevant, or degree of adherence of the project to the areas: strategic, enabling, production, for sustainable development and quality of life, or work in scientific societies and editorial of periodicals in the country and abroad, work in management scientific studies, awards, decorations and other distinctions, taking into account their professional stage.	1.0	-	2.0	1.0	1.0
F	Degree of adherence of the project to basic and fundamental science and interaction with other groups and research networks or work in scientific societies and journal publishing in the country and abroad, work in scientific management, awards, decorations and other distinctions, taking into account its professional stage.	-	-	1.0	1.0	-

highest weight over the years (varying between 3.0 and 4.5), followed by the contribution to the training of human resources (point C, with a weight varying between 1.5 and 2.5) and the merit of the project (point A or B, with a weight varying between 1.0 and 2.0). In the end, the grade for each proposal is measured by the weighted average of the grades assigned to each item.

In observing the changes in the criteria for Civil Engineering committee (CA-EC), which are available as an annex to the calls for proposals between 2016 and 2023, three documents were consulted: the first until 2017, the second from 2018 to 2020, and the third from 2021 to 2023. In general, the indicators consist mainly of quantitative criteria, with the minimum values increasing with the level of the PQ category. In all the calls, it is stated that the number of grants awarded at a CA-EC evaluation session is limited by the value set by CNPq for the field of Civil Engineering. Scholarships are awarded in order of priority, depending on demand and based on comparative analysis. The fact that a candidate meets all the quantitative minimums of the profile for a given level does not guarantee the award of the scholarship or the maintenance of the level even if the candidate already has the benefits from a PQ scholarship (CNPq 2023b, p. 100). However, unlike observed in other fields of knowledge, the CA-EC documents do not present the tie-breaking criteria in this comparative analysis, which can create inequities in the process.

The most recent notices include the elimination of articles in international or national conferences, an increase in the minimum number and quality (higher Qualis/CAPES strata system or impact factor) of articles published in journals, and the inclusion of minimum values for the H-index (Web of Science). These developments demonstrate the increase in the

requirements level for a professor in Brazil to be awarded one of these scholarships over the years.

Current criteria

Upon further examination of the current criteria, it can be observed that the CNPq (2023a) indicates that, regardless of the CA, the criteria must include the following items as general guidelines:

a) scientific merit of the project;
b) b) relevance, originality and repercussion of the candidate's scientific production;
c) training of human resources at postgraduate level;
d) scientific, technological and innovation contribution, including patents;
e) coordination or participation in research projects and/or networks;
f) international insertion of the proponent;
g) participation as scientific editor;
h) participation in scientific and academic management activities.

In the context of proposal analysis, it is also important to consider the following factors: focus on major national problems; multi- and transdisciplinary approaches; social impact; communication with society; interaction with the production park; and environmental conservation and sustainability. In general, CNPq establishes the guidelines that must be observed by the CAs. However, it does not define or detail how this should be done.

In accordance with the general criteria of the CA–EC (CNPq 2023b), the following standards have been established:

- Doctorate time: CNPq (2023a) does not appear to include a criterion to doctorate time in its general guidelines. However, in category 1, the scholarship requires that the researcher have at least 8 years of doctoral studies at the time of implementation. For those classified in Category 2, the scholarship requires at least 3 years of doctorate completion;
- Researcher's performance: The researcher's performance is evaluated through indicators referring to the previous five-year period, in the case of category 2, and the previous decade, in the case of category 1. These indicators consider scientific production, training of human resources, and contribution to innovation. In addition, the researcher's performance was evaluated in terms of coordination or participation in research projects, international insertion in the area, participation in editorial activities, participation in scientific management and academic administration, management of institutions and centers of scientific and technological excellence, and organization of important congresses in the area. This criterion meets the general CNPq requirements, adding the evaluation time that will be considered for each scholarship category;
- Research project relevance: The scientific relevance of the research project is significant, particularly in terms of its potential for economic and social impacts and the development of research networks involving interdisciplinary areas in accordance with paragraph a) of the CNPq general guidelines.

A specific criterion of the CA–EC considers that the candidate will be evaluated in relation to their scientific productivity. This is defined as the relevance of the researcher's individual contribution to the technical and scientific development of the country and the world in the area of Civil Engineering, with adherence to the subareas of construction, geotechnics, or structures (CNPq 2023b). Furthermore, the

document states that the quality and impact of publications are influenced by national and international indexers, including ISI (Institute for Scientific Information), JCR (Journal Citation Reports), SciELO, SCOPUS, and Qualis/CAPES classification. The publication of books and/or book chapters in publishers with quality recognized by the scientific community may also be considered (CNPq 2023b). This summary demonstrates the significance attributed by the CA–EC to publications and their impacts. However, it is unclear what weight is assigned to this indicator in relation to the other criteria presented when candidates submit their proposals. Another issue not addressed in the general CNPq guidelines is the methodology for evaluating the quality and impact of publications. Each CA is responsible for defining these criteria. It is important to note that when consulting the CAPES Sucupira platform (CAPES 2024), the Qualis/CAPES tab displays the following message: Qualis/CAPES classification is exclusively to evaluate the scientific production of postgraduate programs. Any other use outside the scope of evaluation of postgraduate programs is not the responsibility of CAPES. It is therefore evident that the utilization of Qualis/CAPES classification for the individual evaluation of researchers may be exceeding the scope of this platform. Thus, CAPES must authorize to utilize Qualis/CAPES classification for another purposes.

In accordance with these documents (CNPq 2023a, b), additional minimum criteria are presented for differentiating the researcher's classification at various levels of PQ scholarship. These include the number of articles published in Qualis/CAPES classification, the number of supervisions, and the H-index of citations, as sourced from the Web of Science. Tables III and IV present a summary of the aforementioned information, with the minimum and desirable criteria, respectively. It appears that the majority of the minimum criteria constitute quantitative requirements. However, it is not clear whether different weights are assigned to each of them in the final analysis (Table III). It is unclear at which point in the analysis the desirable criteria are employed (Table IV). Furthermore, it is not evident which criteria are applied in the event of a tie, which introduces subjectivity and a lack of transparency to the process.

Upon consulting the CNPq call published in 2023 (CNPq 2023c), it was verified that there were two lines for applying proposals, regardless of the specific call number:

- Line 1 (PQ Grant): This line of research is aimed at those researchers who stand out among their peers. The scientific production of these researchers is valued according to the established normative criteria set by the CNPq, as well as specific criteria set by the CAs. In addition, the following observations are made:

a) to be eligible to receive a PQ scholarship in Category 2, it is necessary to have obtained a doctorate degree by 2020;
b) to be eligible to receive a PQ scholarship in Category 1, it is necessary to have obtained a doctorate degree by 2015;
c) Not be currently enrolled in a PQ or DT scholarship program with a duration that extends beyond the year 2024.

- Line 2 (SR Scholarship): This scholarship is intended for researchers who stand out among their peers as leaders and paradigms in their field of activity. The selection process considers the scientific and/or technological production of the applicants, in accordance with the requirements and normative criteria established by the CNPq and the Advisory Committees. Additionally, the following observations are taken into account:

Table III. Minimum criteria for classification in the PQ scholarship categories defined by the Civil Engineering committee.

Category	Doctorate Competion (years)	Minimum criteria					
		Publications		Number of orientations and co-supervisions		Index H ISI	Other minimum requirements
		Analysis period (years)	articles published	M	D		
2	3	5	3 classified among the 3 higher levels of Qualis/ CAPES, 2 of which are A1 or A2	3	-	3	-
1D	8	10	8 classified among the 3 higher levels of Qualis/ CAPES, 4 of which are A1 or A2	8	2	6	-
1C	8	10	12 classificados entre os 3 níveis superiores do Qualis/CAPES, 6 of which are A1 ou A2	8	3	8	-
1B	8	10	16 classified among the 3 higher levels of Qualis/CAPES, 8 of which are A1 or A2	8	5	10	Coordination of R&D projects; Involvement in cooperation and exchange agreements with other institutions in the country and abroad; Participation in international technical and scientific entities.
1A	10	10	20 classified among the 3 upper levels of Qualis/ CAPES, 10 of which are A1 or A2	8	9	14	Coordination of R&D projects; Involvement in cooperation and exchange agreements with other institutions in the country and abroad; Participation in international technical and scientific entities; Ability to explore new scientific frontiers in projects that involve challenges.

Note: EM: Master's degree; E: Doctorate; R&D: Research and Development.

◊ one must have been a PQ or DT scholarship holder in Category 1 for at least 20 years, whether or not the years were consecutive. Alternatively, one must have been a PQ or DT scholarship holder in Category 1, at levels A or B, for at least 15 years, whether or not the years were consecutive;

◊ to be still active in the development of scientific and/or technological research, and to provide training for researchers at different levels.

Upon examination of the CA–EC criteria (CNPq 2023b) in conjunction with the terms of the CNPq 2023c, it becomes evident that there is a degree of alignment with regard to the "doctorate

Table IV. Desirable criteria for inclusion in the PQ scholarship categories defined by the CA-EC.

PQ level	Desirable criteria
2	-
1D	Have participated in postgraduate program management recommended by CAPES
1C	Coordinate R&D projects, form research groups with national and/or international insertion
1B	Join the editorial board of Qualis/CAPES journals classification (levels A1, A2)
1A	Be part of the editorial board of Qualis / CAPES journals classification (levels A1, A2) and have participated in the management of postgraduate programs recommended by CAPES

time" requirement. It is also noteworthy that the aforementioned notice contains a section that includes the following text: the specific criteria of each Advisory Committee, available in Annex I and an integral part of this Call, will be observed in terms of the minimum requirements to classify researchers as PQ-SR Fellows. However, there was no information on the specific CA – EC criteria for granting SR scholarships.

Another noteworthy aspect of the CNPq (2023c) call is the emphasis placed on the valuation of scientific production across the two funding lines. This may potentially lead to a misinterpretation among some members of the academic and scientific community regarding the prioritization of quantity over quality in scientific research.

More recently, through the CNPq informative note (2024a), the body's Executive Board determined to include the criterion that the period for evaluating the scientific productivity of the proponents be extended by two years, for each birth or adoption that occurs within the deadline stipulated in the call to reduce the effects of these responsibilities on the comparative analysis between proposals submitted in the same area. In accordance with the aforementioned decision, the text of the CNPq (2023b) document was revised for all CAs. In the case of CA-EC, the revised text included the following: to promote equity between men and women in science and technology, special criteria will be adopted for researchers who, during the evaluation period, give to birth or adopt of children. In cases where a researcher has had a pregnancy or adoption during the evaluation period, the evaluation time window will be extended by two years for each event. This extension will apply to publications, supervisions, and other intellectual productions of the researcher in two additional years prior to the current period. The objective of this measure is to compensate for the impact of parenthood on the scientific productivity of researchers. Researchers who wish to opt for this special criterion must inform the dates of birth or adopt of their children in the proposal (CNPq 2023b).

Number of permanent faculty women professors in Brazilian postgraduate programs

In Brazil, 41 PPGs in the field of civil engineering and 3 PPGs in the field of transport engineering were identified, resulting in a total of 44 PPGs consulted. The permanent teaching of these PPGs is, on average, 19 individuals, with 5 being women (26% of the total). A total of 2 PPGs have no women in their group, while one has a majority of women (60%). Figure 8 identifies the number of PPGs by percentage ranges of female presence in the permanent faculty. It is observed that only 12 PPGs have up to 20% of permanent female professors, 17 PPGs have between 20 and 30%, and 15 have more than 30%. This indicates that 73% of PPGs in the area of Civil Engineering

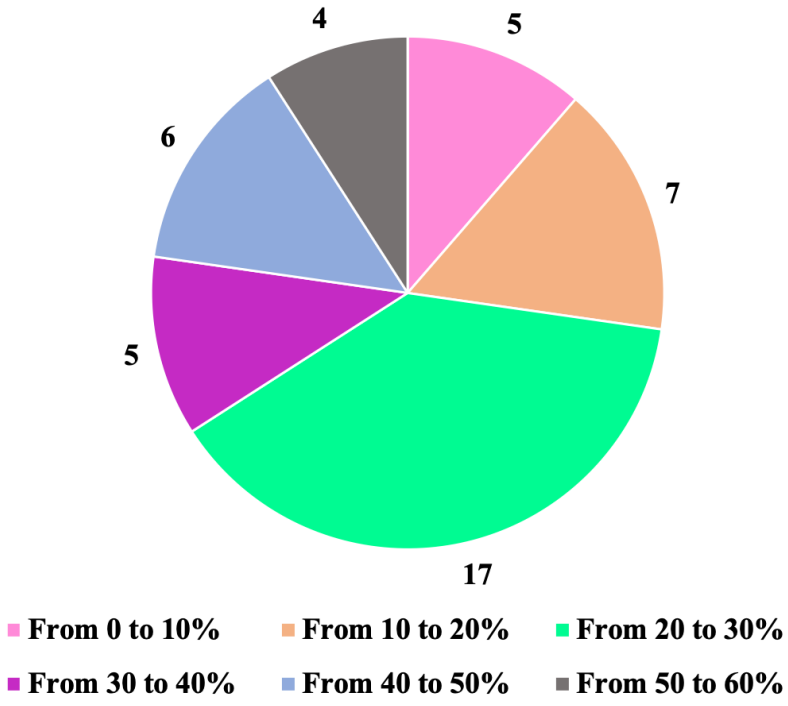

Figure 8. Number of PPGs by percentage ranges of female presence in the permanent faculty, in February 2024.

have more than 20% women effectively acting as professors.

Information of PQ scholarship from the Lattes curriculum

When consulting the Curriculum of current PQ scholarship holders registered on the Lattes Platform, it is observed that:

- Despite the inclusion of the maternity leave field in the Lattes Curriculum by CNPq (2021), only 16% of current PQ scholarship holders have declared this information. This figure does not accurately reflect the true situation, as this was only incorporated into the PQ scholarship evaluation process following the reformulation of the criteria (CNPq 2023b), which has not yet been applied to any call;
- Regarding the career level at the home institution, as illustrated in Figure 9a, 71.4% of PQ scholarship holders are already in the most consolidated classes, 17.9% in the adjunct professor class, 35.7% in the associate class, and 35.7% in the highest class of full professor. In federal institutions, the minimal requirement for advancement to the career top is 16 years of professional experience. In state or private institutions, there may be supplementary criteria, such as the successful approval of specific calls. A comparison of the career levels of the fellows with the PQ fellowship category (Figure 9b) reveals that the majority of professors at the associate and full levels are retained in the PQ-2 level, with few able to reach the upper strata of fellowships.

DISCUSSION

In Figure 2, one can see that 2014 was the year with the largest number of training grant beneficiaries and researchers (around 26,000). In 2023, this number will be reduced to the level

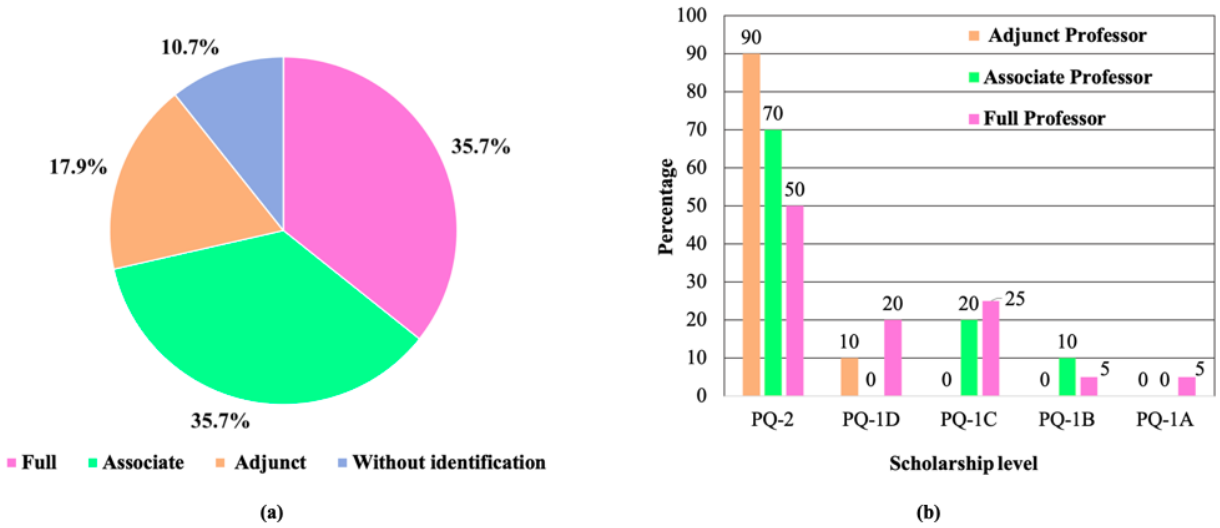

Figure 9. (a) Information declared by female PQ scholarship holders on Civil Engineering in their Lattes Curriculum: Class of academic career; (b) Information declared by female PQ scholarship holders on Civil Engineering in their Lattes Curriculum: Academic career class versus PQ scholarship category.

of beneficiaries registered in 2009 (in the order of 10,000), i.e. a reduction of more than 50%. These data indicate a significant decrease in investment in this area in recent years.

Between 2011 and 2023, there was a stagnation of 20% in the granting of PQ scholarships to professors' women in all Engineering areas (Figure 3). On the other hand, the number of DT scholarships awarded to female engineers increased by 9% during the same period, despite the reduction in investment over the period. It was not possible to identify the reasons that explain why, during the same period of analysis, the percentage of DT scholarships linked to women increased and the PQ scholarship did not. One of the hypotheses that can be listed refers to the differences in the criteria for judging PQ (CNPq 2023b, c) and DT (CNPq 2023d) scholarships, where technological productions do not depend on other parameters such as Qualis/CAPES classification, H index, etc. However, this issue of DT scholarships needs to be better evaluated and was not the subject of this study, as the focus was on PQ scholarships.

Similar data were presented in the Parents in Science document 2023, where women's participation in PQ fellowships has not changed significantly in 20 years across all fields of knowledge. Bezerra et al. (2022) explored the gender scenario regarding proposal and concessions of PQ grant in the fields of physics and nursing, and concluded that underrepresented groups remained in the same position over the years. A number of hypotheses can be put forth to explain this phenomenon. One such hypothesis is that throughout this period, women did not choose a career as researchers for reasons that remain unclear. Alternatively, it is possible that they did make this choice in practice, but that the methodology for evaluating proposals does not consider the current context in an impartial, broad, and fair way, thereby hindering their approvals.

Figures 3 and 4 data indicate that the percentage of female PQ fellows in the field of Engineering is comparable to the percentage observed in the broader field of Civil Engineering. Between 2005 and 2013, there was a notable increase for female PQ fellows, rising from 13%

to 23%. From 2014 to 2023, these percentages remained relatively stable. This suggests that, over a period of approximately 20 years, women constituted only 20% of the PQ scholarship holders in Civil Engineering.

From the Lattes Panel data, it can be observed that the amount of female Civil Engineers registered represents approximately 40% both for professionals currently working on the area or focus on postgraduate studies. These data suggest that women graduated in Civil Engineering have been developed their professional skills or continued theirs studies in this field. In this way, most of these women could have the opportunity to reach the higher level of the academic carrier in this field. However, by considering the PQ scholarships in force in this discussion, one can note that the parameters evaluated indicate that the percentage of women in Civil Engineering who receive PQ grants is lower than the data available in literature for other areas (Parent in Science 2023, UNESCO 2024), and the higher the level of the scholarship, the fewer women are included as also observed by Oliveira et al. (2024). This prompts the question of the underlying causes of this challenging scenario. Why is the number of research engineers reaching the highest levels of the PQ scholarship so low? Is this number also reflected in the submission process or not? Is the selection process being carried out with the completeness and transversality necessary to be considered fair as indicate by SDG 5? It remains to be seen whether the evaluation process is sufficiently subjective to result in unjust outcomes. To ascertain the correct answers to these questions, further studies and investigations are required, as discussed in the following paragraphs.

Even though with the significant decrease in investment in Brazilian fellowship in recent years already shown in Figure 2, the number of PQ grants approved for men showed a slight upward trend, but was stagnated in lower value for women (Figure 6). Even considering the relationship between approved and submitted proposals (Figure 7), the results can point to a gender disparity in terms of approval demands. It is necessary to deeply investigate this scenario, and reflect about the causes. Parent in Science (2023) presents the values of these rates, without separation by area, for the period from 2016 to 2022. On average, women submitted 38.5% of requests, which is higher than the average result obtained in this study from 2013 to 2023 for Civil Engineering (25.81%). However, in both studies men consistently obtained a higher rate of approval. This scenario was also verified by Oliveira et al. (2024). These results can provide insight into the data observed in the field of Civil Engineering, including the discussions about the phenomenon known as the "scissors effect", which refers to a decline in the participation of women in research as they progress through the academic career pipeline.

These findings align with the disparities observed by Oliveira et al. (2021) across various academic fields. In this study, the authors noted that the lower representation of women at the highest levels of PQ scholarships (1A and SR) may indicate the perpetuation of gender hierarchies within academia and the ongoing generational change. Longitudinal monitoring of these agents could provide clues and indications about the time needed for men and women to move from PQ-2 (initial level) to PQ-1 (high level). As previously stated, level 1 of the productivity grant confers access not only to material benefits (the complement value that accompanies the grant for PQ-2 was only granted from September 2023), but also to specific financing calls, as well as symbolic advantage, such as the possibility of joining the CNPq advisory committees. At present, no notices have been published regarding the

selection or election of members to form the advisory committees. Rather, they are chosen or indicated by the CNPq deliberative council in accordance with the requirements presented in RN-002/2015 (CNPq 2015).

Cunha et al. (2021) also reached the conclusion that gender inequalities in science persist in the Brazilian scientific system. They found that women are a minority among PQ/CNPq scholarship holders, that they are concentrated in disciplinary ghettos, and that they face difficulties both in accessing the PQ system and in reaching the modalities of the most prestigious scientific scholarship. Thus, it seems that, regardless of the studies carried out in Brazil over the years on this issue, the conclusions are always the same, which reinforces the need to reevaluate the selection processes for PQ scholars.

Among the judging criteria, the results emphasized that the problem of subjectivity and lack of quality in evaluation can be present at the project analysis stage, and it is important to reflect on how to ensure impartiality and consistency in project evaluation, so as to avoid inequity in the calculation of scores, the ranking of proposals, and the selection of researchers to be funded. In addition, the general criteria do not include what should be done in the case of a tie and whether there is a policy to consider minority groups or to promote gender equality in the selection of these proposals, especially in areas where the gender issue needs to be better assessed. The emphasis on the quantity of publications in journals may inadvertently result in a narrowing of the focus to the mere production of research, rather than the advancement of knowledge through rigorous and ethical research practices. The use of impact factors, which are quantitative bibliometric methods for evaluating scientific journals based on the citations received by the journal, can be an auxiliary tool in this process, provided that they are used with caution (CLARIVATE 2024). Moreover, in any country, science must be regarded as a reliable and credible field, and researchers must be held to the highest standards of integrity. This entails preventing misconduct such as manipulation of data, falsification of results, fabrication of publications, and the submission of duplicate or plagiarized papers (UKRIO 2023). Besides, to really incorporate the SDG5 in the criteria for PQ grants in Brazil and avoid gender inequality, gender mainstreaming steps should be considered.

Azevedo (2023) discussed the negative impacts of focus only in quantity of publications in journals, the Publish or Perish (POP) culture, on the quality of science and the mental health of researchers. Bello et al. (2023) discussed the consequences of the institutionalization of POP and reflected on the disparity in terms of valuing teaching and research activities in academia. North American (ICAI 2021) and European (The Embassy of Good Science 2022, UKRIO 2023) entities have already taken steps to disseminate good academic and scientific practices, publishing manuals and regulations to clarify the issue, encouraging the implementation of a culture of integrity in all research institutions and curbing academic misconduct, which should also include gender equality aspects. In this context, it is imperative that agencies, funding, universities and research institutions in Brazil reflect on their responsibilities in this process and facilitate a more integral, balanced, and fair path, considering more than numbers of papers. This should be reflected in their funding policies, as well as in their regulations, and calls.

A comparison of the criteria for the Civil Engineering CA published by CNPq (2023b) with those of other engineering areas reveals that the requirements of some subareas are less quantitative (Engineering and Environmental

Sciences), while others present weighs for the qualitative and quantitative criteria (Biomedical and Electrical Engineering, Nuclear Energy, Renewable Energy and Energy Planning, Production and Transport Engineering), and others adopt a similar approach to the CA-EC (Mechanical, Naval and Oceanic and Aerospace Engineering). Andrade (2022) demonstrated that the human sciences tend to prioritize the contributions of older scientists who have produced a substantial work over the course of their careers, whereas the technological sciences tend to encourage the involvement of younger researchers. Furthermore, the criteria for the CA of Production Engineering and Transport (CA-EP) emphasized that the assessment of the CA–EP is not based on strictly numerical elements. Rather, it seeks to identify the profile of the researcher, evaluating the productivity, quality, and balance of their activities (CNPq 2023b). This consideration is pertinent given that the majority of Brazilian researchers are affiliated with higher education institutions, where they engage in a range of activities related to research, teaching at various levels, extension, innovation, learnings, and management.

Additionally, Andrade (2022) indicates that who hold higher levels of PQ scholarship (category 1) are also more likely to participate actively in scientific committees that evaluate submitted proposals to CNPq itself. Furthermore, they are perceived as more competitive in terms of participation in calls for research funding and positions.

About the criterion that the period for evaluating the scientific productivity of the proponents be extended by two years, for each birth or adopt, it is understood that the measure was taken as an emergency after controversy in *ad hoc* opinions linked to the CNPq (2023c) call, in an attempt to solve a problem that is structural in Brazil, as previously presented in the introduction of this paper. However, it is possible that this measure may not be entirely fair, because of to conduct a comprehensive understanding from the perspective of gender equality, and to consider its maturity, some aspects should be observed:

- In a common sense, equity is a fundamental instrument for attaining effective equality, with due consideration for the specific circumstances of each individual. Its objective is to implement tangible, comprehensive, and rigorous measures to rectify inequalities;
- A review of the available documents revealed no evidence of a rationale for extending the period by two years, with each pregnancy or adopt considered separately. A search for legislation and reliable sources pertaining to early childhood yielded the following results:
  - ◊ Law No. 13,257 (Brasil 2016) considers that first childhood covers the first 6 complete years of a child's life, that is, it is recognized by law that the child needs more attention until the age of 6 and not just until the age of 2;
  - ◊ The scientific study presented by NCPI (2018) indicated that the experiences of the infant during pregnancy and in first childhood are crucial for their healthy and enduring development. It also emphasized that during this period, the experiences of the infant, particularly those involving interactions with their parents or caregivers, play a pivotal role in the development of their brain;
  - ◊ Resolution No. 2 (MEC 2018) reaffirms and consolidates the regulation of the age cutoff for enrolling children in preschool at 4 years of age. This is to say that in Brazil, it is not mandatory for schools to accept children under 4

years of age. Consequently, if children require additional attention until the age of 6, yet schools are only obliged to accept them at the age of 4, there is a period of more than 2 years during which mothers, fathers, and caregivers bear greater responsibilities and obligations towards their children.

- In addition to these issues, the structural aspects of society, as addressed in the references in the introduction of this paper, must be considered. As previously reported, in Brazil, the largest domestic work is shouldered by women. Furthermore, the scope of care work extends beyond the care of children in first childhood. Consequently, the proposed compensation from the CNPq appears to be inadequate, failing to fully align with the current situation in Brazil and, thus, unable to effectively promote the long-awaited and desired gender equality.

Consequently, it is imperative to conduct a more precise analysis of the manner in which these structural issues impact Brazilian researchers to facilitate the implementation of effective and equitable measures for all. In this process, the documents from Moverse (2022) and the British Council Brazil (2022) can serve as a source of inspiration and guidance for the definition of actions to be carried out. These documents consider the issue of transversalities and gender equality as summarized in this paper Introduction section.

The results shown on Figure 8 summarized that the 2023 potential demand for professors to submit proposals for PQ scholarships in the field of Civil Engineering (73.0%) is approximately three times greater than the percentage of PQ grant requests submitted by woman (27.8%) and four times greater than the percentage of current PQ scholarships awarded to women (18.4%). This information can provide insights about the phenomenon known as the "scissors effect", which refers to a decline in the participation of women professors in research as they progress through the academic career.

The current state of the non-declaration of the maternity leave field in the Lattes Curriculum renders it incapable of being utilized for the purpose of analyzing the impact of maternity leave on the academic career and obtaining the PQ scholarship. It is essential to gather authentic and comprehensive data from a variety of sources, rather than solely relying on voluntary declarations of maternity leave within the Lattes Curriculum. Additionally, it is important to include data on the care work undertaken by Brazilian researchers to ensure the scientific community's full participation in the National Care Policy, implemented by the federal government.

The results also shown that although women professors progress in their careers at their home institutions over time, this does not occur in terms of PQ scholarships. The following questions arise: What could be influencing this disparity? Do the influence of motherhood, the significant care work demands placed on Brazilian families, and other activities carried out in higher education institutions that are not considered in the CA judgment analyses prevent female engineering researchers from reaching the required quantitative indicators? In the assessment of the project's merit by *ad hoc* evaluation, are there gaps in the process that allowed any type of gender discrimination to occur?

The data presented aligns with those published by Parent in Science (2023), which found that the percentage of women PQ scholarship holders is lower than the percentage of women professors in PPGs in Exact and Earth

Sciences, Engineering, Agricultural Sciences, Biological Sciences, and Health Sciences. This further reinforces the necessity to engage with the scientific community to develop policies and criteria that can enhance the selection process, ensuring it is more integral, fair, and holistic. This is crucial to align with the existing policies implemented in other environments and work sectors.

Thus, as indicating by Oliveira et al. (2024), ensure and encourage the full and effective participation of women in science with equal opportunities is a strong global trend, with direct benefits for society as a whole. France, England and the United States are countries that implemented programs to combat gender inequality, with a focus on reducing disparities in developing the science and technology career and promoting studies that includes the transversality of the approach of gender.

CONCLUSIONS

The data presented in this paper about the distribution of PQ grants for higher education professors allows us to conclude that although approximately 40% of women civil engineers are registered on the Lattes Curriculum platform and employed in the field, 73% of PPGs in the field of Civil Engineering have more than 20% of women actually employed as professors. A review of the academic female professors' records revealed that more than 70% of them had already reached the two highest levels of their academic career (associate and full), indicating that they are probably eligible to apply for PQ scholarship. In contrast, only 20% (or less) of the PQ scholarships were approved to women Civil Engineers along 20 years, even when the female submitted requests increased. Currently, only one woman is classified at level 1A, and none is considered Senior.

Thus, it is possible to highlighted some shortcomings to be consider in studies and policies that will support the PQ criteria definition:

- Existence of vertical and horizontal segregation;
- Structural barriers that may be preventing Civil Engineering women professors from developing their skills as researchers in Brazilian PPGs;
- Lack of support, encouragement and policies that allow Civil Engineering women professors to also access the highest levels of PQ scholarships;
- Existence of some stages of the judging criteria in which subjectivity, lack of impartiality and discrimination can occur.

Finally, it is important to rethink the entire process and the contributions of Brazilian Civil Engineering women professors with a wider approach. In the current context, it is impossible to ignore the federal government's National Care Policy, SDG 5 of the ONU BR, and the gender mainstreaming initiatives to implementing gender equality in higher education and research, and also promoting equal opportunities in all work environments, particularly in STEM areas as discussed in the paper. Thus, the integrity of the process will be preserved and conflicting and unfair situations will not occur.

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