Profile of Scientific Initiation students in Brazilian Federal Institutes: Research areas, gender, and scholarship type by region

Perfil dos estudantes de Iniciação Científica nos Institutos Federais: áreas de pesquisa, sexo e bolsas por região do Brasil

Perfil de los estudiantes de Iniciación Científica enlos Institutos Federales: áreas de investigación, género y becas por región de Brasil

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Abstract
Financial support and science promotion policies require preliminary studies of diagnoses, researcher profiles and historicity. Based on that new propositions to stimulate the areas of knowledge, the participation of researchers by gender or even the allocation of resources by region may be implemented. In this context, this study aims to describe the profile of the Scientific Initiation scholarship holders, through financial incentives from the Brazilian National Research Council (CNPq), in the Brazilian Federal Institutes (IFs), considering the type of scholarship, age and gender. A quantitative approach was used, and 2017 data were collected on the CNPq portal. The results show that, out of the total scholarships (n = 31,382), 8.75% of them were offered by FIs, with the majority of scholarships offered by the high school program (64.60%), followed by the technological development program (18.14%) and the scientific initiation program (17.26%). Most students are female (51.1%). Given the above, we emphasize the importance of studies on student profile, so that measures are taken to provide wider access to scholarships for students involved in Brazilian scientific production, as well as map the areas of greatest investment and development technological.
Keywords: Students; Federal system of professional, scientific, and technological education; Gender; Scientific research.

Resumo
O apoio financeiro e as políticas de promoção da ciência requerem estudos preliminares de diagnósticos, perfis de pesquisadores e historicidade. A partir dessas novas proposições de estímulo às áreas do conhecimento, pode-se implementar a participação de pesquisadores por gênero ou mesmo a alocação de recursos por região. Nesse contexto, este estudo objetiva descrever o perfil dos bolsistas de Iniciação Científica, por meio de incentivos financeiros do Conselho Nacional de Pesquisa (CNPq), nos Institutos Federais (IFs) do Brasil, considerando o tipo de bolsa, idade e sexo. Foi utilizada uma abordagem quantitativa e os dados de 2017 foram coletados no portal do CNPq. Os resultados mostram que, do total de bolsas (n = 31.382), 8,75% delas foram oferecidas por IFs, sendo a maioria das bolsas oferecidas pelo programa de ensino médio (64,60%), seguido do programa de desenvolvimento tecnológico (18,14%) e o programa de iniciação científica (17,26%). A maioria dos alunos é do sexo feminino (51,1%). Diante do exposto, ressaltamos a importância dos estudos sobre o perfil do estudante, para que sejam tomadas medidas que possibilitem maior acesso às bolsas para os educandos envolvidos na produção científica brasileira, bem como mapear as áreas de maior investimento e desenvolvimento tecnológico.
Palavras-chave: Discentes; Rede federal de educação profissional e tecnológica; Gênero; Pesquisa científica.

Resumen
Las políticas de apoyo financiero y promoción de la ciencia requieren de estudios previos de diagnóstico, perfil de los investigadores e historicidad. A partir de ahí se pueden implementar nuevas propuestas para estimular las áreas de conocimiento, la participación de los investigadores por género o incluso la asignación de recursos por región. En este contexto, este estudio tiene como objetivo describir el perfil de los becarios de Iniciación Científica, a través de incentivos financieros del Consejo Nacional de Investigación de Brasil (CNPq), en los Institutos Federales (IFs) brasileños, considerando el tipo de beca, la edad y el género. Se utilizó un enfoque cuantitativo, y los datos de 2017 se recogieron en el portal del CNPq. Los resultados muestran que, del total de becas (n = 31.382), el 8,75% de ellas fueron ofrecidas por IFs, siendo la mayoría de las becas ofrecidas por el programa de bachillerato (64,60%), seguido por el programa de desarrollo tecnológico (18,14%) y el programa de iniciación científica (17,26%). La mayoría de los estudiantes son mujeres (51,1%). Destacamos la importancia de los estudios sobre el perfil de los estudiantes, de modo que se tomen medidas para proporcionar un acceso más amplio a las becas para los estudiantes involucrados en la producción científica brasileña, así como mapear las áreas de mayor inversión y desarrollo tecnológico.
Palabras clave: Estudiantes; Sistema federal de educación profesional, científica y tecnológica; Género; Investigación científica.

1. Introduction

The Federal System of Professional, Scientific, and Technological Education (Rede Federal de Educação Profissional, Científica e Tecnológica; RFEPCT), officially instituted in 2008, led to the increase in the number of courses and opportunities offered to students in Brazil. It represented a change in the configuration of federal institutions that offer public and free education. The system was introduced in all of the national territories and is composed of 38 Federal Institutes of Education, Science, and Technology (Institutos Federais; IFs), two Federal Centers of Technological Education (Centros Federais de Educação Tecnológica; Cefets), a Federal Technological University, 22 agricultural technology schools linked to federal universities, and the Pedro II College. According to data from the Ministry of Education portal(Brazil, 2020), 661 units are operating in the 27 Brazilian states, and according to data from the Nilo Peçanha Platform, 1,031.798 students are enrolled in these institutions, in 2018 (Brazil, 2018).

Law No. 11.892/2008, which focuses on the creation of the IFs, initiated the process of the consolidation of the expansion of the Federal System in the interior of Brazil, which is the primary goal of the Institutes: to establish public, free, and quality education in interior cities. The Federal System offers 480,000 vacancies in 11,264 courses each year. The technical courses are integrated into high schools, subsequent courses, technological higher education courses, bachelor's and licentiate degrees, master's and doctorate graduate programs, and specialization programs, and provide initial and continuing training and extension courses.

In addition to offering quality teaching, the Federal System promotes research conducted in the institutions. This is evident when considering the units that make up the Federal System, which is set up as a triad: teaching, research, and extension (Brazil, 2008). This new reality emerged, with the establishment of the institutes over the last ten years.

The creation and production of knowledge is a fundamental part of the promotion of scientific education in IFs because research is an inseparable element of teaching and extension. The guidelines of the IFs included in the legislation, and the institutional documents promote the creation and production of knowledge, as well as teaching and extension. It has gained prominence not only in the promotion of scientific education but also in scientific production, which is an indispensable part of professional training; the inclusion of students in research programs; and occasionally, it is the young people's first contact with science and applied research. In addition, research is one of the elements that the United Nations (UN) identifies as one of the main agents of change to face society's challenges. Education, innovation and leadership are also added (Rodríguez-Abitia, Martínez-Pérez, Ramirez-Montoya, & Lopez-Caudana, 2020).

According to Filho, Zompero, and Laburú (2017), students increasingly need training to understand natural and social phenomena so that they understand the relationship between science and technology and the implications of this relationship on society. The aim is to prepare these students to become reflexive and autonomous students (Melo, Felicio, Ferreira, & Noll, 2020) that are aware of the impacts produced by advances in science and technology in today's world and can discuss and make decisions. Thus, the intrinsic link between research and education centers and character formation, to the extent that the scientist (also referred to as student researchers) should value the disinterested search for truth as an end in itself, demonstrates that their involvement in research should improve the formation of their character (Haverhals, 2007). Besides that, the research inserted in the teaching-learning process is fundamental in the Federal Institutes, precisely due to the integrated areas: teaching, research and extension. In this respect, Heras and Ruiz-Mallén (2017) point out that students becoming involved in science is a fundamental result of learning, both in their attitudes and perceptions of scientific practice, in addition to favoring increased interest in careers in science, technology, engineering and mathematics (STEM) according to Lillywhite and Wolbring (2019). It also affects feelings and emotions embodied, expressed, or processed by these students through learning.

Research is essential in the fields of scientific knowledge production and innovation, and in graduate programs, scientific initiation projects, research groups, and activities involving communication and dissemination of the results of the work of researchers, as both staff and students. Thus, among the purposes of the Institutes is the development of applied research, with the aim to produce knowledge for practical applications; i.e., that can solve everyday problems and problems of local interest (Brazil, 2008).

The Ministry of Science, Technology, Innovation, and Communications (Ministério da Ciência, Tecnologia, Inovações e Comunicações; MCTIC) is included in the national context of the promotion, incentivization, and development of scientific programs. It includes the main government entity that promotes scientific research in Brazil, which is the National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico; CNPq), which was created in 1951. Through the consolidation of this government body, the number of scientific initiation scholarships for research gradually increased. Nogueira and Canaan (2009) demonstrate that before its establishment, scientific scholarships were made available directly to researchers and benefited a small number of projects, encompassing only some areas of knowledge.

Currently, CNPq scholarships have been granted to higher education and research institutions, which have become responsible for the creation and management of their own systems for granting scholarships for researchers and students (Centro de Gestão e Estudos Estratégicos, 2017). Thus, from 1951 onwards, research has been promoted both by the Council and the institutions' budget, which favors the process of the consolidation of research in the IFs.

Among the various types of CNPq scholarships, three scientific initiation programs stand out: the Institutional Program for Scientific Initiation Scholarships (Programa Institucional de Bolsas de Iniciação Científica; PIBIC), Institutional Program for Technological Development and Innovation Initiation Scholarships (Programa Institucional de Bolsas de Iniciação em Desenvolvimento Tecnológico e Inovação; PIBITI), and Institutional Program for High School Scientific Initiation Scholarships (Programa Institucional de Bolsas de Iniciação Científica do Ensino Médio; PIBIC-EM). The PIBIC and PIBITI are focused on higher education, with the PIBITI focusing on providing methods and techniques for technological research and stimulating ways of thinking about technology from an innovation perspective, while the PIBIC-EM includes scholarships for high school students. These three programs aim to stimulate and encourage students to engage in scientific or technological research, adopt actions that consider innovation, and ensure that they have a qualified advisor for developing their projects. The main goal is to develop the training of human resources for research or any professional activity (Brazil, 2006).

In addition to this training in research, in the classroom, the skills provided are interdisciplinary and encompass various knowledge areas (Galvão, Felicio, Ferreira, & Noll, 2020). In this scenario, research becomes an educational principle fundamental for the training of students and provides an environment for dialogue and critical discussion. In this way, it

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awakes students to autonomous and participatory learning and teaches them how to learn (Crowe & Boe, 2019; Demo, 2015; Galiazzi & Moraes, 2002).

Scientific Initiation (SI) programs have great relevance because they strengthen scientific initiation, introduce students to scientific research, and promote their application in academic and professional master's degrees and doctorate programs (Brazil, 2006). The SI programs in the Federal System are in accordance with the policies of the System, which advocate the verticalization of teaching, which enables students to attend the same institution from a secondary-level technical course to a doctorate level while promoting science education.

Considering that the main research funding agency in Brazil is CNPq (Brazil, 2017), updated data until 2017 illustrate that the Council offered 31,382 SI scholarships. Of these, 23,790 were for PIBIC, 2,781 for PIBITI, and 4,811 for PIBIC-EM. They were distributed among universities, research institutes, and application colleges. In this sense, it is important to understand the IFs that are included in the CNPq share and the distribution of scholarships and incentives. Thus, this study aims to describe the profile of students of Scientific Initiation scholarships from IFs, considering the main areas of research as well as the number of scholarships by region and gender. This is important for research incentive and funding strategies to be devised according to gender, the regions in which they least occur and the areas. Once this profile is mapped, it will be possible to analyze the impact on regional development, by areas, mainly of the scientific production of FIs inserted in the local contexts of the country.

2. Methodology

To conduct this study, we opted for a descriptive quantitative approach through a survey of data obtained from 2017 from the panel of Scientific and Technological Initiation Programs, because it was the most current data available at the time of their selection. The data were collected from the CNPq portal (http://cnpq.br/painel-programas-institucionais-de-ict) on March 31, 2019. The main goal of this type of research is to describe the characteristics of SI students precisely and in an aggregate way (Marconi & Lakatos, 2003). This is because joint data can lead to public policy analysis aimed at the largest number of people and institutions, in this case around scientific research development. We selected this method because it allows the analysis of objective data to determine the profile of a population (in this case, students involved in SI programs), and assess the PIBIC, PIBITI, and PIBIC-EM programs developed in the 38 Federal Institutes of Brazil. Statistical analysis through graph and table representation represents one of the most used means in these cases.

The Federal System is made up of 38 IFs (Table 1 - Supplementary Material 1). Endowed with administrative, of movable and immovable property, financial, didactic, pedagogical, and disciplinary autonomy, the changes introduced were visible in the structure and number of campuses developed, which led to an increase in the number of students. Their administrative bodies comprise a central body; the Rectory, formed by the pro-rectories; and autonomous teaching units. Thus, they are equal to federal universities in several aspects, including the promotion of knowledge production through the promotion of research. A descriptive statistical analysis was used for assessing the complex set of data with which we aimed to obtain verifiable and straightforward representations for making generalizations (Marconi & Lakatos, 2003).

The following variables were established: number of financial incentives offered by type of scholarship program, gender, age of students, region of the country and area of knowledge. These variables were descriptively analysed by gender and type of program; area of knowledge and modality; gender, area of knowledge and modality. The data were presented through percentage and graphs in order to describe the characteristics of the scientific initiation and technological development audiences, tracing the profile of the scholarship students.

3. Results

From the data collected in the CNPq portal, it was possible to determine the profile of the students enrolled in the SI programs offered by the Institutes, and the information on the number of students by program, scholarship type, and age are illustrated in Tables 1 and 2. In 2017, Brazil had 311 institutions that offer SI programs, including universities, institutes, and research centers. Of these, 36 were IFs, accounting for 10.37% of the total number of institutions (Brasil, 2017). Only two Federal Institutes (Piauí and Roraima) did not offer any of the three types of Scientific Initiation—PIBIC, PIBITI, or PIBIC-EM.

Table 2: Total number of SI students in Brazil and Federal Institutes by scholarship type.

PROGRAM	TOTAL	IF	%
PIBIC	23,790	474	2.0
PIBITI	2,781	498	17.9
PIBIC-EM	4,811	1,774	36.9

Source: Authors.

Of the 31,382 students involved in research in these types of scholarship, 2,746 participated in SI projects at the Ifs, and a total of 8.75% of SI scholarship students nationwide were in the Federal Institutes.

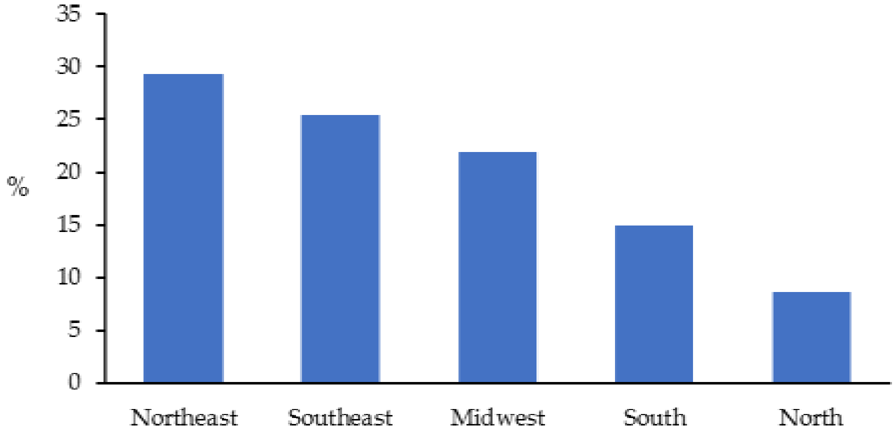
Table 3: Total students by scholarship type and age in Federal Institutes.

PROGRAM	TOTAL	19 YEARS OR YOUNGER (%)	20 YEARS OR OLDER (%)
PIBIC	474	43 (9.1)	431 (90.9)
PIBITI	498	42 (8.4)	456 (91.6)
PIBIC-EM	1,774	1,577 (88.9)	197 (11.1)

Source: Authors.

Most of the PIBIC and PIBITI students were 20 years or older, a result expected for programs aimed at higher education. Most of the students in the PIBIC-EM were 19 years or younger, which is also in accordance with the expected age for high school students. Of the total number of scholarship students (2,746), 38.8% (1,066) were 20 years or older, and 61.2% were 19 years or younger because the highest concentration of scholarships was in the PIBIC-EM. In addition, the scholarships were distributed by region (Figures 1, 2, 3, and 4) and knowledge areas (Figure 5).

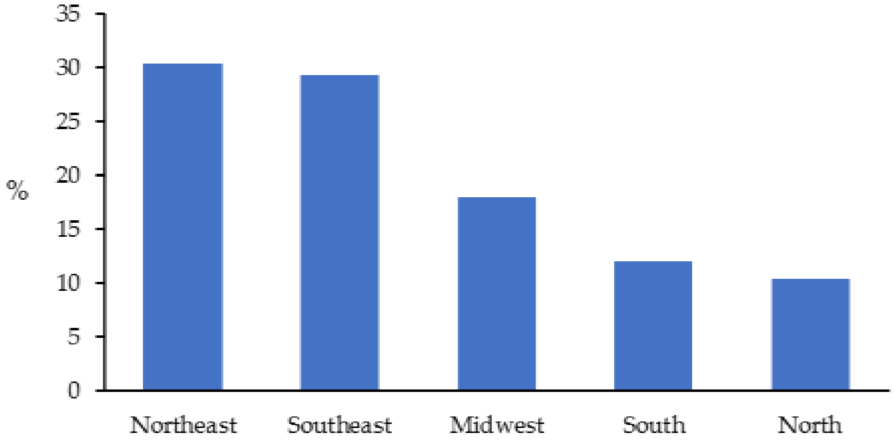
Figure 1: Distribution of the total PIBIC, PIBIC-EM, and PIBITI scholarships by region.



Source: Authors.

The Northeast region (29.3%) was the region with the largest number of IF students receiving SI scholarships, followed by the Southeast region (25.4%) and then the Midwest (21.8%), South (14.9%), and North (8.6%).

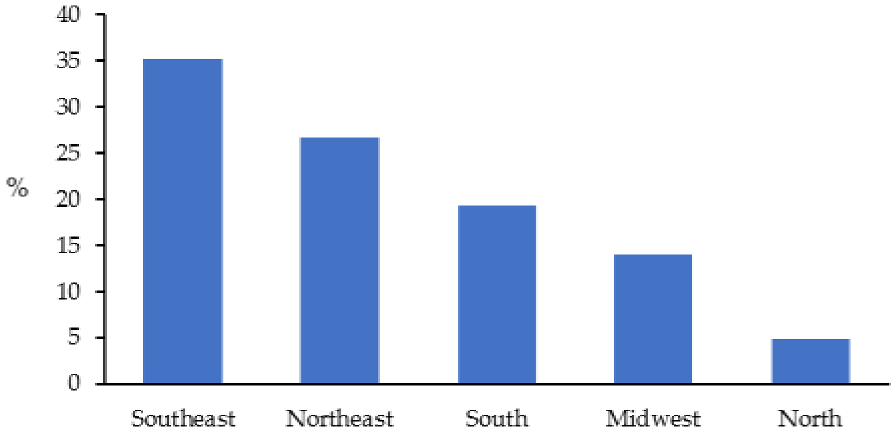
Figure 2: Distribution of PIBIC scholarships by region.



Source: Authors.

The results followed the same order for scholarships distributed among the IFs, and the Northeast region (30.5%) had the largest number of IF students receiving PIBIC scholarships, followed by the Southeast region (29.3%) and then the Midwest (17.9%), South (12%), and North (10.3%).

Figure 3: Distribution of PIBITI scholarships by region.



Source: Authors.

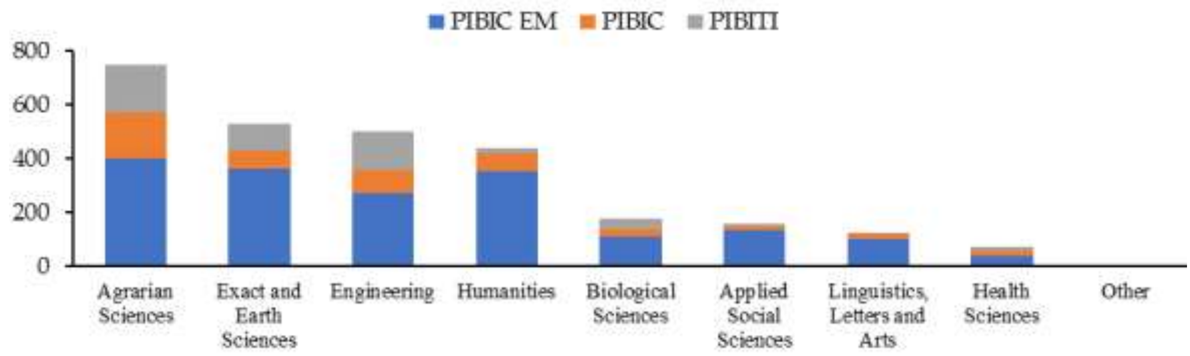
In PIBITI, a program with an emphasis on technological development and innovation, the region with the largest number of scholarships was the Southeast (35.1%), followed by the Northeast (26.7%), South (19.3%), Midwest (14.1%) and North (4.8%).

Figure 4: Distribution of PIBIC-EM scholarships by region.

Source: Authors.

In PIBIC-EM, the region with the largest number of scholarships was the Northeast (29.7%), followed by the Midwest (25.1%), Southeast (21.6%), South (14.4%), and North (9.1%).

Figure 5. Distribution of scholarships by knowledge area.



Source: Authors.

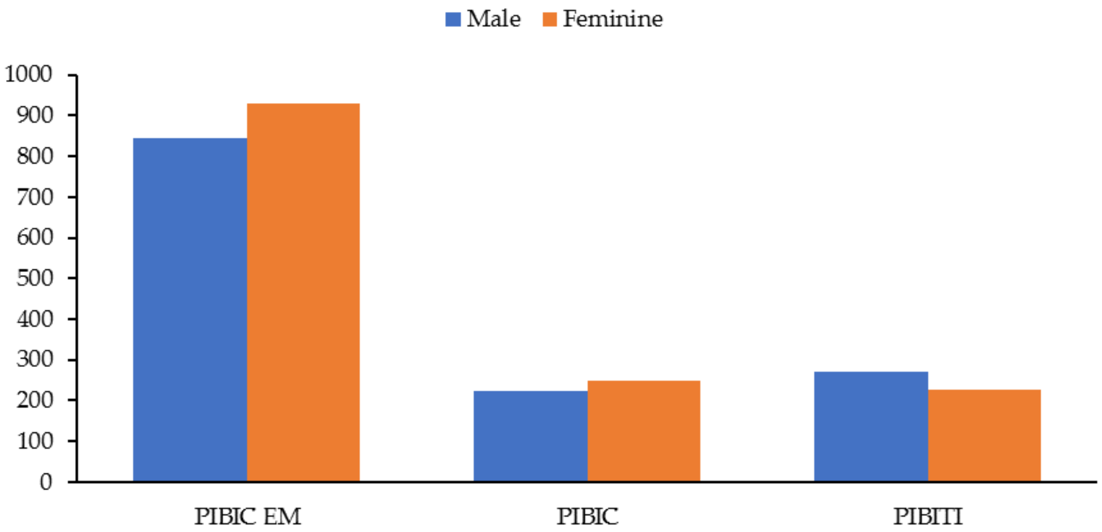
In PIBIC-EM, the most researched areas were Agricultural Sciences (22.6%); Exact and Earth Sciences (20.4%); Human Sciences (20%); Engineering (15.2%); Applied Social Sciences (7.6%); Biological Sciences (6.3%); Linguistics, Literature, and Arts (5.7%); and Health Sciences (2.1%).

In the PIBIC, the most researched areas were Agricultural Sciences (36.1%), followed by Engineering (18.4%); Exact and Earth Sciences (14.3%); Human Sciences (13.5%); Biological Sciences (6.3%); Health Sciences (4.4%); Linguistics, Literature, and Arts (3.8%); and Applied Social Sciences (3.2%).

Finally, in the PIBITI, similarly, Agricultural Sciences was the most researched area (34.7%), followed by Engineering (28.9%); Exact and Earth Sciences (20.3%); Biological Sciences (7%); Human Sciences (4%); Health Sciences (2.4%); Applied Social Sciences (1.4%); and Linguistics, Literature, and Arts (0.8%).

Women received 51.1% of scholarships, and men received 48.9%, and women were the predominant participants in the PIBIC and PIBIC-EM (Figure 6).

Figure 6. Distribution of scholarships by gender.



Source: Authors.

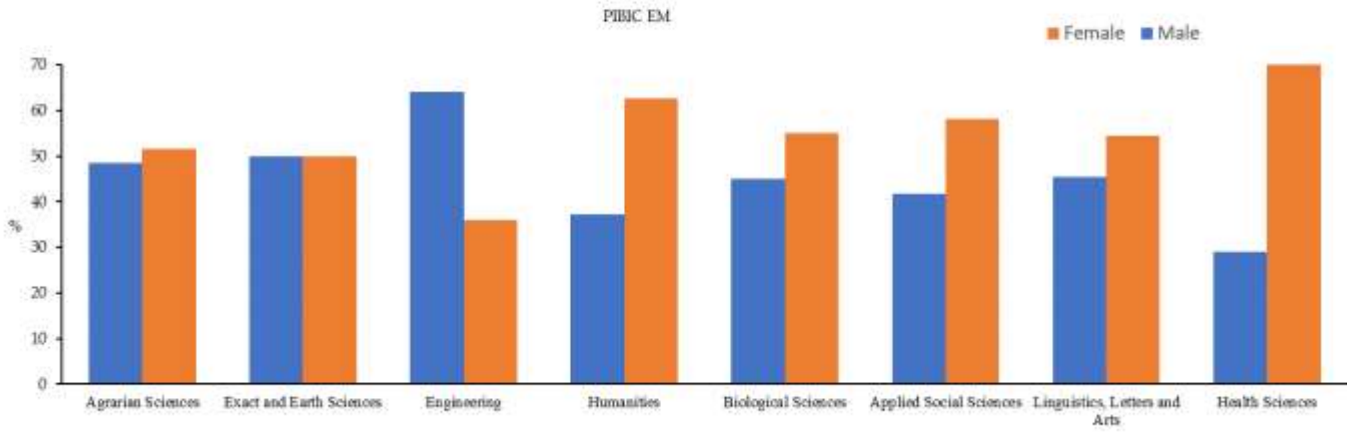
In the PIBIC-EM, the most researched area among women was Health Sciences (71.1% of students researching the subject were women), and the most researched area among men was Engineering (64.1%; Figure 7). The most researched areas among women after Heath Sciences were Human Sciences (62.7%); Social and Applied Sciences (58.2%); Biological Sciences

(55%); Linguistics, Literature, and Arts (54.5%); Agricultural Sciences (51.6%); Exact and Earth Sciences (50%); and Engineering (35.9%). The most researched areas among men after Engineering were Exact and Earth Sciences (50%); Agricultural Sciences (48.4%); Linguistics, Literature, and Arts (45.5%); Biological Sciences (45%); Social and Applied Sciences (41.8%); Human Sciences (37.3%); and finally, Health Sciences (28.9%).

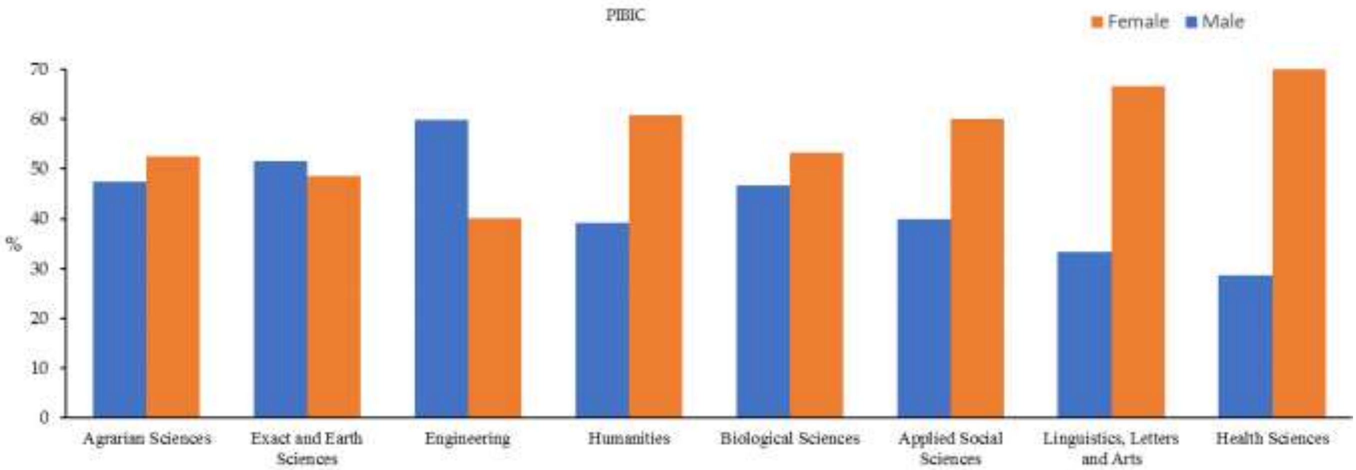
In the PIBIC, the most researched area among women was Health Sciences (71.4%), and the most researched area among men was Engineering (59.8%). The area least researched among women was Engineering (40.2%), as in the PIBIC-EM, and the area less researched among men was Health Sciences (28.6%). The most researched areas among men varied compared to the PIBIC-EM were as follows: Biological Sciences (4th position: 46.7%); Applied Social Sciences (5th position: 40%); Human Sciences (6th position: 39.1%); and Linguistics, Literature, and Arts (7th position: 33.3%). The second most researched area among women in the PIBIC varied compared to the PIBIC-EN and was Linguistics, Literature, and Arts (66.7%), followed by Human Sciences (60.9%), Applied Social Sciences (60%), and Biological Sciences (53.3%). The other areas remained in the same position as in the PIBIC-EM.

In the PIBITI, the most researched areas among women were Health Sciences and Linguistics, Literature, and Arts, both with the same percentage (75%). The most researched area among men was Engineering (66.7%). The area less researched among women was Engineering (33.3%), and the areas less researched among men were Health Sciences and Linguistics, Literature, and Arts (25%). In the PIBITI, the second most researched area among men was Exact and Earth Sciences (65.3%), followed by Applied Social Sciences (57.1%), Human Sciences (50%), Agricultural Sciences (46.2%), and Biological Sciences (31.4%). The second most researched area among women was Biological Sciences (68.6%), followed by Agricultural Sciences (53.8%), Human Sciences (50%), Applied Social Sciences (42.9%), and Exact and Earth Sciences (34.7%).

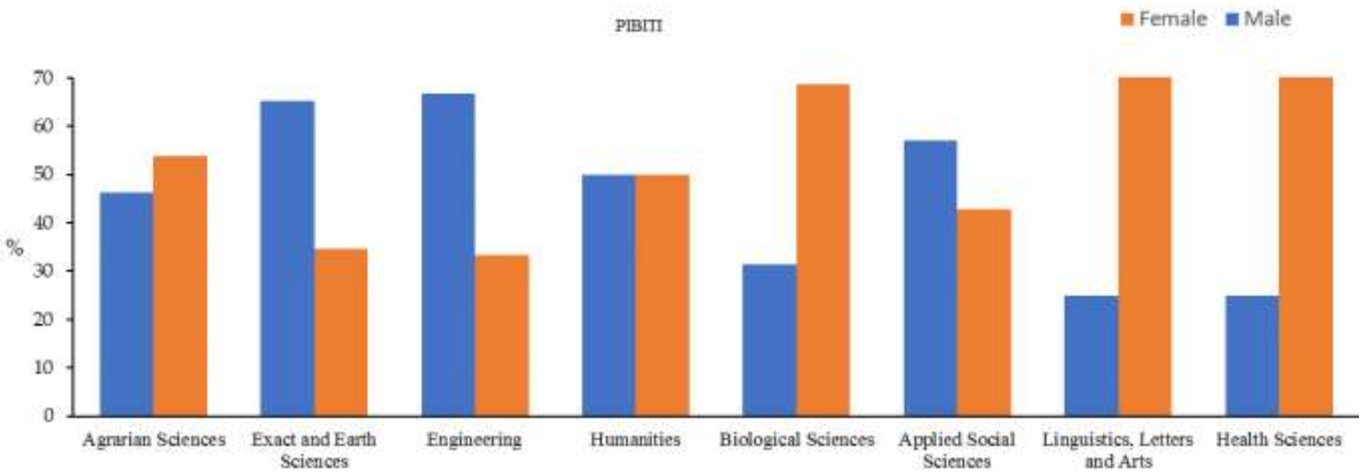
Figure 7. Distribution of PIBIC-EM (A), PIBIC (B), and PIBITI (C) scholarships by gender and knowledge area.



A



B



C

Source: Authors.

4. Discussion

The preliminary results of this study indicate that the SI activities in FIs have characteristics that match the profile of the institutions. Most of the scholarships were granted to the PIBIC-EM, which is justified by the characteristics of the IFs because since their creation, they have prioritized technical secondary education, primarily in the form of integrated courses.

Other characteristics of SI in IFs are that most students are 19 years or younger, which matches the high school age range; the Northeast region is the region that offers the most scholarships; and Agricultural Sciences was the most researched area. Considering that IFs are part of a Federal System with only ten years of effective implementation and institutionalization of the field of research, the approximately 2,746 students engaging annually in SI become significant because of the recent process of consolidation.

Understanding the profile of the social agents of SI projects is fundamental for creating Brazilian institutional policies for the promotion of research, analyzing scientific production in specific areas, recognizing the importance of scholarships for students involved in research, and identifying the most researched areas. In this perspective, a study conducted by the Center for Strategic Studies (Centro de Gestão e Estudos Estratégicos, 2017) on the PIBIC, and PIBITI revealed that in 2013, the PIBIC was more prominent in the Southeast, followed by the Northeast, South, Midwest, and North. This study considered all of the educational institutions offering SI in Brazil. In comparison, for this study whose data are from 2017 and only refer to the Federal Institutes, the profile by region (Figure 2) illustrates a different reality as the PIBIC is more prominent in the Southeast, followed by the Northeast, Midwest, South, and North.

For the PIBITI, the prominence of the regions that developed more SI projects that were focused on technology and innovation did not change between 2013 and 2017 (Figure 3), with the Southeast in the first position, followed by the Northeast, South, Midwest, and North. We noted that, in both studies, the research was mainly developed in large urban centers, specifically cities in the Southeast Region, suggesting that the interior is still in a secondary position regarding the advancement of science and scientific knowledge.

The change of the prominence of the Midwest region is favorable and reveals that one of the main goals of the Federal System may have been achieved. That is, the aim of the Expansion Plan of the Federal System to promote teaching, research, and extension in the interior of Brazil and create 500 new units between 2006 and 2018 (Brazil, 2020), may have been achieved precisely because of its capillarity character and the presence of IFs in the regions without professional education. Among the benefits of the expansion of RFEPCT were the inclusion of thousands of young people in school and the changes in the economic, cultural, and political levels of their participation, especially in small and medium cities (Frigotto, 2018).

Our study demonstrates that in 2017, women were the majority of the participants in two of the scholarships, PIBIC and PIBIC-EM. Only in the PIBITI was the percentage of men higher than the percentage of women, and this was only by 9.22% (Figure 6). Data from the CGEE study corroborates the increase in the participation of women in research since 2001 when 54.54% of the students receiving PIBIC scholarships were female. In 2013, the percentage had increased to 60.38%. While since 2007 most of the PIBITI scholarships were granted to men, we observed a proportional decline in this rate. In 2007, their presence was 62.76%, and in 2013 it had decreased to 51.45%.

Meanwhile, the increase of women in the development of SI projects was significant, from 37.24% to 48.55%. Despite the small discrepancy between the number of women and men receiving the scholarships, most of the students receiving the PIBIC and PIBIC-EM scholarships were women. It can be noted that women have occupied a prominent position in the development of SI projects in high school and higher education, which indicates a greater engagement of women in scientific research.

From the crossing of the data, considering the distribution of the scholarships by gender and area in PIBIC, we observed a predominance of women in six of the eight areas analyzed (Figure 9). The most researched areas were Health

Sciences; Linguistics, Literature, and Arts; and Human Sciences. Gender disparities often emerge from the choice of the undergraduate degree, and women still have little representation in physics, engineering, and computing (Cheryan, Ziegler, Montoya, & Jiang, 2017). Su and Rounds (2015) also reported that women are a minority in science, technology, engineering, and mathematics (STEM). These choices of individuals may be related to the stereotypes that society builds around women to choose which career path to pursue (Piatek-Jimenez, Cribbs, & Gill, 2018).

In this sense, students who participate in programs focused on scientific research often report having positive experiences because the skills acquired accompany them throughout their academic life. Improved skills in research, data collection and analysis, understanding the information obtained, hypothesis building, creativity, better performance in written and oral production, and personal achievement (Harrison, Dunbar, Ratmansky, Boyd, & Lopatto, 2011) were the most reported skills.

Moreover, the participants can become active subjects of the learning process and develop their own research. They can also create, prepare, learn, and develop, under the guidance of a professor (Demo, 2009). The student's advisor should provide knowledge of all of the stages of scientific research. In view of this experience, students will possibly be more aware when choosing their student career (Bell, Blair, Crawford, & Lederman, 2003). Students involved in the research experience will discover new data, usually promote interaction, and collaborate with other scientists, in addition to learning scientific practices (Auchincloss et al., 2014). Therefore, the association between teaching and research provides opportunities for students to experience scientific research holistically (Brownell et al., 2015).

A gender study by Kang, Keinonen and Salonen (2019) highlights that with regard to gender differences in the aspiration of science at an early stage, while girls' self-concept was stable and indicated a less predictive power, their interest in science. increased significantly during high school and was indicated as a powerful predictor of the aspiration of science. It may be inferior to this that scientific initiation programs constitute a further stimulus for students to choose future scientific careers (or not).

Interest in the second assessment of the study, which was conducted in Finland, when students were about to complete high school at age 16, indicated a much greater impact on career decision-making compared with interest seen by first time at age 13. That is, by participating in science education in high school, the likelihood of girls choosing careers related to science increased in the country studied. Thus, research recommends science teachers to play an essential role in encouraging students to choose scientific careers. However, this role may not be fulfilled without adequate support and without government support, and this support can be provided through CI. Thus, a proposal by Kang et al. (2019)is to develop collaborative work between policy makers, education teachers and science teachers to initiate and implement a national STEM (science, technology, engineering and mathematics) education.

According to Kang and Keinonen (2018), several student-centered approaches, such as question-based learning and discussion-oriented classes, increase the interest of Finnish students in science in high school. Thus, these student-centered instructions should be considered to foster better environments in which girls can engage in science-related activities, advanced studies and careers, as they are still outnumbered in career-related occupations in STEM.

5. Conclusion

It is of paramount importance to understand the subjects that are involved in scientific research through the Scientific Initiation projects of the Brazilian Federal Institutes. This is because knowing the local reality, the institutional research landscape, it may be possible to outline strategies, proposals and policies aimed at students. The determination of the profile of students by scholarship type, age, and research area, creates a general overview of the students that are developing research, and the most researched areas. The data obtained can assist the competent bodies and educational institutions involved in the development of education strategies to provide increasingly broad access for students in scientific research projects, allowing them to have the first contact with science in the basic education system. Moreover, it provides an overview of the most researched areas, and this can be compared to innovations emerging from these areas. Thus, programs and projects in several areas can be proposed as an incentive for developing research that can be applied in society.

Thus, our study demonstrates the need to conduct further studies to determine the profile of students in these SI programs to promote the development of national and local policies of scientific initiation and to investigate how these profiles are translated into innovation (or lack of innovation) in their respective fields. These policies are an important driver of the knowledge of those directly involved in research and their connection to education.

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