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Dorothy Bishop / 18 Jun 2016

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(Im)Balance of gender in Brazilian science

Maria Luisa Silva, Emma Otta, Alan McElligott

Despite significant progress, there is still a gender gap in science all over the world, especially at upper levels. Progressive countries are recognizing the need to address barriers of gender equity to retain their best scientists to ensure research excellence and returns on the investment made on training women scientists. We investigated the gender distribution of: (i) the productivity scholarship holders of the Brazilian National Council for Scientific and Technological Development (PQ: N= 13,625), (ii) the members of the Brazilian Academy of Science (N= 899), and (iii) the amount of funding awarded for research (N = 3,836). We found gender imbalance in higher levels of Brazilian science considering scientific productive scholarship, grants and membership in the Brazilian Academy of Sciences. Female scientists were more frequently awarded PQ scholarships at the lower level of the research ranking system, whereas male scientists were awarded with higher levels, both in the area of Engineering, Exact Sciences and Earth Sciences – this is a CNPq field study, equivalent to Science, Technology Engineering and Mathematics – STEM in USA – and in the area of Life Sciences. This imbalance was not found in Humanities. Only 14% of the members of the Brazilian Academy of Science were women. A low representation of Humanities in the Academy (3.7%) was found in comparison with the hard sciences (Engineering, Exact Sciences and Earth: 54.9% and Life Sciences: 41.4%). Finally, female scientists obtained significantly more funding at the lowest range, whereas male scientists obtained significantly more funding at the higher ranges.

(IM)BALANCE OF GENDER IN BRAZILIAN SCIENCE

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Abstract

Despite significant progress, there is still a gender gap in science all over the world, especially at upper levels. Progressive countries are recognizing the need to address barriers of gender equity to retain their best scientists and innovators to ensure research excellence and social and economic returns on the investment made by taxpayers each year on training women scientists. We investigated the gender distribution of: (i) the productivity scholarship holders of the Brazilian National Council for Scientific and Technological Development (PQ CNPq: N= 13,625), (ii) the members of the Brazilian Academy of Science (N= 899), and (iii) the amount of funding awarded for research (Edital Universal of CNPq: 3,836). Our findings show gender imbalance in higher levels of Brazilian science considering scientific productive scholarship, grants and membership in Brazilian Academy of Sciences. We found that female scientists were more frequently awarded PQ scholarships at the lower level of the research ranking system (2), whereas male scientists were awarded with higher levels (1A and 1B), both in the area of Engineering, Exact Sciences and Earth Sciences and in the area of Life Sciences. This imbalance was not found in Humanities and Social Science. Only 14% of the members of the Brazilian Academy of Science (ABC) were women. A low representation of Humanities and Applied Social Sciences in the Academy (3.7%) was found in comparison with the hard sciences (Engineering, Exact Sciences and Earth: 54.9% and Life Sciences: 41.4%). Finally, female scientists obtained significantly more funding at the lowest range, whereas male scientists obtained significantly more funding at the higher ranges.

Key words: women in science, gender balance, Brazilian Scientists

Introduction

Although some progress, there is evidence of persistence of a gender gap in science (1) - see a special 2013 issue of the journal *Nature:* nature.com/women, (2- 3). All over the world, many women are deterred from pursuing a career in science to the highest levels. Women scientists are still promoted less, win fewer grants, and are more likely to leave research than similarly qualified men. Whereas around half of those who gain doctoral degrees in science and engineering in the United States and Europe are female, only one-fifth of full professors are women (e.g., ref. 4).

Progressive countries have recognized the need to address barriers to gender equality to retain their best scientists and innovators to ensure research excellence and social and economic returns on the investment made by taxpayers each year on training women scientists. The Athena SWAN Charter is an accreditation and improvement program for higher education and research organizations focusing on gender and other forms of inequality, which was established in the UK in 2005 (5-6). This program is proving successful in transforming gender equality action to improve the promotion and retention of women in science (6). Also notable is the Science in Australia Gender Equity (SAGE), which was created in 2015 (7). SAGE is an initiative of the Australian Academy of Science in partnership with the Australian Academy of Technological Sciences and Engineering, and was adapted from the Athena SWAN Charter (6).

Innovative national policies that affect research funding include gender balance targets (e.g. Slovenia, Switzerland) and legislation on gender quota of up to 40 % of the minority gender on committees (e.g., Finland, Norway). Some countries also have policies to increase university funding based on their performance in terms of gender equality (e.g., Ireland, Germany and Netherlands) (8).

Herein, we studied the gender distribution of: (a) the productivity scholarship holders of the Brazilian National Council for Scientific and Technological Development (9), (b) the members of the Brazilian Academy of Science (ABC) (10), and (c) the amount of funding awarded for research (Edital Universal of CNPq) (11). We analysed the data according to gender, area of knowledge, and level in the research ranking system.

The Brazilian National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq) is a funding agency of the Brazilian federal government. It was created in 1951 and is dedicated to the promotion of scientific and technological research as well as the creation of human resources for research (12-13). It also plays a major role in the formulation and implementation of science, technology and innovation policies in the country. The CNPq productivity scholarship system is highly competitive. Researchers are classified into categories 1 (subdivided into four levels:1 A, 1B, 1C and 1D) and 2, in a decreasing order of prestige and value. The research ranking system is based on scientific output (articles published in peer-reviewed journals, books and book chapters), scientific coordination of research networks, contribution to human resources creation (thesis adviser for Masters and Doctoral students and research initiation for undergraduate students), and time elapsed since attainment of doctoral degree (at least eight years to be a Researcher 1 and at least three years to be a Researcher 2). CNPq also launches calls for funding research projects and selects proposals for financial support that are likely to significantly contribute to the scientific and technological development and innovation in any area of the country's knowledge.

The Brazilian Academy of Science (Academia Brasileira de Ciências – ABC) is a prestigious honorific scientific society, founded in 1916 (14). The most important representatives of the Brazilian scientific community are admitted as members after a rigorous selection process. They have a leadership role in the advancement of scientific and technological activities of the country. ABC interacts with the federal government and its agencies, identifying research priorities in several issues of national interest, focused on the economic development and the well-being of the population. This contributes to new programs and actions of the national policy of Science, Technology and Innovation. The supra-institutional nature of ABC, the leadership role and ample diversity in the areas of interests of its members enable ABC to discuss and propose new solutions to scientific and socio-economical issues that require a multidisciplinary approach.

There is a lot of research on productivity scholarship holders (PQ) of CNPq focused on specific sub-areas of knowledge. Recent studies in Chemisty (15), Odontology (16), Physical Education (17), Veterinary Medicine (18) and Medicine (19-20) show that PQ researchers are predominantly male (60-76%), recipients of category

2 grants (around 56%), and concentrated in the southeast region of Brazil. In Pediatrics (21) and Cardiology (22) the same pattern was found as in the whole of Medicine. One decade earlier, when a slightly different system was used by CNPq to classify PQ researchers (1 A, 1 B, 1C, 2 A, 2 B, 2C), the profile of researchers in public health showed a clear gender gap (23). Whereas 1A (Ph.D. $\geq$ 21 years), 1B (Ph.D. $\geq$ 20 years) and 1C (Ph.D. $\geq$ 14 years) researchers were typically male, 2A (Ph.D. $\geq$ 12 years) could be male or female, and 2B (Ph.D. $\geq$ 9 years) and 2 C (Ph.D. $\geq$ 6 years ago) were typically female.

An analysis of CNPq's database in 2002 revealed that Brazilian women were less represented than men in the higher position in the career ladder, but not in the lower and intermediate positions (24): Scientific Initiation Scholarship (55% of 14,040), Master Scholarships (53% of 5,592), Doctoral Scholarships (48% of 5,734), Postdoctoral Fellowship (50% of 376), Productivity Scholarship (32% of 7,763). A proportion of the women that go through the early stages of scientific knowledge production are "lost" along the way, or simply do not get the recognition of peers to continue to conduct research with grants (19). However, the gender gap seems to be closing in some fields. Among psychology PQ researchers, no gender difference was found in the research ranking system (25), with predominance of category 2 (58%) for the overall sample, followed by the category 1D (13.1%).

The goal of the present research is to offer a more comprehensive picture of gender imbalances of Brazilian science, by comparing the areas of Engineering, Exact Sciences and Earth Sciences, Life Sciences, and the Humanities and Applied Social Sciences. Our hypothesis is that the gender gap will be less pronounced among productivity scholarship holders than in the Brazilian Academy of Science. We also expected that the gender gap would be less pronounced in the fields of Humanities and Applied Social Sciences compared to Engineering, Exact Sciences and Earth Sciences, and Life Sciences. Our hypothesis was also that there would be a gender imbalance in the amount of funding obtained for research. The overarching goal of our study is to contribute to a rise of awareness of the issue of gender imbalance in science.

Examining the membership of the science academies of Brazil, China, France, and the USA according to gender, we found that the percentage of women varies

between 6 and 14% (China 6%, France 11%, USA 13%, Brazil 14%). Women represent less than 12% of the membership of the world's national science academies, according to a study conducted by the Academy of Science of South Africa (ASSAf). An analysis of 69 National Science Academies revealed that the average proportion of members who were women stood at just 12 percent in 2013-14. Women were relatively more represented in the Academies of North America, Latin America and the Caribbean, with the Cuban Academy of Sciences having the highest proportion of female members (27%) (26).

Results

Analysing the distribution of the CNPq's productivity scholarship holders, we found that women are involved in all areas of research. There was a significant association between gender and area of knowledge (contingency chi-square test, $\chi 2 = 899.01$, df = 2, $p < 0.001$). The gender distribution was more asymmetrical in Engineering, Exact and Earth Sciences (19.8% Female (F) versus 80.2% Male (M)) and more balanced in Humanities and Applied Social Sciences (49.7% F versus 50.3% M), with Life Sciences in an intermediate position (41.3% F versus 58.7% M), (Figure 1).

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Gender distribution of productivity scholarship holders in sub-areas of knowledge

There was a significant association between gender and the sub-areas of Engineering, Exact and Earth Sciences, in other words, there are significantly less women than expected by chance in some of these areas (ECET), ($\chi 2 = 267.05$, df = 21, $p < 0.001$). The sub-areas were organized according to the value of standardized residuals, making it straightforward to determine which cells were contributing the most to the chi-square value, and which were contributing the least. Adjusted residuals larger than +2 or smaller than -2 indicate significant departures from the null hypothesis of independence (for details see Appendix 1). It is notable that the number of women was smaller than expected in the sub-areas of Biomedical Engineering, Mathematics,

Mechanical Engineering, Electrical Engineering, and Physics, but was greater than expected by chance in the sub-areas of Chemistry, Chemical Engineering, Industrial Design, Nuclear Engineering, Materials Engineering, Sanitary Engineering, Production Engineering, and Oceanography.

A significant association was found between gender and the sub-areas of Life Sciences (CV), ($X^2 = 788.70$, df = 29, $p < 0.001$). The number of women was smaller than expected by chance in Agronomy, Agricultural Engineering, Zootechnics, Forest Engineering, Physical Education, Veterinary Medicine, Zoology, Fisheries Engineering, Biophysics, but was greater than expected by chance in the sub-areas of Nursing, Phonoaudiology, Nutrition, Public Health, Microbiology, Genetics, Botanics. Immunology, Physiotherapy, Pharmacy, Food Science and Technology, Pharmacology, Morphology, and Biochemistry (for details see Appendix 2).

There was also a significant association between gender and the sub-areas of Humanities and Applied Social Sciences (CHSA), ($\chi2 = 360.06$, df = 23, $p < 0.001$). The number of women was smaller than expected by chance in Economics, Philosophy and Administration, but was greater than expected by chance in the sub-areas of Linguistics, Social Service, Education, Information Science, Psychology and Arts (for details see Appendix 3).

Distribution of productivity scholarship holders by gender and scholarship level

There was a significant association between gender and scholarship level in Engineering, Exact Sciences and Earth Sciences (ECET; $\chi2 = 45.70$, df = 4, $p < 0.001$), Life Sciences (CV; $\chi2 = 89.20$, df = 4, $p < 0.001$), and Humanities and Applied Social Sciences (CHSA; $\chi2 = 13.78$, df = 4, $p < 0.01$). It is notable that in ECET and CV the number of women was greater than expected by chance in the lower level of the research ranking system (2), whereas the number of men was greater than expected by chance in the higher levels (1A and 1B;Table 1). A different pattern was found in CHSA, with a smaller gender gap in the research ranking system.

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Significant variation across sub-areas was found. In Engineering, Exact Sciences and Earth Sciences, the gender gap in favour to men was higher in Chemistry ($\chi 2$ = 16.38 , df = 4, p <0.01), Civil Engineering (Fisher's Exact Test = 16.24, p <0.01), and Sanitary Engineering (Fisher's Exact Test = 9.89, p < 0,05). In Life Sciences the gender gap in favour to men was higher in Medicine ($\chi 2$ = 23.78, df = 4, p <0.001), Public Health ($\chi 2$ = 18.85, df = 4, p <0.001), Physiology (Fisher's Exact Test = 26.22, p < 0.001), Agronomy (Fisher's Exact Test = 20.67, p < 0.05), Pharmacology (Fisher's Exact Test = 18.40, p < 0.001), Odontology (Fisher's Exact Test = 11.82, p < 0.05, and Botanics (Fisher's Exact Test = 10.50, p < 0.05). In Humanities and Applied Social Sciences significant associations between gender and scholarship level were found in Psychology (Fisher's Exact Test = 61.76, p < 0.001) and Urban Planning (Fisher's Exact Test = 15.26, p < 0.01), with more women than expected by chance in the intermediate levels of theresearch ranking system, PQ-1B and PQ-1C.

Brazilian Academy of Science

There were 126 female members (14%) of the Brazilian Academy of Science (ABC; $\chi 2$ = 465.64, N = 899, df = 1, p <0.001). Examining the gender distribution as a function of areas of knowledge, using the classification of the National Council for Scientific and Technological Development (CNPq), it is notable that the gender gap is more pronounced in Engineering, Exact Sciences and Earth (8.9%) and less pronounced in Life Sciences (20.4%) and Humanities and Applied Social Sciences, (18.2%), ($\chi 2$ = 23.87, N = 899, df = 1, p <0.001). Male scientists predominate in all areas of knowledge and the representation of Humanities and Applied Social Sciences is low in the Academia (Table 2).

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The percentage of women in the Brazilian Academy of Sciences does not correspond to the percentage of women among Productivity Scholarship Holders; it is two times lower. This occurs in all areas of knowledge (Figure 2).

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For Brazilian Academy of Science members who were Productivity Scholarship Holders there was a significant association between gender and scholarship level in Life Sciences - CV (Fisher's Exact Test = 10,08, $p < 0.05$), but not in Engineering, Exact Sciences and Earth Sciences - ECET ($\chi 2 = 4{,}765$, df = 4,NS). The small sample size in Humanities and Applied Social Sciences - CHSA precludes cross-tabulated analysis. It is notable that in CV the number of women was greater than expected by chance in the lower level of the research ranking system (1D), whereas the number of men was greater than expected by chance in the higher level (1A) (Table 3).

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Amount of funding awarded by gender

Analysing the amount of funding awarded by gender in the UNIVERSAL CNPQ CALL (Figure 3), it was found that female scientists obtained significantly more funding at the < R$ 30,000.00 range, whereas male scientists obtained significantly more funding at the higher ranges, especially at the range R$ 60.000.00 - R$ 120.000.00 (contingency chi-square test, $\chi 2 = 24.20$, N = 3,836, df = 2, $p < 0.001$).

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An additional analysis of the amount of funding awarded by gender in the Universal CNPq Call, separately conducted by areas of knowledge (Table 4), showed that the association was significant in Life Sciences (contingency chi-square test, ($\chi 2 = 17.195$, N = 2024, df = 2, $p < 0.001$), but not in Humanities and Applied Social Sciences, ($\chi 2 = 3.218$, N = 651, df = 2, NS), nor in Exact Sciences and Earth Sciences, ($\chi 2 = 2.277$, N = 1161, df = 2, NS).

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Discussion

Our findings show gender imbalances in the upper levels of Brazilian science considering scientific productivity scholarships, grants and membership of Brazilian Academy of Sciences. Our analysis of a sample of 13,625 productivity scholarship holders of the Brazilian National Council for Scientific and Technological Development (CNPq) showed that female scientists were more frequently awarded PQ scholarships at the lower level of the research ranking system (2), whereas male scientists were awarded with higher levels (1A or 1B). This was evident in Engineering, Exact and Earth Sciences, and in Life Sciences. This general result is in line with the gender gap in science found at upper levels all over the world (e.g. refs 4 and 27). In Brazil the gender gap in science was reduced in Humanities and Social Science in comparison to the hard sciences as also was found in UK (8).

Our analysis of a sample of 3,836 researchers awarded funding for research in the Universal CNPq Call showed that female scientists were more frequently awarded less funding to conduct their research than male scientists. We did not have access to the amounts of funding requested by gender, and therefore we do not know if women applied for similar amounts. However, it is notable that there were no significant differences in the amount of funding awarded according to gender both in the area of Humanities and Applied Social Sciences, and in the area of in Engineering, Exact and Earth Sciences, and in Life Sciences. The smaller amount of funding awarded to female scientists was only found in the area of Life Sciences (less than 30 thousand reais versus 60-120 thousand reais). In biomedical sciences, women also get smaller grants than men in the US (28) and the UK (29).

Brazilian government has programs such as Programa Pró-Equidade de Gênero e Raça (30) [The Pro-Equity Gender and Race Program], Observatório de Igualdade de Gênero [Brazil Observatory of Gender Equality] (31). They focus on people management and organizational culture to achieve equality between women and men in

316 the labour market, political participation, violence against women, but not specifically
317 on gender inequality in science. The Brazilian Academy of Science (Academia
318 Brasileira de Ciências – ABC) has a leadership role in the country, contributing to the
319 policy of Science, Technology and Innovation. The achievements of Brazilian women
320 in science are discussed by ABC, recognizing the importance of retaining them, making
321 the best use of the investment made in training women scientists, but but even with
322 more female presence than other countries the imbalance is still evident great gender
323 imbalance is still evident.

324 There are relatively more women members of ABC in comparison with other
325 Academies of Science (26), but the results of our study revealed several asymmetries in
326 ABC: (a) male prevalence in all areas of knowledge: Engineering, Exact and Earth
327 Sciences (8.9% F versus 91.1% M), Life Sciences (20.4% F versus 79.6% M) and
328 Humanities and Applied Social Sciences (18.2% F versus 81.8% M), (b) very low
329 representation of Humanities and Applied Social Sciences in the Academia (3.7%) in
330 comparison with the hard sciences (54.9% for Engineering, Exact and Earth Sciences
331 and 41.4% for Life Sciences), (c) the percentage of women in the ABC is approximately
332 half of percentage of women among Productivity Scholarship Holders in all areas of
333 knowledge (Exact Sciences and Earth Sciences: 8.9% versus 19.8%; Life Sciences:
334 20.4% versus 41.3%; Humanities and Applied Social Sciences: 18.2 versus 49.7%); (d)
335 among members of ABC who were Productivity Scholarship Holders of the area of Life
336 Sciences the number of women was greater than expected by chance in the lower level
337 of the research ranking system (1D), whereas the number of men was greater than
338 expected by chance in the higher level (1A).

339 Overt sexism has decreased over the last few decades, but subtle gender biases
340 maybe still held even by individuals who consider themselves as egalitarian, and are
341 exhibited by both men and women (32-34), and may help to explain the results that we
342 obtained in our study. Nosek *et al.* (2009) (ref. 35) analysed Implicit Association Tests
343 completed by citizens of 34 countries and discovered that nation-level implicit
344 stereotypes associating science with males more than with females predicted nation-
345 level sex differences in 8th-grade science and mathematics achievement. They
346 suggested that implicit stereotypes and sex differences in science participation and

performance are mutually reinforcing, contributing to the persistent gender gap in science engagement.

There is experimental evidence that science faculty's subtle gender biases favour male students (36). In a double-blind study, science faculty from research-intensive universities rated application materials of a student for a laboratory manager. The student was randomly assigned either a female or a male name. Faculty participants rated the female applicant as significantly less competent and hireable than the (identical) male applicant. They also selected a lower starting salary and offered less career mentoring to the female applicant.

Our results show clear evidence of imbalance of gender in Brazilian science, and this probably has deep institutional and cultural roots. We agree with Mühlenbruch and Jochimsen (2013) (37) that research policies are needed and only wholesale reforms will bring equality.

Materials and Methods

The study sample included a total 13,625 productivity scholarship holders of the Brazilian National Council for Scientific and Technological Development (CNPq), 4859 from the area of Engineering, Exact Sciences and Earth Sciences (ETEC), 5687 from the area of Life Sciences (CV), and 3079 from the area of Humanities and Applied Social Sciences (CHSA), according to lists publicly available at the site of the agency at January 2016. The study sample also included a total of 899 active members of the Brazilian Academy of Sciences according to lists organized by gender publicly available at the site of ABC at January 2016. Their area of knowledge was identified, Lattes *curricula*, the main source of information on Brazilian researchers, and photos were checked, and CNPq research categories (1A, 1B, 1C, 1D, and 2) were determined for those who were productivity scholarship holders.

We analysed an additional sample of 3,836 researchers awarded funding for research in the UNIVERSAL MCTI / CNPQ CALL (Nº 14/2014), comparing the results by gender in the three funding ranges: less than 30 thousand Brazilian reais, 30-60 thousand Brazilian reais and 60-120 thousand Brazilian reais. The call was open to all scientific disciplines and types of research, from basic research through to applied research, including scientists who are not PQ holders. To the lower funding range (< R$ 30,000.00) could apply researchers with Ph.D. > 7 years ago. The intermediate funding range (R$ 30,000.00 - R$ 60,000.00) was open to level 2 researchers. Level 1 PQ holders could only submit proposals to the higher funding range (R$ 120,000.00)

Statistical analysis

Separate databases were created for Engineering, Exact Sciences and Earth Sciences (ETEC), Life Sciences (CV), and Humanities and Applied Social Sciences (CHSA) productivity scholarship holders, for researchers awarded funding and for members of the Brazilian Academy of Science. Databases were constructed with information on gender, sub-area of knowledge, research category (1A, 1B, 1C, 1D, 2) and amount of funding. Categorical (dichotomous or nominal) variables were compared using the chi-square test in the SPSS 20.0 for Windows software package.

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522

523 Table 1 - Distribution of the productivity scholarship holders by gender and scholarship
524 level (F = Females, M = Males, n = frequencies, AR = Adjusted residuals)
525

Exact Sciences and Earth Sciences							
Level	F (n)	M (n)	Total	F (%)	M (%)	AR F	AR M
PQ-1A	41	378	419	4.2%	9.7%	-5.5	**5.5**
PQ-1B	75	391	466	7.7%	10.1%	-2.3	**2.3**
PQ-1C	78	380	458	8,00%	9.8%	-1.7	1.7
PQ-1D	161	595	756	16.5%	15.3%	0.9	-0.9
PQ-2	621	2139	2760	63.6%	55.1%	**4.8**	-4.8
Total	976	3883	4859	100,00%	100,00%		
Life Sciences							
Level	F (n)	M (n)	Total	F (%)	M (%)	AR F	AR M
PQ-1A	132	393	525	5.6%	11.8%	-7.9	**7.9**
PQ-1B	172	343	515	7.3%	10.3%	-3.8	**3.8**
PQ-1C	248	351	599	10.6%	10.5%	0.1	-0.1
PQ-1D	418	580	998	17.8%	17.4%	0.4	-0.4
PQ-2	1379	1671	3050	58.7%	50.1%	**6.4**	-6.4
Total	2349	3338	5687	100,00%	100,00%		
Humanities and Applied Social Sciences							
Level	F (n)	M (n)	Total	F (%)	M (%)	AR F	AR M
PQ-1A	126	143	269	8.2%	9.2%	-1	1
PQ-1B	158	132	290	10.3%	8.5%	1.7	-1.7
PQ-1C	154	113	267	10.1%	7.3%	**2.7**	-2.7
PQ-1D	219	262	481	14.3%	16.9%	-2	2
PQ-2	874	898	1772	57.1%	58,00%	-0.5	0.5
Total	1531	1548	3079	100,00%	100,00%		

526

Table 2 Distribution of the members of the Brazilian Academy of Science by gender and area of knowledge (F = Females, M = Males, n = frequencies, AR = Adjusted residuals)

Area	F (n)	M (n)	Total	AR F	AR M
Engineering, Exact Sciences and Earth	44	450	494 (54,9%)	-4,9	**4,9**
Life Sciences	76	296	372 (41,4%)	**4,7**	-4,7
Humanities and Applied Social Sciences	6	27	33 (3,7%)	,7	-,7
Total	126	773	899		

535 Table 3 Distribution of the members of the Brazilian Academy of Science who are
536 Productivity Scholarship Holders by gender and scholarship level (F = Females, M =
537 Males, n = frequencies, AR = Adjusted residuals)

Exact Sciences and Earth Sciences							
Level	F (n)	M (n)	Total	F (%)	M (%)	AR F	AR M
PQ-1A	17	137	154	65,4%	57,8%	,7	-,7
PQ-1B	3	27	30	11,5%	11,4%	,0	,0
PQ-1C	0	13	13	0%	5,5%	-1,2	1,2
PQ-1D	4	18	22	15,4%	7,6%	1,4	-1,4
PQ-2	2	42	44	7,7%	17,7%	-1,3	1,3
Total	26	237	263				
Life Sciences							
Level	F (n)	M (n)	Total	F (%)	M (%)	AR F	AR M
PQ-1A	20	99	119	41.7%	64.7%	-2.8	**2.8**
PQ-1B	4	13	17	8.3%	8.5%	.0	.0
PQ-1C	7	11	18	14.6%	7.2%	1.6	-1.6
PQ-1D	9	13	22	18.8%	8.5%	**2.0**	-2.0
PQ-2	8	17	25	16.7%	11.1%	1.0	-1.0
Total	48	153	201				
Humanities and Applied Social Sciences							
Level	F (n)	M (n)	Total	F (%)	M (%)	AR F	AR M
PQ-1A	4	4	8	80.0%	57.1%	.8	-.8
PQ-1B	0	0	0				
PQ-1C	0	1	1		14.3%	-.9	.9
PQ-1D	0	1	1		14.3%	-.9	.9
PQ-2	1	1	2	20.0%	14.3%	.3	-.3
Total	5	7	12				

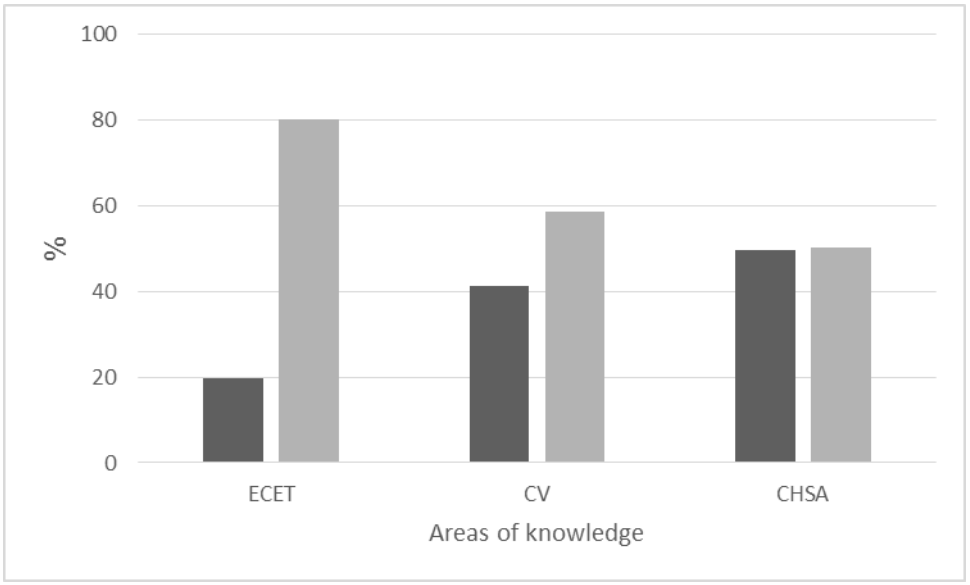
538

Table 4 - Distribution of gender by amount of funding in the UNIVERSAL MCTI / CNPQ CALL - Nº 14/2014 in the major areas of knowledge: Humanities and Applied Social Sciences (CHSA), Life Sciences (CV) and Engineering, Exact Sciences and Earth Sciences (ETEC)

Exact Sciences and Earth Sciences							
Amount	F (n)	M (n)	Total	F (%)	M (%)	AR F	AR M
60-120 thousand reais	38	152	190	13,30%	17,40%	-1,6	1,6
30-60 thousand reais	76	231	307	26,60%	26,40%	,1	-,1
less than 30 thousand reais	172	492	664	60,10%	56,20%	1,2	-1,2
Total	286	875	1161	100,00%	100,00%		
Life Sciences							
Amount	F (n)	M (n)	Total	F (%)	M (%)	AR F	AR M
60-120 thousand reais	112	218	330	13,2%	18,6%	-3,3	**3,3**
30-60 thousand reais	236	362	598	27,7%	30,9%	-1,5	1,5
less than 30 thousand reais	503	593	1096	59,1%	50,6%	**3,8**	-3,8
Total	851	1173	2024	100,0%	100,0%		
Humanities and Applied Social Sciences							
Amount	F (n)	M (n)	Total	F (%)	M (%)	AR F	AR M
60-120 thousand reais	25	37	62	7,5%	11,6%	-1,8	1,8
30-60 thousand reais	86	78	164	25,8%	24,5%	,4	-,4
less than 30 thousand reais	222	203	425	66,7%	63,8%	,8	-,8
Total	333	318	651	100,0%	100,0%		

549

550 **FIG. 1**



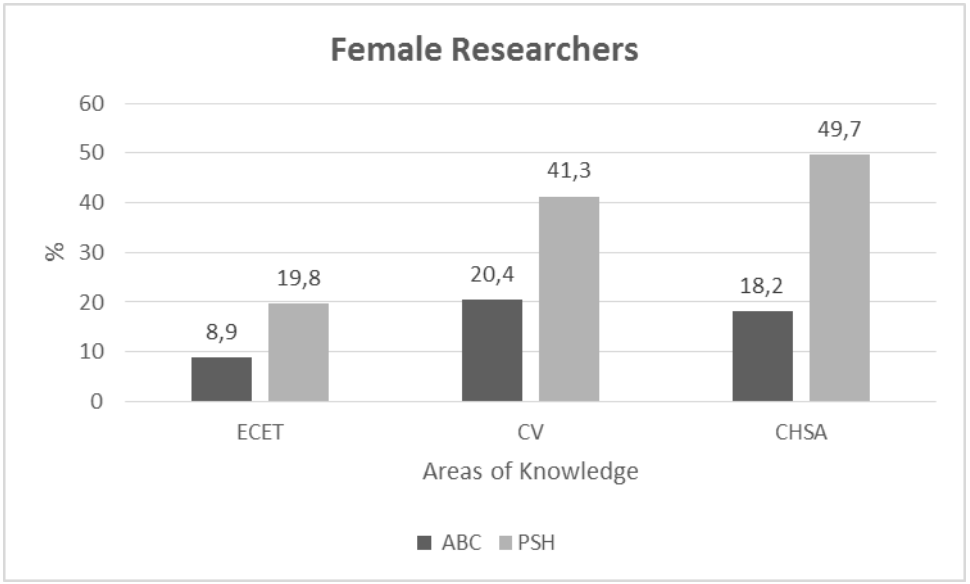
551

552

553 Figure 1 Percentage distribution of gender by productivity scholarship (women = dark
554 bars, men = light bars) in the major areas of knowledge: Humanities and Applied Social
555 Sciences (CHSA), Life Sciences (CV) and Engineering, Exact Sciences and Earth
556 Sciences (ECET)

557

FIG. 2



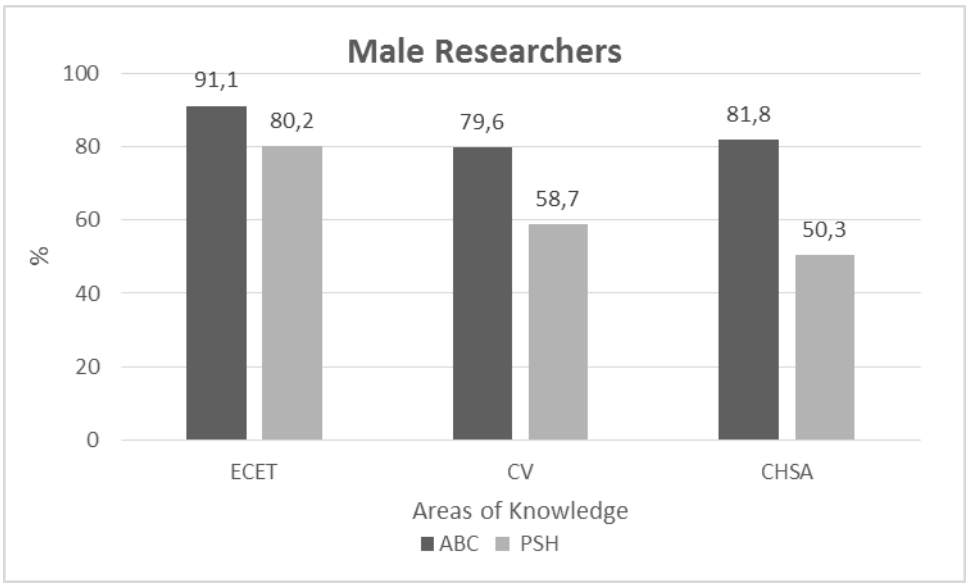


Figure 2 – Comparative distribution of Members of the Brazilian Academy of Science (ABC – dark bars) and of Productivity Scholarship Holders (PSH – light bars) by gender and areas of knowledge (ECET = Engineering, Exact Sciences and Earth Sciences, CV = Life Sciences, CHSA = Humanities and Applied Social Sciences)

FIG. 3

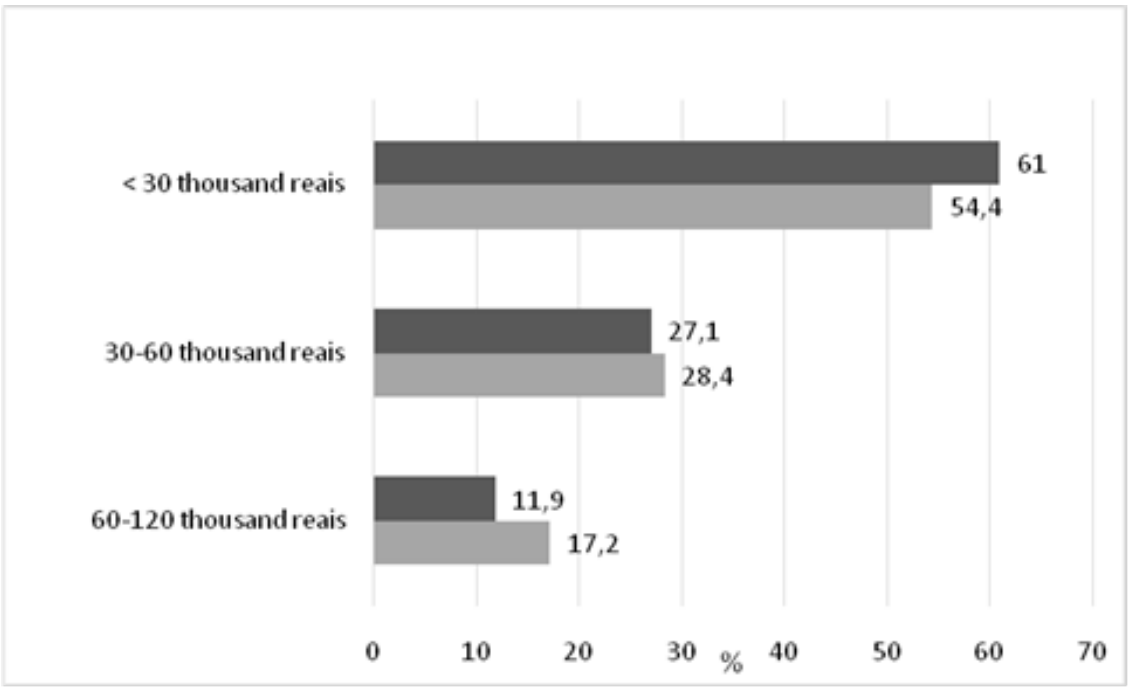


Figure 3 Percentage distribution of gender by amount of funding in the UNIVERSAL CNPQ CALL (women = dark bars, men = light bars)

581 Appendix 1 - Distribution of the productivity scholarship holders by gender and sub-
582 areas of Engineering, Exact and Earth Sciences (F = Females, M = Males, n =
583 frequencies, RA = Adjusted

584

Sub-areas	**F (n)**	**M (n)**	**Total**	**AR F**	**AR M**
Chemistry	207	480	687	**7.1**	-7.1
Chemical Engineering	59	95	154	**5.7**	-5.7
Industrial Design	14	16	30	**3.6**	-3.6
Nuclear Engineering	25	48	73	**3.0**	-3.0
Materials Engineering	87	247	334	**2.8**	-2.8
Sanitary Engineering	36	88	124	**2.5**	-2.5
Production Engineering	26	62	88	**2.2**	-2.2
Oceanography	33	85	118	**2.2**	-2.2
Computer Science	88	287	375	1.7	-1.7
Geosciences	107	363	470	1.5	-1.5
Probability and Statistics	19	51	70	1.5	-1.5
Transportation Engineering	13	39	52	0.9	-0.9
Civil Engineering	56	210	266	.4	-.4
Astronomy	20	79	99	.0	.0
Aerospace Engineering	10	44	54	-.3	.3
Mining Engineering	4	21	25	-.5	.5
Marine Engineering	1	10	11	-.9	.9
Biomedical Engineering	4	60	64	-2.8	**2.8**
Mathematics	29	271	300	-4.7	**4.7**
Mechanical Engineering	24	252	276	-4.9	**4.9**
Electrical Engineering	13	269	282	-6.7	**6,7**
Physics	101	806	907	-7.5	**7,5**
Total	976	3883	4859		

585 Appendix 2 - Distribution of the productivity scholarship holders by gender and sub-
586 areas of Life Sciences (F = Females, M = Males, n = frequencies, RA = Adjusted
587 residuals)

Sub- areas	F (n)	M (n)	Total	RA F	RA M
Nursing	165	8	173	**14.7**	-14.7
Phonoaudiology	50	1	51	**8.3**	-8.3
Nutrition	54	27	81	**4.7**	-4.7
Public Health	114	85	199	**4.7**	-4.7
Microbiology	105	82	187	**4.2**	-4.2
Genetics,	134	115	249	**4.1**	-4.1
Botanics	115	95	210	**4.0**	-4.0
Immunology,	90	69	159	**4.0**	-4.0
Physiotherapy	43	23	66	**4.0**	-4.0
Pharmacy	88	68	156	**3.9**	-3.9
Food Science and Technology	99	82	181	**3.7**	-3.7
Pharmacology	102	87	189	**3.6**	-3.6
Morphology	64	52	116	**3.1**	-3.1
Biochemistry	113	119	232	**2.3**	-2.3
Physiology	86	92	178	1.9	-1.9
General biology	4	1	5	1.8	-1.8
Parasitology	66	77	143	1.2	-1.2
Odontology	82	129	211	-.7	.7
Medicine	205	333	538	-1.6	1.6
Aquaculture	22	47	69	-1.6	1.6
Ecology	68	126	194	-1.8	1.8
Biophysics	24	59	83	-2.3	**2.3**
Fisheries Engineering	28	79	107	-3.2	**3.2**
Zoology	64	157	221	-3.8	**3.8**
Veterinary Medicine	91	208	299	-3.9	**3.9**
Physical education	14	70	84	-4.6	**4.6**
Forest Engineering	26	121	147	-5.9	**5.9**
Zootechnics	59	195	254	-6.0	**6.0**
Agricultural Engineering	17	127	144	-7.3	**7.3**
Agronomy	157	604	761	-12.4	**12.4**
Total	2349	3338	5687		

588 Appendix 3 - Distribution of the productivity scholarship holders by gender and sub-
589 areas of the Humanities and Social Sciences (F = Females, M = Males, n = frequencies,
590 AR = Adjusted residuals)
591

Sub-areas	**F (n)**	**M (n)**	**Total**	**AR F**	**AR M**
Linguistics	152	59	211	**6.7**	-6.7
Social Service	62	9	71	**6.4**	-6.4
Education	242	136	378	**5.9**	-5.9
Information Science	35	10	45	**3.8**	-3.8
Psychology	175	138	313	**2.3**	-2.3
Art	61	42	103	**2.0**	-2.0
Letters	126	102	228	1.7	-1.7
Urban Planning	44	33	77	1.3	-1.3
Architecture and Urbanism	54	42	96	1.3	-1.3
Domestic Economy	1	0	1	1.0	-1.0
Anthropology	74	66	140	.8	-.8
Archaeology	23	19	42	.7	-.7
Tourism	8	6	14	.6	-.6
Communication	61	61	122	.1	-.1
History	113	125	238	-.7	.7
Geography	40	51	91	-1.1	1.1
Theology	2	5	7	-1.1	1.1
Sociology	88	106	194	-1.3	1.3
Museology	1	4	5	-1.3	1.3
Law	26	42	68	-1.9	1.9
Political Science	42	77	119	-3.2	**3.2**
Management	50	126	176	-5.8	**5.8**
Philosophy	22	111	133	-7.8	**7.8**
Economics	29	178	207	-10.6	**10.6**
Total	1531	1548	3079		

592