Uncovering Barriers for Women in Russian Grant Funding: Rejected and Supported Grant Applications

Elena Chechik*

*elenachechik@gmail.com
0000-0002-2277-0490
Center for Institutional Analysis of Science & Education,
European University at St.Petersburg, Russia

This paper analyzes data from about 400,000 grant applications, both accepted and rejected, submitted to the Russian Foundation for Basic Research (RFBR) from 1994 to 2016, across eight research fields, including STEM and Social Sciences & Humanities (SSH). The purpose of this study was to examine gender inequality in the grant application process by analyzing the number of applications submitted, the percentage of applications accepted, and the representation of women across different research fields and grant types. The results indicate that there is persistent gender disparities in funding, with women being underrepresented in STEM fields and facing lower acceptance rates for their grant applications in STEM and SSH. Additionally, women are more likely to participate in lower-status grant competitions.

1. Introduction

Gender disparities in the funding process have been well-documented in the literature. Previous research has shown that there is a gender gap in research funding. Despite growing attention to gender disparities, women in academia still receive less research funding (Oliveira et al., 2019; Yip et al., 2020). Research has revealed a persistent gender gap in research funding, affecting both early career and high-level researchers. Despite an overall increase in the percentage of female researchers successfully receiving grants, they continue to lag behind their male counterparts (Safdar et al., 2021). However, specific research on women's representation in grant application processes in Russia is lacking.

The purpose of this study is to contribute to the existing body of research by providing a detailed analysis of data on grant applications submitted to one of the largest scientific foundations in Russia. The period under consideration spans over 20 years, allowing us to trace trends and patterns that reveal persistent gender inequalities in the grant application process in eight research areas, including STEM and SSH. The study also examines different types of grants in terms of PI requirements and the purposes for which grants are applied.

Our results show that, despite a gradual increase in the proportion of female applications over the years, men continue to have a higher proportion of winning applications in most fields. However, gender parity in the number of applications by the end of the period under review was achieved in two fields: *Biology & Medicine Sciences* and SSH. Women were more likely to apply for and win the less prestigious competitions for young scientists, which focused on organizing events and publishing purposes.

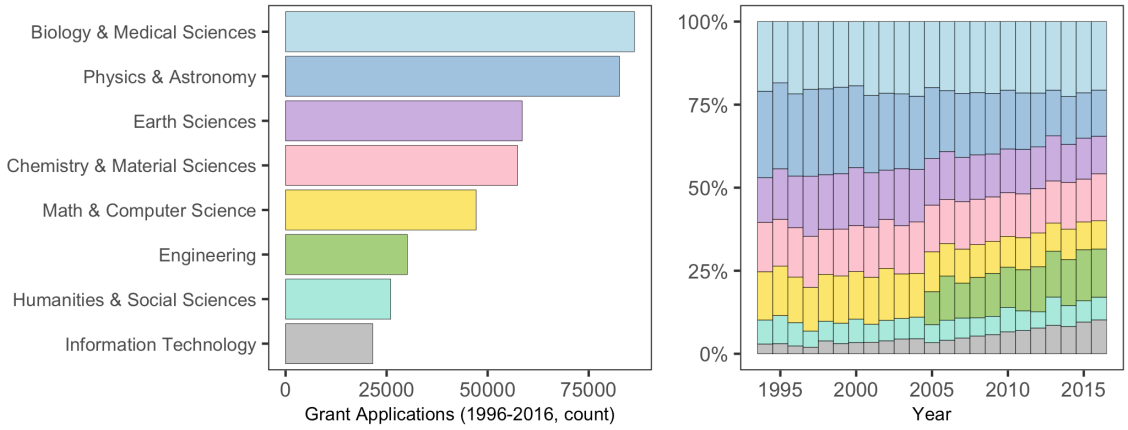
Overall, this study adds to the growing body of research on gender disparities in research funding by providing insight into the grant application process in Russia. The findings suggest that despite some progress in achieving gender parity in certain fields, persistent gender inequalities remain in the research funding process.

2. Data

I have collected data on over 400,000 grant applications submitted to the Russian Foundation for Basic Research (RFBR) from 1994 to 2016. The RFBR is a government-funded organization that provides financial support for a diverse range of fields. There are different types of grants which can cover various scientific goals, such as research, events, equipment, and publishing.

The grants are distributed across eight main research fields, with *Biology & Medical Sciences* and *Physics & Astronomy* being the two most popular fields, accounting for 21% and 20% of all grant applications submitted between 1995-2016, respectively. The majority of the grant applications received by the RFBR are in STEM fields, with SSH accounting for only 6.4% of the applications (see Fig. 1).

Figure 1: Grants applications by research fields (1994-2016).



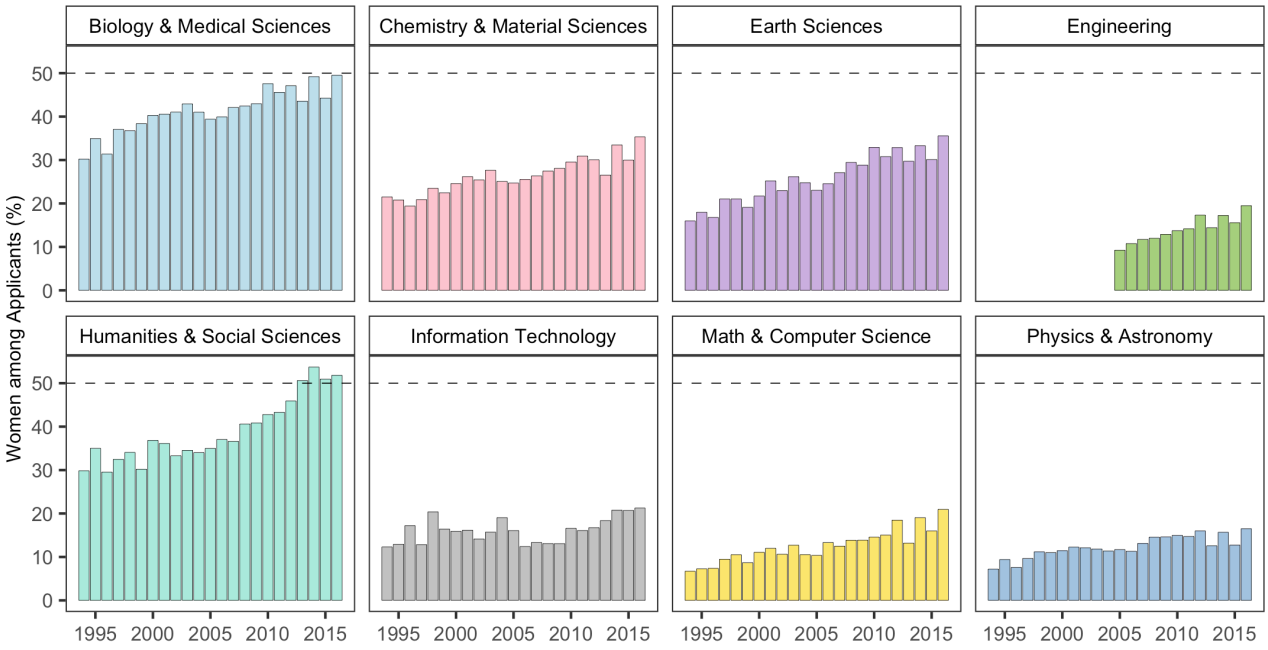
To determine the gender of grant applicants, I analyzed the gender-specific endings of their last names. This analysis was performed for 326,661 grant applicants, which represents 80% of all applicants. The results showed that 75.5% of the applicants were male, while 24.5% were female (see Supplementary Table S1).

3. Results

3.1. Gender dinamics by research field

The number of applications submitted by women remained consistently lower than that of men, the proportion of female applications has steadily increased. By 2016, the proportion of female applications had reached 31.8%, compared to 17.2% in 1994. Figure 2 illustrates the trend of increasing female representation in grant applications across all research fields. SSH showed the highest proportion of female applications, with a steady increase from 30% in the 1990s to 50% at the end of the period. *Biology & Medical Sciences* also demonstrated an increase from 30% at the start of the period to gender parity at the end. *Physics & Astronomy* had the lowest proportion of female applications, with a gradual increase from 7% in 1994 to 16.5% in 2016.

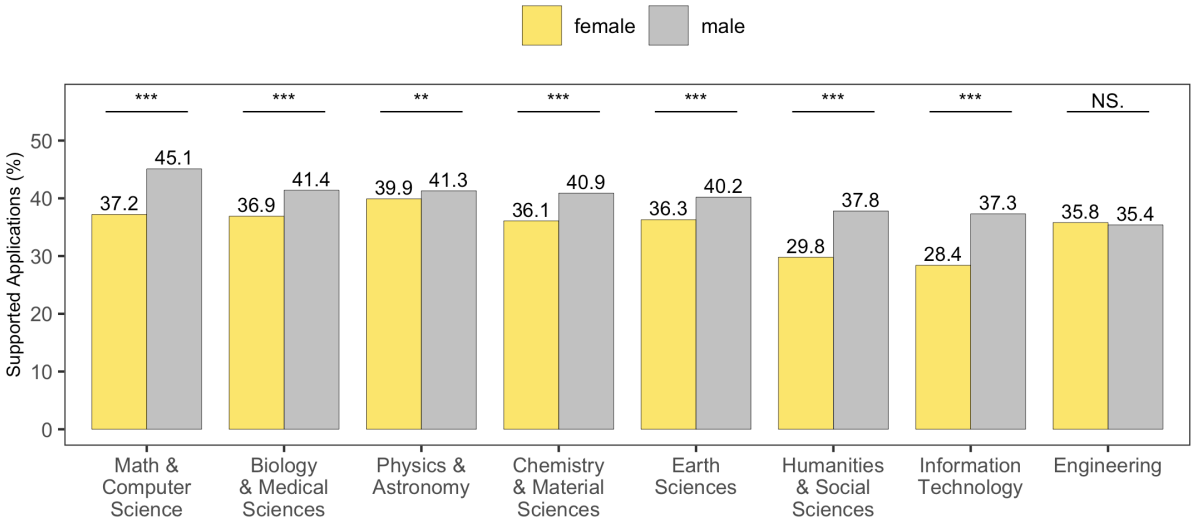
Figure 2: Proportion of women among grant applicants by field.



3.2. Supported applications gap

Figure 3 displays the proportion of approved grant applications for men and women in different research fields. The data indicates that men have a higher share of successful applications in *Math & Computer Science*, with 45.1% of applications submitted by men being approved. However, only 37.2% of applications submitted by women are approved in this field (p-value <0.001, chi-squared test, [add Effect size, z-test]). The data also shows that in most fields, women have a significantly lower share of approved applications than men, with the largest gap observed in *IT* and *Social Sciences & Humanities*. The only field where the gap is not significant is *Engineering*, where both women and men have an equal share of approved applications.

Figure 3: Proportion of supported applications by gender.

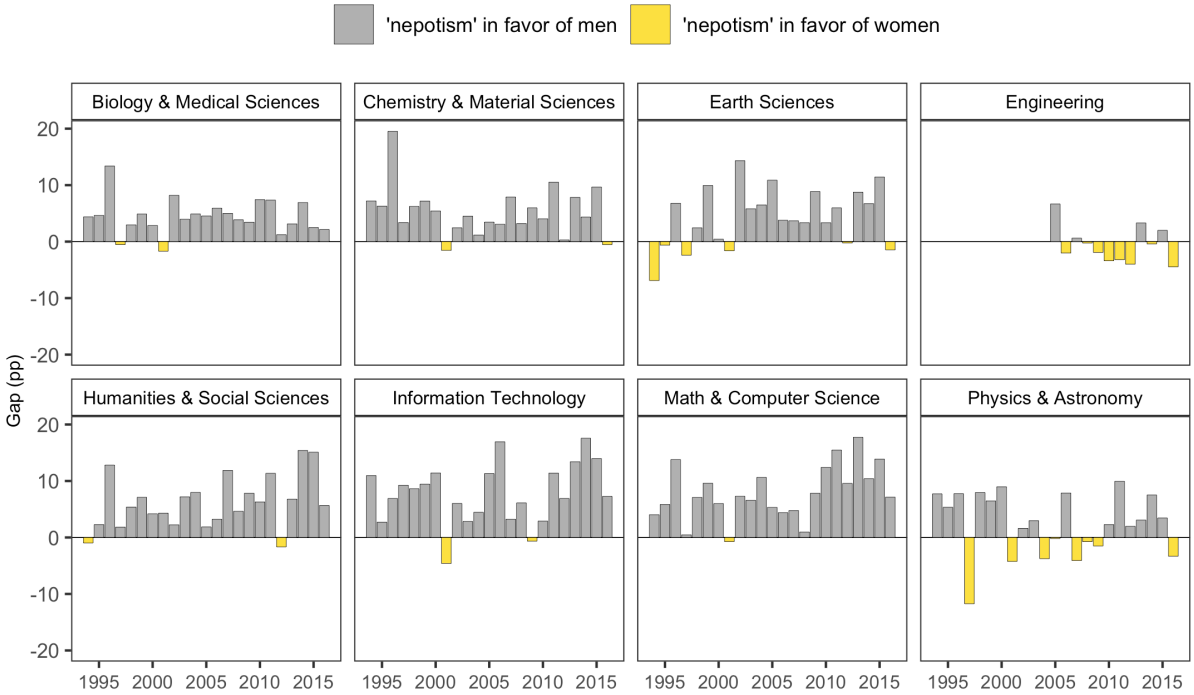


When we analyze the gender gap in accepted applications by year, we observe a pattern of "nepotism" towards women in *Engineering* (see Fig. 4). Additionally, *Physics & Astronomy* also

exhibits a of "nepotism" towards women in some years. In all other fields, the trend of "nepotism" is towards men, which is consistently observed annually.

The term "nepotism" used in this paper refers to the disparity in the proportion of grant applications approved between men and women. It is important to note that the qualifications and experience of applicants are not taken into account in this analysis. It is possible that the observed gender gap in approved applications can be explained, for example, by differences in the quality of applications. Therefore, the word "nepotism" is put in quotation marks to indicate its limited and specific use in this context.

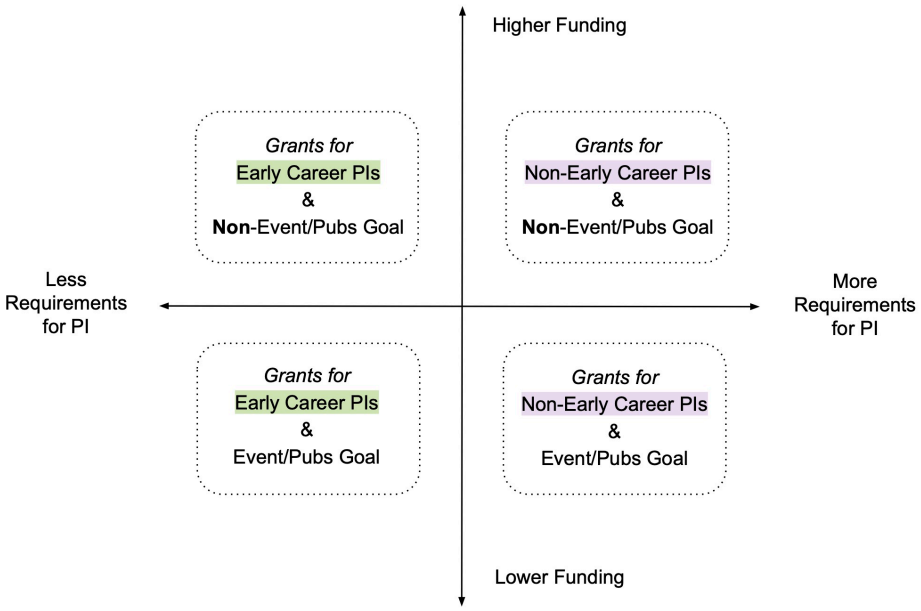
Figure 4: Gender disparity in the proportion of supported applications by field.



3.3. Types of grants: who can be a PI and what is a goal

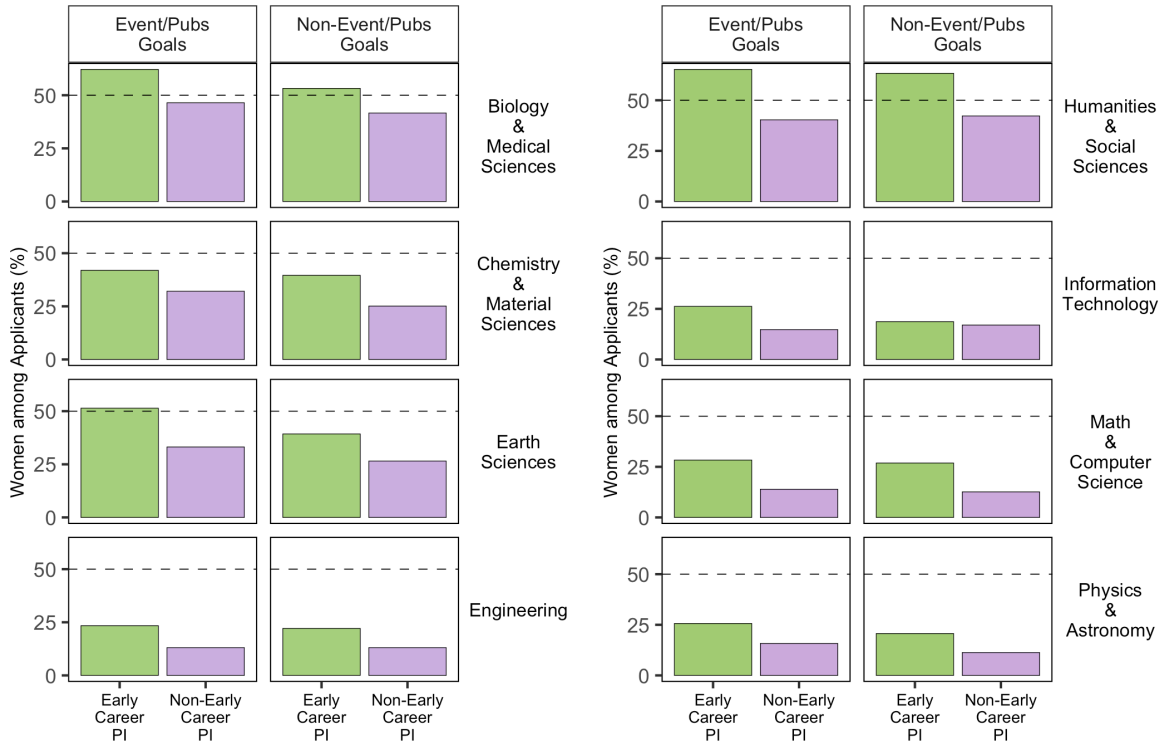
The RFBR provides grants not only in various research fields but also in different types of grants with varying goals and requirements for a PI. The size of the financial support and expected results will also differ for gifferent types of grants. For instance, grants may be awarded for organizing educational conferences or publishing books. These types of grants differ from the larger grants given for large-scale laboratory research projects. We will analyze grants separately for competitions targeted at young scientists and those not specifically targeted at them. Furthermore, we will distinguish between competitions that fund events/publishing and those that do not have such a focus. This classification will enable us to identify competitions of different "status," with varying funding levels and requirements for PIs and results (see Figure 5).

Figure 5: Types of grants by PIs requirements and grant goals.



During the period under review, grants specifically aimed at early-career researchers were not available every year. However, when these grants were offered, we observed a higher proportion of women applying for them compared to other grants, across all research fields (Figure 6) [p-value, chi-squared test, add Effect size, z-test]. Additionally, when we classify grants based on their purpose and separate event/publication grants as a distinct category, we found that more women applied for these grants (which typically have lower levels of funding), compared to grants without such objectives.

Figure 6: Proportion of women among grant applicants by grant type (2005-2016).



Therefore, we conclude that the classification of grant types by status, as presented in Figure 5, is meaningful – we see a fewer women applying for higher-status contests. Women are more likely to

apply for grants designed for early-career researchers and those with event/publication goals. However, do they have a higher success rate in winning these grants? Preliminary analysis suggests that there is a "nepotism" in favor of women in these types of grants, but the trend is not consistent year over year (see Supplementary Figure S1).

4. Conclusions and Further Research Directions

We reviewed applications for RFBR grants and found that only 24.5% of applications were submitted by female PIs. However, the proportion of female applications has gradually increased from 17.2% to 31.8% over the period of 1994-2016. By the end of the period, gender parity in the number of applications was achieved in two fields: SSH and *Biology & Medical Sciences*. In all other scientific fields, the proportion of female applications was significantly lower, but the general trend of gradual movement towards parity continued (see Figure 2).

Men had a larger share of winning proposals in all fields except *Engineering*. The biggest difference in the share of winning applications in favor of men was observed in *IT* and SSH (see Figure 3). The gender gap in won applications was observed not only in most academic fields but also in most years. The exceptions were *Engineering* and *Physics & Astronomy*, where "nepotism" in favor of women has been observed for several years (see Figure 4).

Thus, we can distinguish three types of research fields:

- *Physics & Astronomy* and *Engineering*: these fields show relatively balanced chances of approving female applications. Although the proportion of female applications in these fields is still low, there has been a consistent increase in the share of female applications over time.

- *Social Sciences & Humanities* and *Biology & Medical Sciences*: the share of female applications is comparable to the share of male applications. However, a higher proportion of applications are approved for men than for women.

- In *all other fields*, the share of female applications remains low (though increasing over time), and men are more likely to win applications than women.

Women were more likely to apply for grants for early-career researchers, as well as for competitions aimed at organizing events and publishing (see Figure 6). These types of grants typically have lower funding and fewer requirements for PIs. Additionally, women were more likely to get such grants, although it is too early to conclude that there is sustained nepotism in their favor at this stage of the study.

The research will be expanded to include a more detailed study of grant types. Currently, it is divided into relatively large groups – grants for early-career researchers, for events, for publishing books – but in the future, we will rank the types of grants more carefully by their "status," considering the maximum payout on grants, minimum requirements for PIs, such as degree, position, etc. In addition, we are currently conducting a textual analysis of the titles in applications to divide the eight research fields into subfields, as there is reason to believe that the subfields may have different gender structures.

Open science practices

The source code used in this study is publicly available on GitHub (https://github.com/hellche/grant_applications) and can be accessed by anyone interested in reproducing this work. The data used in this study was collected by web scraping from open sources. The final dataset is posted on OSF (https://osf.io/3xv9a/). A detailed description of the data collection process is provided in the supplementary materials (https://hellche.github.io/grant_applications/).

As someone who uses open-source software such as R and Python, along with their packages/libraries developed by other people for general use, I strongly support the {softbib} initiative (Arel-Bundock, 2023). The {softbib} scans a project folder, identifies the software used, and automatically generates software bibliographies. This initiative highlights the importance of acknowledging the contributions of software developers to scientific research (Arel-Bundock & McCrain, 2023). With your permission, I would like to add a section of software bibliography, collected using the {softbib} package, to the reference section.

Acknowledgments

The author would like to express gratitude to their colleagues at the Center for Institutional Analysis of Science and Education for their valuable input and support during the preparation of this paper.

Competing interests

The author declares no competing interests.

Funding information

This work was supported by RSCF – Russian Science Foundation, grant #21-78-10102.

References

Burns, K. E. A., Straus, S. E., Liu, K., Rizvi, L., & Guyatt, G. (2019). Gender differences in grant and personnel award funding rates at the Canadian Institutes of Health Research based on research content area: A retrospective analysis. *PLOS Medicine*, 16(10), e1002935. https://doi.org/10.1371/journal.pmed.1002935

Hechtman, L. A., Moore, N. P., Schulkey, C. E., Miklos, A. C., Calcagno, A. M., Aragon, R., & Greenberg, J. H. (2018). NIH funding longevity by gender. *Proceedings of the National Academy of Sciences*, 115(31), 7943–7948. https://doi.org/10.1073/pnas.1800615115

Oliveira, D.F., Ma, Y., Woodruff, T.K., & Uzzi, B. (2019). Comparison of National Institutes of Health Grant Amounts to First-Time Male and Female Principal Investigators. *JAMA*, 321, 898–900. https://doi.org/10.1001/jama.2018.21944

Urquhart-Cronish, M., & Otto, S. P. (2019). Gender and language use in scientific grant writing. *FACETS*, 4(1), 442–458. https://doi.org/10.1139/facets-2018-0039

Safdar, B., Naveed, S., Chaudhary, A. M. D., Saboor, S., Zeshan, M., & Khosa, F. (2021). Gender Disparity in Grants and Awards at the National Institute of Health. Cureus, 13(4), e14644. https://doi.org/10.7759/cureus.14644

Way, S. F., Larremore, D. B., & Clauset, A. (2016). Gender, Productivity, and Prestige in Computer Science Faculty Hiring Networks. *Proceedings of the 25th International Conference on World Wide Web*, 1169–1179. https://doi.org/10.1145/2872427.2883073

Witteman, H. O., Hendricks, M., Straus, S., & Tannenbaum, C. (2019). Are gender gaps due to evaluations of the applicant or the science? A natural experiment at a national funding agency. *The Lancet*, 393(10171), 531–540. https://doi.org/10.1016/S0140-6736(18)32611-4

Yip, P. S. F., Xiao, Y., Wong, C. L. H., & Au, T. K. F. (2020). Is there gender bias in research grant success in social sciences?: Hong Kong as a case study. Humanities and Social Sciences Communications, 7(1), 173. https://doi.org/10.1057/s41599-020-00656-y

Software Bibliography

Allaire, J. J., Xie, Y., McPherson, J., Luraschi, J., Ushey, K., Atkins, A., Wickham, H., Cheng, J., Chang, W., & Iannone, R. (2022). rmarkdown: Dynamic Documents for R. https://github.com/rstudio/rmarkdown

Arel-Bundock, V., (2023). Softbib: Software Bibliographies for r Projects. https://CRAN.R-project.org/package=softbib.

Arel-Bundock, V., & McCrain, J. (2023). Software Citations in Political Science. PS: Political Science & Politics, 1-4. https://doi.org/10.1017/S1049096523000239

Gagolewski, M. (2022). stringi: Fast and portable character string processing in R. *Journal of Statistical Software*, 103(2), 1–59. https://doi.org/10.18637/jss.v103.i02

Harrison, J. (2020). RSelenium: R Bindings for 'Selenium WebDriver'. https://CRAN.R-project.org/package=RSelenium.

Lander, J. P. (2022). coefplot: Plots Coefficients from Fitted Models. https://CRAN.R-project.org/package=coefplot

R Core Team. (2021). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing. https://www.R-project.org/

Rudis, B., Bolker, B., & Schulz, J. (2017). ggalt: Extra Coordinate Systems, 'Geoms', Statistical Transformations, Scales and Fonts for 'ggplot2'. https://CRAN.R-project.org/package=ggalt

Silge, J, & Robinson, J. (2016). Tidytext: Text Mining and Analysis Using Tidy Data Principles in R. *JOSS* 1 (3). https://doi.org/10.21105/joss.00037.

Slowikowski, K. (2021). ggrepel: Automatically Position Non-Overlapping Text Labels with 'ggplot2'. https://CRAN.R-project.org/package=ggrepel

Wickham, H. (2022a). stringr: Simple, Consistent Wrappers for Common String Operations. https://CRAN.R-project.org/package=stringr

Wickham, H. (2022b). Rvest: Easily Harvest (Scrape) Web Pages. https://CRAN.R-project.org/package=rvest.

Wickham, H. (2023). Httr: Tools for Working with URLs and HTTP. https://CRAN.R-project.org/package=httr.

Wickham, H., Averick, M., Bryan, J., Chang, W., McGowan, L. D., François, R., Grolemund, G., Hayes, A., Henry, L., Hester, J., Kuhn, M., Pedersen, T. L., Miller, E., Bache, S. M., Müller, K., Ooms, J., Robinson, D., Seidel, D. P., Spinu, V., … Yutani, H. (2019). Welcome to the tidyverse. *Journal of Open Source Software*, 4(43), 1686. https://doi.org/10.21105/joss.01686

Xie, Y. (2014). knitr: A Comprehensive Tool for Reproducible Research in R. In V. Stodden, F. Leisch, & R. D. Peng (Eds.), Implementing Reproducible Computational Research. Chapman and Hall/CRC. http://www.crcpress.com/product/isbn/9781466561595

Xie, Y. (2022). knitr: A General-Purpose Package for Dynamic Report Generation in R. https://yihui.org/knitr/