When Matthew met Matilda. Gender discrimination in Public Funding of Scientific Activity in Argentina.

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Abstract. Identifying gender discrimination in the allocations of public grants is a matter of key importance. The objective of this article is to explore the presence of gender bias in the allocation of public funds to support scientific activity by studying the Fund for Scientific and Technological Research (*FONCYT*) in Argentina.
In order to identifying gender discrimination in the allocations of grants, we test the presence of Matthew and Matilda effects. The former is related to the positive feedbacks between previous access to public funds and present possibilities of accessing. The latter, in turn, refers to lower level of probabilities of accessing and remaining for women. Research questions are about the existence and verification of Matthew and Matilda effects. The database consist of all the researchers that applied to *FONCYT* between 2003 and 2015, whether they were granted or not. Available information includes participation into the program together with their scientific production, academic achievements, and demographic information -such as date of birth, gender, place of residence, academic affiliation, years of experience, and other relevant data is considered. The period under analysis coincides with a period of significant expansion of the fund given by an increase in the level of financial resources. Additionally, the information related to academic productivity was validated with bibliometric information retrieved from SCOPUS database. Results provide evidence that confirms multiple forms of the Matilda effect, and verifies the Matthew one in the scientific research subsidy program. This seems to verify that female researchers suffer a strong disadvantage in the allocation of public funds to finance their research projects.

Keywords: PROBIT model, public funds, gender bias, matilda effect

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1 Introduction

The objective of this article is to explore the presence of gender bias in the allocation of public funds to support scientific activity. We study the Fund for Scientific and Technological Research (*FONCYT*) in Argentina, dedicated to grant non-reimbursable subsidies to scientific and technological projects that are considered of priority for national development[4]. Researchers from public or private non-profit organizations can apply to the fund by submitting a detailed project proposal once a year.

To identify gender discrimination in the allocations of grants we test the presence of Matthew and Matilda effects. The former is related to the positive feedbacks between previous access to public funds and present possibilities of accessing. The latter, in turn, refers to less level of probabilities of accessing and remaining for women[5]. Hence, research questions are about the existence and verification of Matthew and Matilda effects.

The empirical exercise is based on a database that integrates two primary sources of information: i) *FONCYT*'s administrative register with the population of researchers that applied to the fund, whether they were granted or not, and ii) the national online CV data system of Argentina (CVar). The result of the integration of these two databases is an unbalanced dynamic panel database at the level of researcher and year -5234 observations with an average 2 observation per case-, that includes information of the researcher' participation into the program together with their scientific production, academic achievements, and demographic information -such as date of birth, gender, place of residence, academic affiliation, years of experience, and other relevant data. The period under analysis is 2003-2015, which coincides with a period of significant expansion of the fund given by an increase in the level of financial resources. Additionally, the information related to academic productivity was validated with bibliometric information retrieved from SCOPUS database[6].

Results provide evidence that confirms multiple forms of the Matilda effect, and verifies the Matthew one in the scientific research subsidy program. Firstly, we found that female researchers have 2.6 percentage points lower probability of being selected for the first time than males (Matilda effect). Considering that the unconditional probability of receive a subsidy for the first time is 35%, this negative female marginal effect represents 7%. Secondly, we found that women's probability of being a supported researcher is on average 8 percentage points lower than men's probability, regardless the number of times she or he was selected (another type of Matilda effect). Regarding the persistence rate within

[4]It is important to notice that, in contrast to typical subsidy programs in developed countries, *FONCYT*'s funds cannot be used to pay researcher's salaries.

[5]Even though binary gender determination is a hegemonic social construction which must be destructed, this discussion is beyond the objective of the present work (see Hernando Gonzalo, 2007[8] for a deeper discussion).

[6]We are still working on the integration of information, then results presented in this paper are preliminary and based on a sample from the population with information available from the different sources.

FONCYT, past accessing to the program increases the probability of accessing in the present for the whole sample (Matthew effect). However, state dependence is more intense among male than among women researchers (+5.5 p.p. versus +2.5 p.p.) (a third type of Matilda effect). From an aggregated view, these results seem to point that female researchers suffer a strong disadvantage in the allocation of public funds to finance their research projects. Additionally, results would show that although *FONCYT* seems a gender unbiased fund given the equal participation of women and men in each call, a deeper look at the determinants and evolution of applications reveals the presence of gender discrimination against women, partially explained by the different sources of gender bias in the academic career (D'Onofrio & Tignino, 2018[5]).

The rest of this paper is organized as follows. After this introduction, the theoretical framework is presented in section 2. Data and methodology are described in section 3, presentation and discussion of results, in section 4. Finally, some conclusions are provided in section 5.

2 Theoretical framework

Studies framed on evaluation of funds for scientific and technological research are mostly focused on their effects on beneficiaries' quality and/or productivity (e.g., Benavente, Crespi, Figal Garone, & Maffioli, 2012[1]; Chudnovsky, López, Rossi, & Ubfal, 2008[3]; Godin, 2003[6]; Inglesi-Lotz & Pouris, 2011[9], among others). Nevertheless, a less explored effect refers to recurrence in accessing to public funds, known as Matthew effect in the literature. The origin of this concept is Merton's (1968)[14] work, and highlights three sources of recurrence: reputation, capabilities and "halo effect". Reputation source refers to the selection of the "best" candidates due to their prominent prestige. Policy makers select them because a priori assume these researchers will arise better results, then avoiding fail in the process of fund allocation. Capability source refers to knowledge processes and capabilities accumulation which beneficiary researchers go through when they develop research projects. Hence, they are able to present prominent projects in terms of design and quality. Lastly, "halo effect" is a less explored – and potentially more perverse – source and refers to the appropriation of works of highlighted researchers that scarcely participate in the project, and even did not participate at all. This source is most likely to be verified in gender analyses.

In this line, and to honor the feminist defender Matilda Joslyn Gage, Rossiter (1993)[17] defines the existence of the Matilda effect. This effect refers to the systematically less recognition of women in the scientific community. Less relative recognition is induced by a set of macro-social believes which relate female gender, which include the assumption of some sort of lack of "special" capabilities to occupy higher hierarchical positions, such as team and project direction (Linková, 2017)[12]. As a result, women are less likely to ascend in the career, which in academy is manifested by lower rates of women project directions. This is related to another key concept within gender studies known as glass ceiling. It names the socially accepted consensus about implicit limits to women profession success

(Cislak, Formanowicz, & Saguy, 2018)[4]. Of course, women's maternity and their higher levels of relative dedication to (unpaid) house work, given the social division of labor, also play a key role in women performance in science (Sotudeh & Khoshian, 2014)[18].

Both Matthew and Matilda effects have been verified in previous studies, but methodologies do not allow the generalization and extrapolation of results beyond the studied cases. For instance, a higher level of male authors in neuroscience is verified (González-Álvarez & Cervera-Crespo, 2017)[7]. Similarly, abstracts done by men or about male subjects in communication sciences are highly scored (Knobloch-Westerwick, Glynn, & Huge, 2013)[10], and to be awarded due to their academic work (Lincoln, Pincus, Koster, & Leboy, 2012)[11].

Considering the above, we postulate two research questions about the allocation of public funds for research projects, with a gender perspective:

- **RQ1**: Are women less likely to obtain research grants for the first time? This question aims at testing whether women face more difficulties in "participating" in the funding system as compared to their male counterparts.
- **RQ2**: Are women less likely to recurrently be benefited with research grants? This question aims at testing whether women face more difficulties in "repeatedly participate" in the funding system compared to their male counterparts (i.e. less likely to be benefited again with new research grants).

3 Data and methodology

To address these research questions, we built a database integrating two primary sources of information: i) *FONCYT*'s administrative register, with the population of researchers that applied to the fund, whether they were granted or not, and ii) the national online CV data system of Argentina (*CVar*), with information about the scientific career of researchers. The result of the integration of these two registers is an unbalanced dynamic panel database at the level of researcher and year, that includes information of the researcher' participation in the program together with their scientific production, academic achievements, and demographic information -such as date of birth, gender, place of residence, academic affiliation, years of experience, and other relevant data. Additionally, the information related to academic productivity was validated with an external source of information of bibliometric information such as SCOPUS database. The final database is compound by 5042 observations, with an average of 2 observation per research, for the period 2003-2015 (see a detailed explanation and treatment of each variable in Table 1.

To answer the first research question -the presence of gender bias in the probability of being granted with research public funds for the first time-, the basic setup is a discrete-choice model like that used by McDowell, Singell, Ziliak, & Ziliak (2001)[13] to model gender bias in promotion within the economics profession. Under this model, we assume an aggregate measure of productivity (P_{ijt}) for researcher i working on the j-fields during year t, that depends linearly on

Table 1: Summary of the main variables

Variables	Description	Values
Researcher Characteristics		
Academic Achievement$_{it}$	Classification of researcher within the National Fund for Teacher's Incentive.	1(high) to 5 (low)
Female$_{i}$	Binary variable that indicates if the researcher that request for a public support is a female.	1 if researcher that request for a public subsidy is a woman, and 0 otherwise
Age$_{it}$	Researcher's age.	1 to ∞
Solicitation Variables		
FONCYT Presented$_{it}$	Amount of research project presented	0 to ∞
FONCYT Type$_{it}$	Set of binary variables that indicates the category of *FONCYT*	0: Young Researcher / 1: Newly Research Group / 2: Consolidated Research Group
Longitudinal-averaged research's structural characteristics		
Academic Achievement$_{it}$	Average of researcher' classification	0 to ∞
Age$_{it}$	Average of researcher's age	0 to ∞
Time, Institutional and Regional Fixed Effects		
Region$_{it}$	Set of binary variables that indicates geographical location of researchers.	1: north-west / 2: north-east / 3: centre / 4: south
Institution$_{it}$	Set of binary variables that indicates the institution of researchers	1: University / 2: National Scientific and Technical Research Council (CONICET) / 3: Research Center linked to CONICET
Year$_{t}$	Set of binary variables that indicates time-fixed effects.	2003-2015
Adjudication Variables		
FONCYT t-1$_{it}$	Lag of innovation subsidy in t. Annual estimation.	1 if research receipt a public support in t; 0 otherwise
FONCYT t=1$_{it}$	Innovation subsidy at the initial period. Annual estimation.	1 if research receipt a public support in initial period; 0 otherwise

a vector of attributes (X_{ijt}): $P_{ijt} = X_{ijt}\beta + \varepsilon_{ijt}$ where ε_{ijt} measures unobserved individual productivity. Each area (j) evaluation committee has a threshold productivity level in mind, and potentially it could apply different threshold for different researchers and moments in time (P_{ijt}), which represents the minimum necessary productivity to achieve promotion. This threshold is a function of the field and individuals (Z_{ijt}) and measurement errors in assessing productivity (ν_{it}): $P_{jt} = Z_{ijt}\gamma + \nu_{it}$ An individual is selected into the scientific research subsidy program if the productivity level exceeds the required threshold: $X_{ijt}\beta + \varepsilon_{ijt} > Z_{ijt}\gamma + \nu_{it}$. According to that, gender differences can be modeled by including a gender dummy variable in Z_{it}. If ε_{ijt} and ν_{it} are normally distributed we can use a *PROBIT* model to estimate the probability of being a supported researcher by the very first time: $P(y_{ijt} = 1|Z_{ijt}) = Z_{i,j,t}\beta + \alpha_i + u_{ijt}$ where unobserved researchers heterogeneity is characterized by a fixed specific component (α_i) and a white noise error component (u_{ijt}). This last error term is uncorrelated to both the fixed-in-time component and the set of explanatory variables included in Z_{ijt}.

To allow for correlation between α_i and Z_{ijt} we follow the proposition of Mundlak (1978)[15] and Chamberlain (1984)[2]:$\alpha_i = \xi' Z'_i + u_i$ where u_i is assumed independent from Z_{ijt} and $u_{i,t}$ for all the researchers and time periods. We define Z'_i as the longitudinal average of researcher structural characteristics. The assumption is that differences in longitudinal averaged characteristics are informative about the underlying researcher-specific characteristics, so that the individual differences that are left (u_i) may be more plausibly supposed to be independent of observed characteristics. Formally, we propose the estimation of the following equation:

$$P(y_{ijt} = 1|Z_{ijt}) = Z_{i,j,t}\beta + \alpha_i + \xi' Z'_i + u_i + u_{ijt} \tag{1}$$

This model can be used to estimate the determinants of entry into the scientific research subsidy program. An indication of gender bias is that, after controlling for all other relevant covariates, women have lower probabilities of being a supported researcher.

To answer the second research question -the presence of gender bias in the probability of recurrently accessing the fund - we use a model of annual probabilities of entering to and exiting from the program (also known as transition probability models). Formally, we suggest an extension of equation (1) that consists of the inclusion of the lagged specification of the dependent variable ($y_{i,t-1}$): $P(y_{ijt} = 1|X_{i,t}, y_{i,t-1}) = \lambda y_{ijt-1} + \beta Z_{ijt} + \alpha_0 + \xi' Z'_i + u_i + u_{i,t}$.

This model can be used to estimate the determinants of entry into the scientific research subsidy program (Pereira & Suárez, 2017)[16]. The presence of the lagged outcome variable allows testing the hypothesis of true state dependence. The larger the value of λ, the greater the degree of state dependence in benefit receipt probabilities. To test gender bias in the probability of being recurrent into the scientific research program we include an interaction term between the gender dummy and the lagged outcome variable. Finally, if being beneficiary in the initial year $y_{i,1}$ is correlated with the time-invariant individual-specific effect

u_i, a correlation is induced between the error term and the lagged dependent variable, leading to a bias in the parameter estimates. To avoid this problem, we employed the conditional maximum likelihood estimator proposed by Wooldridge (2005)[19] that consist of modelling the distribution of the binary receipt from $t = 2, 3, \cdots, T_i$ and conditioning on a set of explanatory variables and the binary receipt indicator for the initial year. Formally, the dynamic equation becomes:

$$P(y_{i,t} = 1|X_{i,t}, y_{i,t-1}) = \lambda y_{i,t-1} + \beta X_{i,t} + \alpha_0 + \alpha_1 y_{i,1} + \xi' Z_i' + u_i + u_{i,t} \quad (2)$$

$t = 2, 3, \cdots, T_i$

4 Results

As we mentioned before, Mathilda effects refers to the gender discrimination against female researchers in the allocation of public funds to support scientific activity. There are two manifestations of Mathilda effect that can be analyzed jointly or separately: entry into the *FONCYT* and remaining within the *FONCYT*.

Firstly, we studied the presence of gender bias in the probability of being supported for the first time. Table2 is based on equation (1) and reports estimates using three different *PROBIT* models to check the robustness of results: i) a pooled model, ii) a panel random effects model, and finally iii) a Mundlak-Chamberlain approach for random effects model. All the regressions include the same set of covariates: demographic indicators, academic achievements, academic productivity and year, regional and institutional fixed effect. Explanatory variables are defined so that the reference categories characterize the situation of a male researcher that request a public subsidy for his scientific project. Looking at table 3 as a whole, compared to men researchers, the average female access to scientific public support is negative and statistically significant. This verifies the robustness of the empirical strategy. In terms of the marginal effect, the estimates for the female dummy lies in the range between -0.048 and -0.026 showing the overestimation of the first and second model. According to the results presented in the third column, on average -and controlling for researcher's heterogeneity- female researchers have 2.6 percentage points lower probabilities of being supported for the first time than male researchers.

To properly interpret these marginal effects, we should consider the unconditional probability of being accepted for the first time into *FONCYT* (see Table 3) . This probability is 35 percent. Hence, the female marginal effects estimated represents -14%, -11 and -7% according to the model considered. Therefore, results estimated in table 2 and table 3 confirm gender discrimination in the probability of receive a subsidy to finance research projects for the first time, but its magnitude is not relevant compared to the unconditional probability. Thus, the answer to our first research question is that there is gender discrimination in accessing the system of public funds for scientific research, although it is reduced in terms of the actual probability of accessing.

Secondly, we analyzed both the probability of entry and the probability of persistence within *FONCYT*. That is, we studied gender bias in the allocation of

	Pooled *PROBIT*	Panel *PROBIT*	
		RE	(Chamberlain-Mundlak) RE
Female	-0.040**	-0.040**	-0.026*
	(0.010)	(0.012)	(0.011)
Observations	5,234	5,234	5,234
No. Researchers		3042	3042
Year FE	YES	YES	YES
Regional FE	YES	YES	YES
Institutional FE	YES	YES	YES
Time-averaged characteristics	NO	NO	YES

Note: i) The binary dependent variable takes value 1 if the researcher requested and received a subsidy for her/his scientific project; ii) All the regressions include the same set of covariates: demographic indicators, academic achievements year, regional and institutional fixed effect; iii) Standard errors in parentheses; iv) ***statistically significant at 1%, ** at 5%, *s at 10%.

Table 2: Gender bias in *FONCYT* participation: probability of being supported for the first time.

	Pooled *PROBIT*	Panel *PROBIT*	
		RE	(Chamberlain-Mundlak) RE
Female (A)	-0.048**	-0.040**	-0.026*
	(0.010)	(0.012)	(0.011)
Unconditional probability (B)	35,50%	35,50%	35,50%
(A) / (B)	-14%	-11%	-7%
Observations	5,234	5,234	5,234
No. Researchers		3042	3042

Note: i) The binary dependent variable takes value 1 if the researcher request and receive a subsidy for her/his scientific project; ii) All the regressions include the same set of covariates: demographic indicators, academic achievements, year, regional and institutional dummies; iii) Standard errors in parentheses; iv) ***statistically significant at 1%, ** at 5%, * at 10%. Source: own elaboration.

Table 3: Gender bias in *FONCYT* participation: unconditional probability and female marginal effect.

subsidies to scientific activity in a broader sense. Table 4 is based on equation 2 and explanatory variables are defined so that the reference categories characterize the situation of a male researcher. The set of covariates is the same we used in equation 1 but we incorporated a binary receipt indicator for the initial year l. First row of table 4 shows the probability gap between female and male researchers. According to it, women have 8.7 percentage points lower probabilities of being supported than men. It is worth nothing that the difference with the estimated results reported in table 2 is that in this case we included all the adjudications and not just the first one. The second row of the table shows the estimate ofλ , the degree of state dependence. Considering the whole sample, state dependence in public support to scientific activities is positive and statistically significant. Therefore, the Matthew effect is verified. Then, results show that the degree of state dependence within female researchers is lower than the one that shows their male counterparts. That is, past accessing to *FONCYT* increase the probability of accessing in the present in +3.4 p.p. within women but climbs up to +6.2 p.p. within man. Looking table 4 as a whole, the lower probability of both accessing and remaining for female researchers within *FONCYT* show the presence of gender discrimination. This way, the answer to our second research question is that evidence seems to confirm the presence of Mathilda Effect in both accessing and remaining into the funding program to scientific activity. In other words, women have lower probabilities than men of being beneficiary of public funds for research, and once they were granted, they even have lower probabilities than men of accessing again, even when women and men have similar scientific trajectories and demographic characteristics.

Receive a *FONCYT* at t	Dynamic RE *PROBIT*		
	All Sample	Males	Females
Female	-0.087**		
	(0.017)		
Received *FONCYT* at t-1	0.052**	0.062*	0.034*
	(0.019)	(0.027)	(0.017)
Observations	4,404	2,109	2,295
No. Researchers	2269	1089	1180
Year FE	YES	YES	YES
Regional FE	YES	YES	YES
Institutional FE	YES	YES	YES
Time-averaged characteristics	YES	YES	YES

Note: i) The binary dependent variable takes value 1 if the researcher request and receive a subsidy for her/his scientific project; ii) All the regressions include the same set of covariates: demographic indicators, academic achievements, year, regional and institutional dummies; iii) Standard errors in parentheses; iv) ***statistically significant at 1%, ** at 5%, * at 10%. Source: own elaboration.

Table 4: Gender bias in *FONCYT* participation: unconditional probability and female marginal effect.

5 Conclusion

The purpose of this paper was to analyze gender discrimination in the process of allocation of public funds for scientific activity, in order to test the presence of Matthew and Mathilda effects. The former is related to the positive feedbacks between previous and present accesses to public funds. The latter refers to the lower level of probabilities of accessing and remaining for women. We constructed a novel database that stem from the integration of the national CV data system of Argentina and the administrative register of the Fund for the Scientific and Technological Research (*FONCYT*). We design a methodological strategy that consisted on the estimation of a panel random effect *PROBIT* model where the none-correlation assumption was relaxed, and the estimation of a dynamic random effect *PROBIT* model where unobservable characteristics and initial conditions were controlled.

Estimated results confirm the presence of Matilda effects in the scientific research subsidy program. Firstly, we analyzed the probability of entry for the first time to *FONCYT*. We found that female researchers showed 2.6 percentage points lower probabilities of being supported than male researchers. Secondly, we studied both the probability of accessing and remaining within *FONCYT*. We found that women's probability of being selected was around 9 percentage points lower than men's one. Finally, despite that past accessing to the program increases the probability of accessing in the present, the degree of state dependence is considerably lower among female than male researchers ($+5.5$ p.p. versus $+2.5$ p.p.). From an aggregated point of view, results seem to point that female researchers suffer strong disadvantages in the allocation of public funds to finance their research projects.

Bibliography

1. Benavente, J. M., Crespi, G., Figal Garone, L., & Maffioli, A. (2012). The impact of national research funds: A regression discontinuity approach to the Chilean FONDECYT. Research Policy, 41(8), 1461–1475. https://doi.org/10.1016/j.respol.2012.04.007
2. Chamberlain, G. (1984). Panel Data. En Z. Griliches & M. D. Intriligator (Eds.), Handbook of Econometrics (Vol. 2, pp. 1247–1318). Amsterdam: North Holland.
3. Chudnovsky, D., López, A., Rossi, M. A., & Ubfal, D. (2008). Money for science? the impact of research grants on academic output. Fiscal Studies, 29(1), 75–87. https://doi.org/10.1111/j.1475-5890.2008.00069.x
4. Cislak, A., Formanowicz, M., & Saguy, T. (2018). Bias against research on gender bias. Scientometrics, 115(1),189\T1\textendash200.https://doi.org/10.1007/s11192-018-2667-0
5. D'Onofrio, M. G., & Tignino, M. V. (2018). Indicadores diagnósticos sobre la situación de las mujeres en ciencia y tecnología en Argentina y Banco de acciones en género y ciencia. Taller Mujeres en ciencia y tecnología: hacia una participación con equidad, Ministerio de Educación, Cultura, Ciencia y Tecnología (MECCYT); Ciudad Autónoma de Buenos Aires. https://www.argentina.gob.ar/sites/default/files/presentacion_diagnostico_mujere.
6. Godin, B. (2003). The impact of research grants on the productivity and quality of scientific research. Ottawa: INRS Working Paper, 2003.
7. González-Álvarez, J., & Cervera-Crespo, T. (2017). Research production in high-impact journals of contemporary neuroscience: A gender analysis. Journal of Informetrics, 11(1), 232–243. https://doi.org/10.1016/j.joi.2016.12.007
8. Hernando Gonzalo, A. (2007). Sexo, Género y Poder. Breve reflexión sobre algunos conceptos manejados en la Arqueología del Género. Complutum, 18(18), 167–173.
9. Inglesi-Lotz, R., & Pouris, A. (2011). Scientometric impact assessment of a research policy instrument: The case of rating researchers on scientific outputs in South Africa. Scientometrics, 88(3), 747–760. https://doi.org/10.1007/s11192-011-0440-8
10. Knobloch-Westerwick, S., Glynn, C. J., & Huge, M. (2013). The Matilda Effect in Science Communication: An Experiment on Gender Bias in Publication Quality Perceptions and Collaboration Interest. Science Communication, 35(5), 603–625. https://doi.org/10.1177/1075547012472684
11. Lincoln, A. E., Pincus, S., Koster, J. B., & Leboy, P. S. (2012). The Matilda Effect in science: Awards and prizes in the US, 1990s and 2000s. Social Studies of Science, 42(2), 307–320. https://doi.org/10.1177/0306312711435830
12. Linková, M. (2017). Academic Excellence and Gender Bias in the Practices and Perceptions of Scientists in Leadership and Decision-making Positions

Marcela Linková. Gender and Research, 18(1), 42–66. https://doi.org/10.13060/25706578.2017.18.1.349
13. McDowell, J. M., Singell, L. D., Ziliak, J. P., & Ziliak, J. P. (2001). Gender and Promotion in the Economics Profession. Industrial and Labor Relations Review, 54(2), 224. https://doi.org/10.2307/2696008
14. Merton, R. K. (1968). The Matthew effect in science: The reward and communication systems of science are considered. Science, 159(3810), 56–63.
15. Mundlak, Y. (1978). On the pooling of time series and cross section data. Econometrica, 46, 69–85.
16. Pereira, M., & Suárez, D. (2017). Matthew effect, capabilities and innovation policy: the Argentinean case. Economics of Innovation and New Technology, 27(1), 62–79. https://doi.org/10.1080/10438599.2017.1294544
17. Rossiter, M. W. (1993). The Matthew Matilda effect in science. Social studies of science, 23(2), 325–341.
18. Sotudeh, H., & Khoshian, N. (2014). Gender differences in science: The case of scientific productivity in Nano Science & Technology during 2005-2007. Scientometrics, 98(1), 457–472. https://doi.org/10.1007/s11192-013-1031-7
19. Wooldridge, J. M. (2005). Simple solutions to the initial conditions problem in dynamic, nonlinear panel data models with unobserved heterogeneity. Journal of Applied Econometrics, 20(1), 39–54. Recovered from http://ideas.repec.org/a/jae/japmet/v20y2005i1p39-54.html