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ABSTRACT

Women are substantially under-represented in the field of economics all around the world: their progress is slow and just few women reach top positions. From the 1980s, studies document the clear barriers and implicit biases in publishing, promotion, and tenure that women face to enter and to success in the field. The paper aims at contributing to this strand of literature proposing an analysis of gender differences in economics focusing on "excellence" in the profession and in the way the discipline is conceiving and reproducing it in rankings. Using RePEc as a dataset, I test how different definitions of excellence can systematically advantage or disadvantage women's visibility in rankings of top economists and how it impacts on their probability to receive rightful recognition in academia. I found that, even among top economists, being a woman significantly reduces the probability of reaching the top of the profession by almost 15 pp. The results also underline a problematic relationship between gender and excellence that sets the bar higher for women in reaching the top of the academic career. Women economists, despite their efforts to increase their visibility, tend to receive less recognition than men in terms of promotion to full-professorship based on the criterion of excellence in which they excel. In fact, women are penalised in their academic progresses, not only for their lower productivity in terms of number of published articles than their male colleagues but also for lower returns in promotions for their high performance in terms of citations received. Challenging the assumption about gender neutral excellence is a first important step to challenge power hierarchical patriarchal structures in the economics profession and to advance the representation of women and diverse individuals in apical roles in economics.

1. Introduction

The awarding of the 2019 Prize in Economic Sciences in Memory of Alfred Nobel to the second woman and youngest-ever recipient, Esther Duflo, increased attention from the media, as well as from the public and private sectors, to the lack of diversity in the economics profession. Apart from obvious criticisms and ethical issues related to the methodology used by Duflo (randomised control trials),[1] consider Duflo's own words, in a press conference in Stockholm, following the announcement of the Prize: 'Showing that it is possible for a woman to succeed and be recognised for success I hope it is going to inspire many, many other women to continue working and many other men to give them the respect that they deserve like every single human being.'

It is clear from Duflo's words that recognition of success for women in the economics profession, which is heavily male dominated, is still the exception and not the rule. For instance, Gottfried Haberler wrote to Kahn in 1933: 'Who is Joan Robinson who wrote [in the *Economic Journal*]? The Christian name sounds like a woman's but the article seems to me much too clever for a woman. ...' (Harcourt and Kerr 2009, p. 8). Some eighty-seven years later, women economists are still considered not "clever" enough or excellent enough to be included in the recent debate on recovery measures

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[1] For a complete analysis of randomised control trials (RCTs) in the field of development, see Kvangraven (2020); Kabeer (2019); Deaton and Cartwright (2018); and the open letter on The Guardian Online signed by fifteen leading economists (https://www.theguardian.com/global-development/2018/jul/16/buzzwords-crazes-broken-aid-system-poverty).

in the post COVID-19 pandemic, where their voices have been largely absent from the media coverage and neglected in the national taskforces charged with the social and economic reconstruction (see for example the petition "Dateci Voce" in Italy that demanded women voices in COVID-19 fight https://www.bbc.com/news/world-europe-52588862).

Systematic underestimation and minimization of women's qualifications, known as the Matilda effect (Rossiter 1993) in the economics profession is often explained in relation to women's choices in terms of sub-field specialization or women's less competitive attitudes and behaviors (Kesebir *et al.* 2019). However, a consistent strand of literature has documented that women experience a higher risk of sexual harassment in workplaces (Allgood *et al.* 2019), biased recruitment and promotion practices (van den Brink and Benschop 2012; Corsi *et al.* 2018; Chavance and Labrousse 2018; Glötzl and Aigner 2018) and higher negative effects on their scientific productivity from traditional gender social roles that place a heavier burden on them of both for care work within households and families (Minello 2020) and care services for the "academic family" (i.e. non-research related duties how highlighted by Guarino and Borden 2017). Studies have also begun to adopt an intersectional approach to understand the heterogeneity of women's experiences in academia, exploring how multiple social identities, including ethnicity (Mayuzumi 2015; Mirza 2006), sexuality, (Boustani and Taylor 2020) class, minority approaches to the discipline and political identity, such as being openly feminist (Sang 2018), interact and intersect with discrimination in their careers. In fact, the (re)production of a false gender binary could lead to the misguided conclusion that all women economists have equal opportunities to succeed in the profession. It is therefore important to analyse women at the top of the economics profession, to identify whether there are biases in the way the discipline is conceiving excellence. I therefore focus on demand-side explanations to gender inequalities, to give a first insight on how current practices of identification of excellence may keep women or, better, some women out of the top of the economics profession.

This paper contributes to the literature about women in the economics profession by highlighting the gendered and socially-constructed nature of excellence and the gender specific returns in terms of academic careers of being included in rankings of top economists. This has important implications for institutions, universities and individuals, in particular those interested in challenging power hierarchical structures in academia and advancing the representation of women and diverse individuals in apical roles in economics. In fact, an unquestioning focus on apparently gender-neutral criteria (such as merit and excellence) leads many women and minorities to interpret their activities and their selves as lacking in merit (Baker and Brewis, 2020) or worse, to accept and promote mainstream definitions of excellence (Carter *et al.* 2010; Forget 2011; Zacchia 2017) with an overall reduction of pluralism in the profession. Psychological and sociological literature has underlined how the discourse of excellence is a tool used (consciously or unconsciously) to support hierarchies, practices and norms that in turn underpin a hegemonic system (Sliwa and Johansson 2014).

Using data drawn from RePEc (Research Papers in Economics),[2] I analyse the specific profiles, in terms of educational background, affiliation and research activities, of women and men who are listed in the rankings of top economists according to different definitions of academic excellence. Firstly, I test if among the top 10% of economists reported in RePEc certain metrics of professional excellence systematically disadvantage or advantage women. Secondly, for a homogeneous sample of top economists, I analyse if the returns to high performance on those rankings in terms of promotion to full professorship differ for men and women. Finally, I study how the academic productivity of top economists in RePEc has changed across decades (from the 1980s to the current days) to identify patterns of convergence of top women economists.

The paper proceeds as follows. Section 1 describes the data used and the rationale behind the analyses. Section 2 presents the different ranking methods available in RePEc, to identify the variables and methodologies that tend to systematically advantage or disadvantage women's visibility in rankings of excellence. Section 3 describes, by means of multivariate probit regressions, the returns to performance of different excellence rankings in terms of the probability of successfully achieving academic excellence (full professorship). Session 4 compares the evolution of academic publications among top economists.

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[2] Please see: http://repec.org/

I conclude with a discussion about the main results of the empirical analysis and its implication for the development of the discipline, identifying open questions for future research, also in the wake of the post COVID-19 pandemic.

2. Background and data

Women's under-representation in top positions in universities across the globe, and especially in the most powerful or influential places, is well established. While the problem concerns mainly the STEM fields, economics, as a social science, is considered an "outlier" and not in a good way (Ceci *et al.* 2014;[3] Fourcade *et al.* 2015; Bayer and Rouse 2016; Wu 2018). Focusing on the economics profession, the current literature describes structural and organizational barriers which might impede women's climb in their careers (Lundberg 2020; Costantini and Zacchia 2019; Allgood *et al.* 2019; Vettese 2019; Hospido and Sanz 2019). Lundberg and Stearns (2019), focusing on the US, identified two main mechanisms through which the barriers against women in economics may operate: differences in productivity (quantity and quality of publications) between men and women, and differences in how they are evaluated. The latter is identified as the main factor explaining female disadvantage in economics since 'women are held to higher standards than men of equal ability, and need to publish more, higher-quality work to achieve equal levels of success in this profession' (Lundberg and Stearns 2019, p. 20).

To compensate for this adverse climate for women in the profession, many initiatives and programs[4] have been recently created to attract more women to economics, mainly by celebrating the contributions of top women researchers who have been excellent and influential in their areas of expertise, as a way to inspire future generations. While it is important to celebrate excellent women economists, it is crucial to understand why so few women are ranked in top economists' lists and who are those women who have being included in these rankings. Women in fact are highly underrepresented among those commonly considered top economists, even if different measures of excellence are used. For example, considering the publication of articles in the "top five" journals (T5)[5] women represent: 'only 11 percent of all authors published since 1990, 12 percent since 2000 and 14 percent since 2010. Between 1986 and 2015, there has been zero growth in the number of exclusively female-authored papers; almost no growth in the number of majority female-authored papers; and no meaningful change in the number of mixed-gendered papers with a senior female co-author. The only tepid growth that has occurred, is largely—if not entirely—due to an increase in the number of articles by senior men co-authoring with a weak minority of junior women' (Hengel and Moon 2019, p.5).

Not only is the visibility of women in T5 publications low but also the gate-keeping power of these publications in positively influencing the tenure decisions is lower for women, since: 'there are differences in rates of tenure by gender, although they are not precisely determined due to our small sample size for women. For men, two T5s is more than enough to get a 50% or higher probability of attaining tenure in the first spell. It takes three for a woman' (Heckman and Moktan 2018, pp. 6 and 7).

If aggregated rankings of individuals are considered, the visibility of women is even lower than in the T5. For example, the Global Highly Cited Researchers list in 2019 considered only 10 women (among whom is the Noble prize winner Esther Duflo) of a total of 113 economists identified by the Web of Science Group as having exceptional performanc.[6] 8.9% is the share of women economists (223 of a total of 2,506) in the list of the most-cited authors based on Scopus data[7] standardized for career years and corrected for self-citations. If RePEc is used, the share of women among the top

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[3] Ceci *et al.* (2014) in their extensive analysis of gender gaps in US academic careers in math-intensive and non-math intensive fields firstly used the word "outlier" to describe the situation of economics in the sense that it was the only academic field with "a persistent sex gap in promotion that cannot be readily explained by productivity differences" (Ceci *et al.* 2014, p. 116).

[4] For example, the Women in Economics Project by CEPR and UBS (for details see https://www.ubs.com/global/en/our-firm/women-in-economics.html).

[5] The "top-five" economics journal are the American Economic Review (AER), Econometrica (ECA), the Journal of Political Economy (JPE), The Quarterly Journal of Economics (QJE) and The Review of Economic Studies (REStud).

[6] The list focuses on contemporary research achievement: only highly cited papers in journals indexed in the Web of Science Core Collection during the period 2008-2018 were surveyed.

[7] A composite indicator for each author is computed considering six citation metrics (total citations; Hirsch h-index; coauthorship-adjusted Schreiber hm-index; number of citations to papers as single author; number of citations to papers as single or first author; and number of citations to papers as single, first, or last author). For details see: https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3000384

10% authors list is even lower, accounting for only 7.6%: 215 women among 2,839 top economists.[8] Although the RePEc network considers its rankings as 'experimental' (Zimmermann 2013), they provide a comprehensive overview of the competitive environment in economics. The RePEc ranking of individuals is, in fact, used more and more for evaluation purposes (promotion and tenure decisions) and even hiring. According to Meyer and Wohlrabe (2018): 'The relevance of an author's position in the RePEc ranking (…) plays a crucial role in job-market decisions. The number and quality of publications is a key determinant of who wins in the race for tenure and promotion. Moreover, an author ranking can also be a crucial determinant for evaluating the quality of potential co-authors' (Meyer and Wohlrabe 2018, p. 223). RePEc's rankings have also been used for the selection of members of national assessment committees, for example in Italy (Baccini 2012).

Therefore, I decided to concentrate on RePEc rankings of top authors because it can be considered one of the largest bibliometric databases in the field of economics and it has the advantage of being a database fed directly by authors, with a good representation of all the countries of the world. RePEc is based on the 'active participation principle', where authors, institutions and publishers must register and provide information to the network. Currently, it contains almost 2.8 million works authored by more than 55,000 authors from 101 countries. RePEc also collects a considerable amount of data regarding publications, authors (in terms of current affiliation, and in a few cases educational background),[9] citations, and even social engagement such as visibility on social media, particularly Twitter. Furthermore RePEc, being open source, has the advantage of providing for free a series of measures to compose alternative rankings of researchers that can be used to investigate gender gaps in ranking positioning using different definitions of excellence, ranging from the simple count of publications to citations and centrality in networks of authors. Moreover, different combination of weights for measures of excellence are available such as the simple,[10] discounted[11] or recursive[12] impact factors. Finally, the rankings of authors in RePEc consider all types of publications, including working papers, chapters, and books, which are typically neglected by other rankings (such, as for example, the Global Highly Cited Researchers described above).

Of course, RePEc has its limits. Since it is based on the "active participation principle", there could be omissions due to the fact that only journals and working paper series that are listed in RePEc and only authors that registered themselves are considered. Moreover, the publications need to be maintained and new items have to be added, and it is up to the publishers and authors to do this work. In this sense women's underrepresentation could also be partially due to their lower levels of self-promotion on RePEc, but it is worth remembering that almost 15,000 authors are women,[13] a high number compared to other datasets such as Econlit that, as computed by Card *et al.* (2020), collects publications by only 3,352 women authors.

For the analyses in the next two sections, I use the rankings of top 10% of authors (with references to their publications in all years) that are updated and published monthly.[14]

I began by collecting data for each author listed in RePEc's top 10% authors list (2,839 authors in total), her/his position in the 36 alternative rankings available based on different dimensions and weights. Then I compared the distribution of men and women according to the 36 different rankings, in order to define how different definitions and measures of excellence affect the gender gap in positioning in ranking of top 10% authors. Since most of the rankings of individuals are based on the number of citations received in academic publications, I test also if rankings based on citations tends to penalise or not women. In fact, in the literature on the evidence for the existence of a gender gap in citations is mixed

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[8] From a gender perspective, even if RePEc should be, by nature, an inclusive dataset, women represent only 25% of all authors registered.

[9] RePEc Genealogy is now implementing information to document, within the field of economics, who was a student of whom, when and where. More information is available at: https://genealogy.repec.org/

[10] The simple impact factor is calculated dividing the number of citations to items in a series of working paper or journal by the number of items in the series of working paper or journal.

[11] The discounted impact factor accounts for the year of publication of the citing paper, highlighting the publication that are more recently well-cited.

[12] The recursive impact factor is computed in the same way as the simple impact factors but weighing each citation by the impact factor of the citing items.

[13] Since 2006, RePEc also provides data about "Female representation in Economics". The identification of the sex of an author is inferred from her/his first and middle names; gender attribution contemplates that, if there is more than 90% confidence that the gender is correct using a name data bank, it is attributed. Ambiguous and unrecognized names are then manually entered "exception tables" for case-by-case attributions; such names accounted for only about 0.4%.

[14] I retrieved data on August 2019.

and controversial. For example, Larivière *et al.* (2013) find that articles with women in dominant author positions receive fewer citations than those with men in the same positions, due to the fact that: 'women's publication portfolios are more domestic than their male colleagues' (Larivière *et al.* 2013, p. 212). Instead, Bransch and Kvasnicka (2017) and Hamermesh (2018) find no significant differences in citations between men and women in economics. In contrast, Hengel (2019), controlling for "superstar" and Nobel prize effects, finds that the gender citation gap reversed because female-authored papers are cited from six to nine times more than papers by men who are equally prominent. Also, Grossbard *et al.* (2018), concentrating their analysis on demographic economics journals, find that female-authored papers are cited more than male-authored articles. Finally, Card *et al.* (2020) document that all female authored papers receive about 25% more citations than similar male authored papers, proposing as an explanation for that the higher bar that women authors face in the publishing process.

Secondly, I analyse if there are gender biases also in the returns to high performance on RePEc rankings in terms of promotion to full professorship. For a homogenous sample (in terms of academic age) of 359 top authors (of which 55 are women), I integrated the data available in RePEc with information about their affiliations, educational backgrounds and current academic positions as of September 2019, gathering data from CVs available on personal and institutional webpages. By means of multivariate probit regressions, I analyse how a higher positioning in rankings of excellence in RePEc impacts on their probability of being appointed full professors and if there are significant gender differences.
Lastly, I also collected data for 752 women economists listed in the ranking of female economists in RePEc to define the main differences in academic production from the '80s to nowadays among top economists comparing women included in the list of top 10% authors not only with their male top economists colleagues but also with other excellent women economists that are not included in that ranking. In fact, RePEc, to compensate for the underrepresentation of women, computes a "ranking of female economists" that is performed solely among women,[15] and that gives a wider overview of the presence and contributions of women economists to the profession.

3. Ranking what? Definitions of excellence in RePEc and gender visibility

Rankings of individuals are heavily affected by methodologies used in their compositions, and RePEc gives the opportunity to account for this diversity (Hausken 2016; Seiler and Wohlrabe 2012). In fact, the final ranking of top 10% authors in RePEc is the result of 36 different rankings. Every person registered in the RePEc with works listed in his/her profile is ranked according to different criteria that can be based on the number of works, on citation counts, on journal page counts, on popularity on RePEc services (i.e. abstract views or downloads) and on measures of centrality in networks of authors (closeness[16] and betweenness[17]). All the criteria are also weighted for the impact factor or the number of co-authors. It is important to remember that the impact factors used for the calculation of rankings are determined with the RePEc data, so not only journals are considered but also working paper series. However, for six rankings based on page counts only academic journal articles are considered. As evident from table 1, most of the rankings, 17 on 36, are based on citation counts simple or weighted.

For each dimension (Table 1) RePEc calculates a score for each registered author. On this basis, an ordinal ranking is computed. Each author's best and worst ranking results are excluded. The average rank score of the 36 ranks is calculated by harmonic mean (see Zimmermann 2013 for a detailed description) as follows:

$$M_{-1} = N \frac{1}{\sum_{i=1}^{N} \frac{1}{r_i}}$$

where r_i is the ranking of an author in criterion i. On the basis of this values authors are ranked in the top 10% authors list.

For each author the variability in his/her outcome is very high, depending on the measures of excellence considered. Just to give a practical example, the woman who has the highest position in the top 10% authors aggregated ranking in

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[15] https://ideas.repec.org/top/top.women.html
[16] The average number of degrees of separation through co-authorship with all other registered authors
[17] The frequency the author appears on the shortest path through co-authorship between any two other registered authors

RePEc is ranked in 20th position, in the 66h position in rankings based on the number of works (for example ranking based on the number of distinct works that indicate how prolific an author), and in 2,062nd position if criteria based on networks' centrality are used (i.e. closeness). Instead, if measures of citations are considered, she improves her position in rankings (for example, she is ranked in the 12th position on the list that considers the simple citation count).

Therefore, in order to investigate how different rankings evaluate the few women economists listed (215)[18] in the aggregated top 10% authors list, I considered for each author the reverse of his/her positioning in the alternative 36 rankings calculated with different combinations of measures and weights. Then I ran a nonparametric equality-of-medians test, more properly known as the Wilcoxon rank-sum test, to compare differences in median positioning of men and women for all the 36 RePEc rankings. The Wilcoxon rank-sum test gives the likelihood that a member of one group will score higher than a member of the other group.[19] To simplify, the Wilcoxon rank-sum test, in this context, is useful to compute the probability that men authors are ranked higher than women on average in a specific ranking,[20] and so to define which rankings tend to disadvantage or advantage women most. A result of the Wilcoxon rank-sum test (first column in Table 2)[21] higher than 50% means that on average men tend to have higher positions in the rank with respect to women. For example, looking at the final RePEc top 10% authors list, there is a 55.5% probability that men are better ranked than women in this list.

Table 1 clearly shows that the rankings that systematically disadvantage women are those based mainly on the number of publications, in particular when it is considered the number of pages weighted with the simple impact factor and then divided by number of authors on each work. Moreover, women tend to be more penalised when only journal articles are considered in rankings, highlighting how women, even those considered excellent according to the common definitions used in the discipline, have a lower productivity in terms of number of published articles than male colleagues.

The results are in line with the findings of Hengel (2017; 2019) and Hengel and Moon (2019; 2020) that empirically proved the higher standards applied to women's writing in academic peer reviewed journals. In fact, they conclude that female-authored papers spend three to six months longer in peer review compared to observably equivalent male-authored papers. These higher standards, at the expense of quantity, cause collateral damage to women's productivity, since women, compared to men, spend too much time rewriting old papers and not enough time writing new papers. These gender biases in peer review processes also translate into career disadvantages, with the possible extreme consequence of withdrawal from academia, due to the current publications-based system for tenure in universities. Apart from the peer review processes, the brake on women's academic productivity is also due to work-life unbalanced towed by traditional gender norms that, how clearly showed by early data on the impact of COVID-19 pandemic, with its unprecedented burden of day care within households and families during the lock-downs, significantly negatively affected only women's publishing (Amano-Patiño et al. 2020; Kim and Patterson 2020).

Measures of popularity and centrality in networks of authors tend on average to penalise women, bringing out the weak centrality of women in networks of top economists, confirming the analysis by Ductor et al. (2018; 2020), who demonstrates that women tend to publish with fewer co-authors and to collaborate more often with the same co-authors in a tighter network compared to their male colleagues.

Instead ranking based on citations, in particular the ranking that considers citation count weighted by the recursive discounted impact factor (in this case the probability that men are ranked in better position than women is equal to 44.7%), are those where women are better represented in rankings. Once more only when citations are weighted for the

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[18] Top 10% Authors, as of July 2019 (with details), retrieved from https://ideas.repec.org/top/top.person.alldetail.html on 10 August 2019.
[19] The test is commonly used in the analysis of controlled treatment trials, in order to measure the probability that a person assigned to the treatment group will have a better outcome than a person assigned to the control group.
[20] To simplify the interpretation of results I computed the Wilcoxon rank-sum test on the reverse of the ranking position of each author. So, the results can be interpreted as the probability that men rank on average in higher positions in the top lists of authors then women do.
[21] As a robustness check, we also computed the differences of the median scores for women and men, considering each of the 36 rankings above calculated by Fisher's exact test, and we found the same results as the Wilcoxon rank-sum test (results are available on request by the author).

number of publications, as in the case of the h index, a synthetic measure that combines the number of citations with the number of publications by each author, women on average are placed in lower positions in rankings than men. It seems from this simple empirical exercise that women that are included in the list of 10% top economists pervasively used citations in order to boost their bibliometric indicators, following probably pressures of universities' audits that shifts from the culture of "publish or perish" to the culture of "impact or perish" (Biagioli 2016; Baccini *et al.* 2019a). It is therefore interesting to analyse if the adoption of this culture of 'impact or perish' by women has positively impacted on their ability to brake the glass ceiling in academia and if a high performance in rankings of top economists has different returns in terms of access to full professorship for women and men.

Table 1. Gender differences in RePEc's rankings

Wilcoxon test p (m)>p(w)	Description of Rankings	Type of ranking Criteria based on:	Weights used	Code in RePEc
64.9%	Page count with simple impact factor weights divided by number of authors on each work	Journal Page Counts	Simple IF	ANbPages
64.4%	Simple page count	Journal Page Counts	No weights	NbPages
62.8%	Number of Works (with duplications)	Number of Works	No weights	DNbWorks
62.8%	Number of Distinct Works, Weighted by Number of Authors	Number of Works	No. Authors	ANbWorks
59.2%	Number of Distinct Works (no duplications)	Number of Works	No weights	Nbworks
58.8%	The frequency the author appears on the shortest path through co-authorship between any two other registered authors	Networks	No weights	Betweenn
58.1%	Page count with recursive impact factor weights	Journal Page Counts	Recursive IF	AScPages
57.9%	Count with simple impact factor weights divided by number of authors on each work	Number of Works	Simple IF	AScWorks
57.5%	Record of graduates	Popularity on RePEc Services	No weights	Students
57.5%	Page count divided by number of authors on each work	Journal Page Counts	No. Authors	ScPages
57.0%	Count with simple impact factor weights	Number of Works	Simple IF	ScWorks
56.1%	Count with recursive impact factor weights divided by number of authors on each work	Number of Works	Recursive IF	AWScWorks
55.8%	Page count with recursive impact factor weights divided by number of authors on each work	Journal Page Counts	Recursive IF	AWScPages
55.5%	**Final top 10% authors in RePEc**	Harmonic mean of 36 rankings	No weights	
55.4%	Count with recursive impact factor weights	Number of Works	Recursive IF	WScWorks
55.3%	Total downloads per author in the past 12 months	Popularity on RePEc Services	No weights	ADownloads
55.2%	Page count with simple impact factor weights	Journal Page Counts	Simple IF	WSCPages
54.8%	Total abstract views per author in the past 12 months	Popularity on RePEc Services	No weights	AAbsViews
53.5%	h-index	Citation Counts	No weights	HIndex
53.0%	Total downloads in the past 12 months	Popularity on RePEc Services	No weights	Downloads
53.0%	The average number of degrees of separation through co-authorship with all other registered authors	Networks	No weights	Close
52.3%	Total abstract views in the past 12 months	Popularity on RePEc Services	No weights	AbsViews
51.8%	Simple citation count	Citation Counts	No weights	NbCites
51.8%	Citation count divided by number of authors on each work	Citation Counts	No. Authors	ANbCites
49.6%	Citation count with simple impact factor weights divided by number of authors on each work	Citation Counts	Simple IF	AScCites
49.5%	Citation count with recursive impact factor weights divided by number of authors on each work	Citation Counts	Recursive IF	AWScCites
49.5%	Citation count with simple impact factor weights	Citation Counts	Simple IF	ScCites
49.3%	Euclidian citation score	Citation Counts	No weights	Euclidian
49.3%	Citation count with recursive impact factor weights	Citation Counts	Recursive IF	WScCites
49.1%	Count of citing registered authors	Citation Counts	No weights	NCAuthors
49.0%	Rank weighted count of citing registered authors	Citation Counts	No weights	RCAuthors
48.8%	Breadth of citations across fields	Citation Counts	No weights	NEP Cites
48.4%	Citation count discounted by age	Citation Counts	Age	DCites
48.4%	Citation count discounted by age and divided by number of authors on each work	Citation Counts	Age/No. Authors	ADCites
45.6%	Citation count with discounted impact factor weights divided by number of authors on each work	Citation Counts	Discounted IF	ADScCites
45.4%	Citation count with discounted impact factor weights	Citation Counts	Discounted IF	DScCites
45.1%	Citation count with recursive discounted factor weights divided by number of authors on each work	Citation Counts	Recursive IF	AWDScCites
44.7%	Citation count with recursive discounted impact factor weights	Citation Counts	Recursive IF	WDScCites

Notes: the Wilcoxon rank-sum test, first column, has been computed for the reverse of the ranking position for each author. In column 1 the results of the test that represent the probability that men on average has a better positioning in the rankings of top authors in RePEc. The results have been ordered from those that disadvantage most women to those that instead advantage them most.

3.1. "*Publish or perish*" or "*impact or perish*"? Gender difference among top of economists in access to full professorship

In this section, by means of multivariate probit regressions, I analyse if being part of an elite, or better being included in the list of top 10% economists in RePEc, help women in breaking the academic glass ceiling or if there are gender gaps in the returns in terms of being promoted full professors of high performances in the different rankings of top economists analysed in the previous section.

To control for the effect of experience and age, I isolated a homogenous group of women and men within the list of top 10% economists: I considered just 359 top economists, of which 55 were women, whose first publication in RePEc was published between 2000 and 2010. I integrated the data available in RePEc with their academic positions as of September 2019, and educational backgrounds gathering data from personal and institutional webpages. The gender gaps among the sample considered in terms of full professorship are evident: 85.5% of men considered are employed as full professors while among women the share decreases to 67.3%. Looking at the profiles of those excellent economists that also reached the top of their academic careers, almost one man on four (26%) and one woman on three (36%) is affiliated with a global top university.[22] They are part of a restricted network of scholars that mainly studied in US universities for their PhDs (80% for men top economist full professors and 95.6% for women top economists full professors). Moreover, 70% of women that break the glass ceiling gained their PhD from a global top university, while for men the share is even lower (48.5%). These findings confirm the high investment in education done by women and the possible higher level of conformism that women have performed to fit a standardised model of excellence to reach the top of their academic careers.

Therefore, by means of a probit regressions I first analyse the impact of being a woman among this sample of top economists, on the probability of reaching the full professorship, controlling for affiliations, educational backgrounds and their positioning in the RePEc ranking of top 10% economists. Then I run two separate sets of probit regressions, one for women and one for men, to better analyse how different definitions of excellence measured by different RePEc rankings analysed before, can impact on academic careers and which are the main gender differences.

Table 2 clearly demonstrates that, even among top economists, being a woman significantly reduces the probability of being appointed full professor by almost 15 pp.

These findings contradict the claim by Heckman and Moktan (2018) of gender equality in tenure track when controls for affiliation, educational background (quality of *alma mater*), and academic production (number of publications, articles in top 5 journals, co-authors and field-adjusted citations) are considered. But, the results of table 2 are in line with the analysis of full-professorship by Ginther and Kahn (2014) and Kahn (2020) that confirms the lower probability (from 23 to 30 pp) for women than men to receive full professorship within seven years of tenure receipt, even with research productivity controls in US.

Moreover, being affiliated with a global top university has a high significant positive effect on the probability of gaining full professorship. Authors affiliated with a top global university have a more than 30% more chances of breaking the glass ceiling. This result is difficult to comment on, since it is impossible to determine, with available data, if these authors grew up in a global top university or if they achieved their top academic position in another university and then moved to a top university. Therefore, it is interesting to note that being affiliated with a US university has a significant negative effect on reaching full professorship. Considering educational background, instead, gaining a PhD in US is a driver for success in academia, but surprisingly studying in a global top university it is not, for the sample analysed.

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[22] I considered the first 10 universities from the 2019 Shanghai ranking (available at: http://www.shanghairanking.com/ARWU2019.html) and Times Higher Education (available at: https://www.timeshighereducation.com/world-university-rankings/2019/worldranking#!/page/0/length/50/sort_by/rank/sort_order/asc/cols/score).
The universities considered at the top globally are: Oxford University (UK); University of Cambridge (UK); Stanford University (USA); Massachusetts Institute of Technology (MIT) (USA); California Institute of Technology (USA); Harvard University (USA); Princeton University (USA); University of Chicago (USA); University of California, Berkeley (USA); Columbia University (USA); Yale University (USA); Imperial College (UK).

Finally, measures of excellence, like the performance in RePEc top 10% economists ranking, overall do not significantly affect the chances of reaching the top of academic career ladders, but they are really important for women (see the interaction term in Table 2) since a better positioning in the ranking of top authors in RePEC considerably and significantly positively impacts on their probability of being full professors.

This result deserves a closer examination in light of the analyses conducted in section 1. Therefore, I ran several probit regressions (with the same control variables as those used in Table 2), considering separately the dimensions based on citation and publication counts used for the rankings in RePEc (see Table 1) for women and men authors.

Table 2. Probability of breaking the academic glass ceiling for top 10% economists in RePEc

	(1)	(2)	(3)
Women	-0.16***	-0.15***	-0.17***
	(0.04)	(0.04)	(0.06)
Affiliation in US universities	-0.11**	-0.11**	-0.11**
	(0.05)	(0.05)	(0.05)
Affiliation in global top universities	0.33***	0.31***	0.30***
	(0.08)	(0.08)	(0.08)
PhD in global top universities	0.01	0.005	-0.002
	(0.05)	(0.05)	(0.05)
PhD in US universities	0.09*	0.09*	0.09
	(0.06)	(0.06)	(0.06)
Performance in RePEc top 10% economists ranking		80.25	
		(83.41)	
Women # Performance in RePEc top 10% economists ranking			164.9**
			(70.73)
Observations	359	359	359
Wald chi2	25.47	26.39	32.39
p > Chi2	0.00	0.00	0.00
Correctly classified	0.83	0.83	0.84

*Notes: average marginal effects; standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.*
The universities considered at the top globally are: Oxford University (UK); University of Cambridge (UK); Stanford University (USA); Massachusetts Institute of Technology (MIT) (USA); California Institute of Technology (USA); Harvard University (USA); Princeton University (USA); University of Chicago (USA); University of California, Berkeley (USA); Columbia University (USA); Yale University (USA); Imperial College (UK). Performance in RePEc top 10% economists ranking is computed as the reverse of each author's positioning in RePEc top 10% economists ranking.

The average marginal effects in Tables 3 and 4 show the main gender differences in returns to performance in rankings respectively based on works' and journal pages' counts, and those based on citation counts. The data show that the educational backgrounds, when measures of academic production are introduced, are significant only for women since having studied in US increases the probability of reaching the top of the academic careers. Results also confirm that the performance in the rank of top economists in RePEc seems to play a 'gate keeping' role just for women, confirming that, as already demonstrated for the publication in peer reviewed journals (Hengel and Moon 2019; 2020) women are held to higher standards than men also in the access to top positions in academia. For women in fact the probability of being full professors increases more than four times if a higher position in the ranking is gained.

However, women and men are evaluated differently: better performance in measures of excellence based on the number of publications are the main driver of success in academia for women, while for men are those based on citations. In fact, even among the different measures of excellence based on citations, the only one that has a high significant positive impact on the probability of being full professor for women is the one that considers the "h index", a measure that integrates the number of citations with the number of articles published.

Therefore, citations are a poor predictor of promotion to full professor for women, while they are a strong predictor of full professorship for men. Moreover, the number of publications is a stronger predictor of promotion for women than

men. Since in previous session, I demonstrate that women, in rankings of top economists, tend to outperform men with respect to citations, the results in Table 3 and 4 underline that women receive less recognition than men in terms of promotion based on the criterion of excellence in which they excel. Moreover, women tend to experience higher marginal returns in terms of academic progression to the criteria based on the number of publications that is the dimension that mostly penalysed them.

This gender gap in recognition of excellence is consistent with Son Hing *et al.* (2011) that define that ''In practice, merit-based outcome allocations might be enacted in a manner that reinforces the status quo and favors dominant groups because the latter tend to control the evaluation process...'' (Son Hing *et al.* 2011, p. 433). Given that power in academia, and in particular in economics, have historically been predominantly male, patriarchy is a latent social hierarchy that can be embedded within the evaluation of existing standards of excellence, which may lead women's expertise and characteristics to be seen generally and always as lacking in merit, compared to men's, even among top economists. Therefore, questioning the rhetoric of gender neutrality of excellence and merit could help in changing practices and norms by which economists are evaluated and valorized, toward a more equitable field (Ben-Amar *et al.* 2020).

In the next session, I also analyse to what extent standards of excellence have been internalized in the academic production in the last decades among women and men economists. In fact, since the standards of merit that have developed generally reflecting experiences and characteristics of a small elite of male economists, I test if women are converging or better "fixing" their publishing styles and research interests to these "masculine" standards in order to be seen as excellent.

Table 3. "Publish or perish": probability of breaking the academic glass ceiling for top economists for different dimensions of excellence based on number of works and journal page counts by sex

	Men top economists														Women top economists													
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Aff. US universities	55.48 (69.92)	-0.05 (0.05)	-0.06 (0.05)	-0.08 (0.05)	-0.10** (0.05)	-0.06 (0.05)	-0.08 (0.05)	-0.10* (0.05)	-0.05 (0.05)	-0.07 (0.05)	-0.08 (0.054)	-0.06 (0.05)	-0.06 (0.06)	-0.07 (0.06)	-0.29** (0.14)	-0.27*** (0.14)	-0.29** (0.14)	-0.33** (0.14)	-0.33** (0.14)	-0.30** (0.14)	-0.42** (0.16)	-0.39** (0.15)	-0.26* (0.14)	-0.30** (0.14)	-0.30** (0.14)	-0.28* (0.14)	-0.32** (0.14)	-0.32** (0.14)
Aff. Gl. top universities	-0.06 (0.05)	0.29*** (0.09)	0.29*** (0.09)	0.22*** (0.09)	0.23*** (0.09)	0.29*** (0.09)	0.22** (0.09)	0.23** (0.09)	0.29*** (0.09)	0.22** (0.09)	0.23*** (0.09)	0.29*** (0.09)	0.22** (0.09)	0.23*** (0.09)	0.50*** (0.13)	0.56*** (0.14)	0.57*** (0.14)	0.50*** (0.13)	0.50*** (0.15)	0.57*** (0.14)	0.56*** (0.13)	0.52*** (0.14)	0.56*** (0.14)	0.45*** (0.12)	0.45*** (0.130)	0.57*** (0.13)	0.51*** (0.13)	0.52*** (0.14)
PhD Gl. top universities	0.28*** (0.09)	0.03 (0.05)	0.02 (0.05)	0.02 (0.05)	0.01 (0.05)	0.02 (0.05)	0.01 (0.05)	0.01 (0.05)	0.03 (0.05)	-0.02 (0.05)	-0.03 (0.05)	0.02 (0.05)	-0.02 (0.05)	-0.02 (0.05)	-0.30* (0.16)	-0.21 (0.16)	-0.22 (0.16)	-0.17 (0.15)	-0.08 (0.16)	-0.22 (0.16)	-0.25 (0.16)	-0.13 (0.17)	-0.22 (0.15)	-0.28* (0.15)	-0.25* (0.15)	-0.23 (0.16)	-0.30* (0.15)	-0.28* (0.16)
PhD US universities	0.02 (0.05)	0.02 (0.06)	0.01 (0.06)	-0.02 (0.05)	-0.02 (0.05)	0.01 (0.06)	-0.02 (0.05)	-0.03 (0.05)	0.01 (0.06)	-0.03 (0.05)	-0.03 (0.05)	0.01 (0.06)	-0.03 (0.05)	-0.03 (0.05)	0.54*** (0.14)	0.59*** (0.13)	0.60*** (0.14)	0.48*** (0.15)	0.38** (0.16)	0.59*** (0.14)	0.48*** (0.18)	0.35* (0.20)	0.62*** (0.13)	0.57*** (0.14)	0.55*** (0.14)	0.61*** (0.14)	0.58*** (0.15)	0.57*** (0.15)
Top 10% authors	0.02 (0.06)														832.0*** (276.4)													
Measures of excellence based on the Number of Works																												
Nbworks		46.87 (29.30)														32.37*** (12.28)												
DNbWorks			10.33 (22.56)														18.69 (121.2)											
ScWorks				421.4*** (84.80)														695.4*** (241.6)										
WScWorks					340.7*** (73.68)														499.8** (211.6)									
ANbWorks						3.785 (6.806)														-19.88 (137.1)								
AScWorks							484.2*** (98.63)														905.9*** (271.7)							
AWScWorks								418.9*** (88.51)														706.8*** (265.9)						
Measures of excellence based on Journal Page Counts																												
NbPages									14.77 (16.38)														326.7 (209.5)					
ScPages										272.0*** (72.45)														408.6*** (133.0)				
WSCPages											216.8*** (62.16)														315.0** (131.2)			
ANbPages												14.41 (20.03)														255.0 (342.5)		
AScPages													292.3*** (83.34)														245.7* (145.3)	
AWScPages														244.6*** (76.16)														179.7 (140.6)
Observations	304	304	304	304	304	304	304	304	304	304	304	304	304	304	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Wald chi2	12.05	14.35	11.60	26.66	26.42	11.73	28.37	27.68	12.38	21.97	20.12	12.24	19.06	17.40	14.67	26.06	18.72	19.50	16.71	18.81	16.71	17.35	22.99	21.46	18.93	21.12	22.84	21.03
p > Chi2	0.03	0.01	0.04	0.00	0.00	0.04	0.00	0.00	0.03	0.00	0.00	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Correctly classified	0.86	0.86	0.86	0.85	0.85	0.86	0.85	0.85	0.86	0.86	0.86	0.86	0.86	0.86	0.80	0.76	0.75	0.76	0.80	0.75	0.78	0.82	0.78	0.76	0.76	0.80	0.75	0.75

Table 4. "Impact or perish": probability of breaking the academic glass ceiling for top economists for different dimensions of excellence based on citation counts by sex

	Men top economists																	Women top economists																
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Aff. US universities	-0.05	-0.06	-0.09	-0.08	-0.10*	-0.09*	-0.06	-0.06	-0.08	-0.08	-0.09*	-0.09*	-0.06	-0.06	-0.07	-0.06	-0.06	-0.26*	-0.25*	-0.29**	-0.28**	-0.29**	-0.29**	-0.28**	-0.27**	-0.31**	-0.31**	-0.31**	-0.32**	-0.29**	-0.29**	-0.29**	-0.30**	-0.30**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.15)	(0.13)	(0.14)	(0.14)	(0.15)	(0.15)
Aff. global top universities	0.28***	0.28***	0.24***	0.25***	0.24***	0.26***	0.28***	0.28***	0.25***	0.26***	0.25***	0.26***	0.29***	0.27***	0.27***	0.28***	0.26***	0.52***	0.51***	0.47***	0.47***	0.46***	0.474***	0.536***	0.531***	0.496***	0.504***	0.492***	0.513***	0.498***	0.542***	0.542***	0.573***	0.575***
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.08)	(0.08)	(0.09)	(0.09)	(0.14)	(0.13)	(0.14)	(0.14)	(0.14)	(0.15)	(0.14)	(0.13)	(0.13)	(0.14)	(0.14)	(0.14)	(0.13)	(0.13)	(0.14)	(0.15)	(0.14)
PhD global top universities	0.02	0.02	-0.01	-0.01	-0.02	-0.01	0.01	0.02	-0.01	-0.01	-0.02	-0.01	0.02	-0.00	-0.00	-0.00	-0.00	-0.24	-0.26	-0.23	-0.24	-0.20	-0.21	-0.24	-0.26	-0.25	-0.26	-0.22	-0.23	-0.23	-0.23	-0.23	-0.22	-0.22
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.17)	(0.16)	(0.17)	(0.16)	(0.17)	(0.15)	(0.16)	(0.16)	(0.17)	(0.16)
PhD US universities	0.00	0.01	-0.02	-0.01	-0.02	-0.01	0.01	0.01	-0.02	-0.00	-0.03	-0.01	0.01	0.01	0.010	0.01	0.02	0.57***	0.57***	0.52***	0.53***	0.50***	0.51***	0.58***	0.57***	0.51***	0.52***	0.49***	0.51***	0.61***	0.57***	0.57***	0.59***	0.60***
	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)	(0.05)	(0.06)	(0.13)	(0.13)	(0.13)	(0.13)	(0.14)	(0.13)	(0.14)	(0.13)	(0.13)	(0.12)	(0.13)	(0.12)	(0.13)	(0.14)	(0.14)	(0.14)	(0.15)
Measures of excellence based on citation counts																																		
NbCites	120.7*																	214.6																
	(65.10)																	(181.3)																
DCites		30.30																	214.0															
		(27.93)																	(131.0)															
ScCites			322.3***																	297.8*														
			(72.96)																	(176.9)														
DScCites				127.1***																	196.9*													
				(46.28)																	(105.3)													
WScCites					293.8***																	285.5*												
					(69.07)																	(169.4)												
WDScCites						112.7***																	177.0*											
						(43.15)																	(98.05)											
ANbCites							120.5*																	155.4										
							(67.23)																	(178.3)										
ADCites								40.34																	147.5									
								(35.83)																	(139.6)									
AScCites									331.6***																	327.3*								
									(81.00)																	(182.2)								
ADScCites										139.7***																	198.4*							
										(47.80)																	(113.4)							
AWScCites											307.0***																	286.2*						
											(77.39)																	(170.8)						
AWDScCites												125.7***																	158.5					
												(45.62)																	(117.6)					
HIndex													14.66																	768.8***				
													(30.81)																	(296.8)				
NCAuthors														206.6***																	149.6			
														(54.53)																	(129.1)			
RCAuthors															222.8***																	138.2		
															(57.43)																	(127.3)		
Euclidian																116.4**																	-15.17	
																(51.04)																	(75.37)	
NEP Cites																	77.39**																	-12.82
																	(39.02)																	(58.65)
Observations	304	304	304	304	304	304	304	304	304	304	304	304	304	304	304	304	304	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Wald chi2	14.37	12.67	25.04	17.83	22.85	16.43	14.60	13.06	24.17	18.99	22.75	17.24	11.70	26.23	26.24	17.61	15.42	21.12	18.65	17.61	14.96	16.78	14.15	21.06	19.95	16.88	16.00	16.43	15.97	17.14	18.09	18.18	18.11	18.82
p > Chi2	0.01	0.03	0.00	0.00	0.00	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Correctly classified	0.86	0.86	0.85	0.86	0.85	0.86	0.86	0.86	0.85	0.86	0.85	0.86	0.86	0.86	0.86	0.86	0.86	0.74	0.76	0.80	0.80	0.78	0.80	0.76	0.78	0.78	0.80	0.76	0.82	0.80	0.76	0.78	0.75	0.75

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

4. The ladder to the top: gender differences over time

To better understand the determinants for women of inclusion in top authors ranking in RePEc, I analyse, in this last session, the characteristics of women economists not included in that ranking but listed in the "ranking of female economists". To compensate for the underrepresentation of women, RePEc computes an *ad hoc* ranking of female economists that is performed solely among women, without reference to the gender wide ranking: women are ranked according to each criterion and then the rankings are aggregated with the same criteria analysed in the first section of the paper. I therefore gathered all the available information about affiliations and publications of men (2,624 authors) and women (215 authors) economists ranked in top authors list in RePEc and of 752 women authors highly listed (top10%) in the ranking of female economists by RePEc (henceforth defined women not in top 10% authors ranking). This is to investigate if women to enter in the club of top economists must adhere to a mainstream standard of excellence at a more intense pace than both their top male colleagues and other lower ranked women economists.

Table 5. Gender differences for top economists

Men in top 10% authors ranking			Women in top 10% authors ranking			Women not in top 10% authors ranking		
	Freq.	%		Freq	%		Freq.	%
Affiliation								
Non-academic economists	398	15.3	Non-academic economists	39	18.1	Non-academic economists	210	27.9
In top 10 Universities	470	18.1	In top 10 Universities	47	21.8	In top 10 Universities	34	4.5
Country								
USA	1,504	57.3	USA	143	66.5	USA	329	43.8
United Kingdom	242	9.2	United Kingdom	23	10.7	UK	80	10.6
Germany	124	4.7	Germany	9	4.2	Germany	47	6.3
France	94	3.6	France	9	4.2	Italy	40	5.3
Canada	83	3.2	Spain	6	2.8	France	39	5.2
Belgium	38	1.5	Australia	5	2.3	Canada	27	3.6
University								
University of Chicago	75	2.9	UC, Berkeley	8	3.7	Oxford University	9	1.2
Harvard University	70	2.7	Harvard University	7	3.3	LSE	8	1.1
UC, Berkeley	59	2.2	Stanford	7	3.3	Cornell University	7	0.9
Stanford University	58	2.2	Columbia University	6	2.8	University College London	7	0.9
Columbia University	50	1.9	MIT	6	2.8	UC, Davis	7	0.9
University of Pennsylvania	39	1.5	UC, Los Angeles	6	2.8			

Source: Elaboration of RePEc data
Notes: Women not in top 10% authors ranking are authors listed in the 10% of the ranking of female economists except for those women listed in the 215 women listed in top 10% authors ranking

It is evident from Table 5 that the main differences in terms of affiliations are among women ranked in different list of excellences by RePEc. While 18.1% of women in the top authors list are employed outside academia, a slightly higher share than their male colleagues (15.3%), for women not ranked in that list the share is much higher and equal to 27.9%. The latter are mainly employed outside of academia in international organisations such as the World Bank and the International Monetary Fund, national institutions such as Federal Reserve Banks, and research institutions such as the Institute of Labor Economics (IZA). This suggests that a large share of women economists leave academia and enter prestigious international organisations, supporting the hypothesis of a leaky pipeline effect in economic academic careers for women.

Women included in the top 10% authors list are better integrated in top academic environments since more than 20% of them is affiliated with a top global university[23] and more than 65% work in US-based universities and institutions. The comparable figures for the other women economists considered are 4.5% and 43.8%. Consequently, women in the top 10% authors list are mainly concentrated in the same universities of their male colleagues, while for other women this concentration is lower and among the most frequent affiliations there are more European universities.

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[23] See footnote 25.

For women and men in top 10% economists' ranking and for women not in that list I also compare the evolution of their academic production to test if a converge path is in place that could support existing power relations in economics and the gendered and diversity status quo of the profession. I focus on trends since the 1980s in the number of journal articles published, the number of citations received, the breadth of different research fields analysed, and the exposure to issues outside of mainstream economics. For simplicity, I subdivided the last forty years into eight five-year periods.[24]

This analysis identified four main trends (see Chart 1) in academic production, visibility, specialisation, and diversity of ideas.

- ✓ **Academic production.** Considering five-year intervals, women increased the number of publications in the last decades at a faster pace since 1998. But the gender gap in journal article's production has increased and remained stable: men tend on average to publish more journal articles than their women colleagues. Also Ductor et al. (2018), using Econlit as a dataset, identified a stability in the output differences between men and women from the 1990s, with men producing 54% more than women in the second half of 2000s, a share similar of the results of fig. 1.1 where I found that men produce 59% more than women not in top 10% authors list in the period 2013-2017, using RePEc as reference. However, this gender gap is reduced to 22% if women among top 10% authors ranking is considered. The trends confirm the importance of the "publish or perish" proposition for the recognition of excellence in the profession for women.
- ✓ **Visibility.** Women steadily increased their visibility in terms of citations in the last decades. Women in top 10% authors list in RePEc have an average number of citations per year higher than that of their male colleagues and a much higher number of citations than their women colleagues. The results are in line with Hengel and Moon (2019) and Card *et al.* (2020) who found that female-authored papers receive respectively 22–24 log points and about 25% more citations than observably similar all-male-authored papers. This is consistent with female researchers facing a higher bar in the publishing process that tend to improve their writing style (Hengel and Moon 2019). In fact, as underlined by Grossbard *et al.* (2018), women's articles could be cited more because they are of higher quality may be due to a higher likelihood of rejection by top journals, including rejection after articles were reviewed. In case articles were reviewed and rejected they may have benefited from more helpful criticism that contributed to the higher quality of women-authored articles.
- ✓ **Specialisation.** The RePEc database contains information about the content of the publications, including their Journal of Economic Literature (JEL) codes.[25] There are limitations in the use of JEL codes to identify the real field(s) of research of a single paper or, if aggregated, for authors (see Marcuzzo and Zacchia 2016), and new textual analyses are much more reliable for that (Abrosino *et al.* 2018). In this context, conscious of these limits, I use JEL codes just to identify the level of specialisation of each author by period over time. Using the first letter of the JEL codes, it is possible to identify 20 main research fields that I used to calculate the author's specialization through a widely used index in industrial economics: the Herfindahl-Hirschman Index (HHI). The HHI measures how much an author's publications concentrate in just a few JEL codes instead of being scattered among the 20 research fields. The HHI is a commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in a market and then summing the resulting numbers. In this case I calculated the HHI for each top author and for each five time periods as:

$$H = \sum_{i=1}^{N} s_i^2$$

  where s_i is the share of JEL code$_i$ on the total number of JEL codes used in five years, and N is the number of publications in the same time period. High HHI generally indicates a high level of concentration in the same JEL codes. From Chart 1, it is evident that, in general, as authors increased their number of publications, they followed a common trend of diversification of research interests by decreasing their concentration in a few

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[24] In this work I use the five-year periods to have comparable figures with other similar analysis. For example, Ductor *et al.* (2018) to consider gender differences in academic performance use a five-year window reporting that "Our results are qualitatively similar to other intervals of aggregation (e.g. three and ten-year)" (Ductor *et al.* 2018, p. 3).

[25] JEL codes are alphanumeric codes developed by the American Economic Association to form a standardized index of research methods and topics in economics. More information is available at: https://www.aeaweb.org/jel/guide/jel.php.
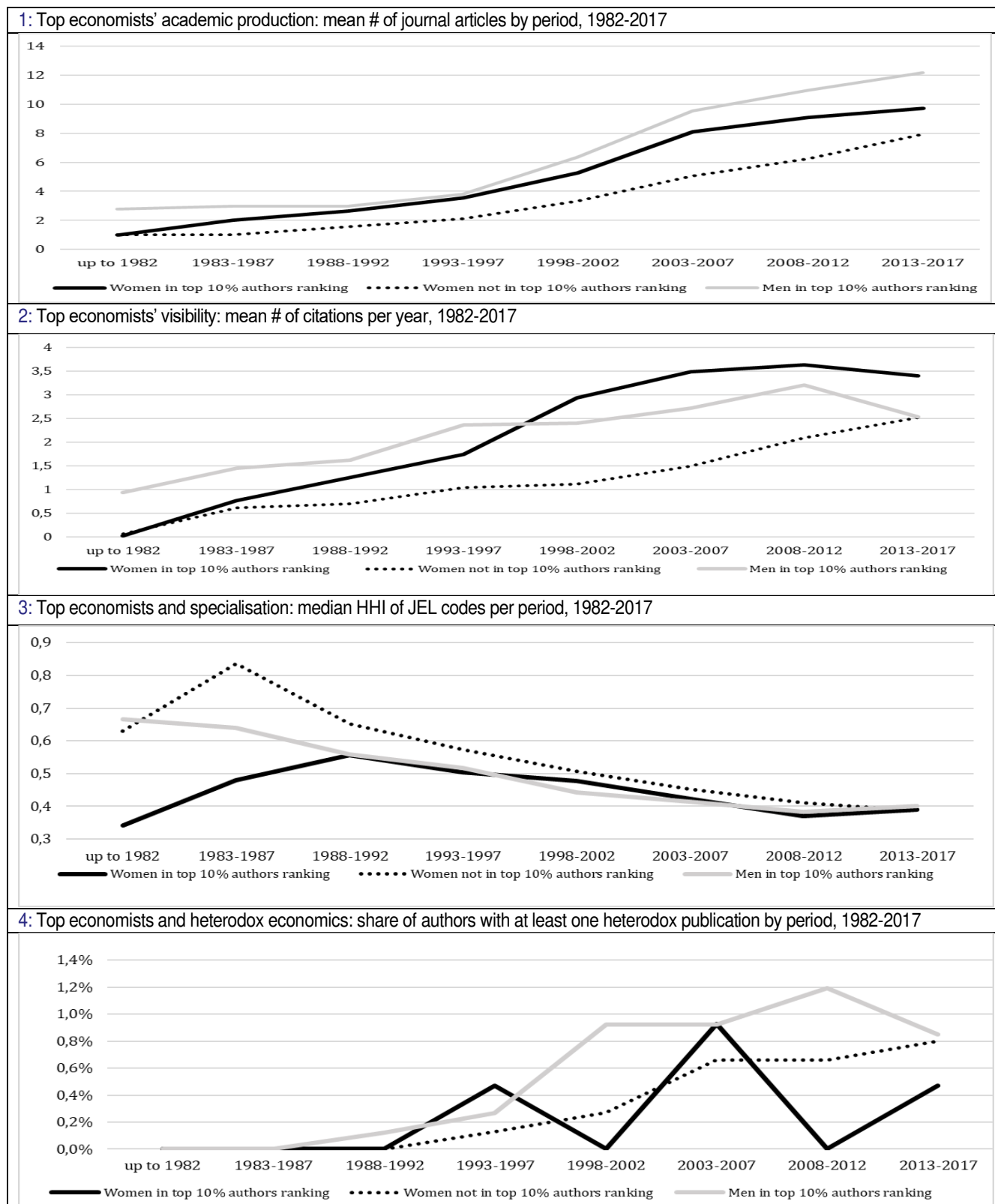
research fields. The trends here are similar for all economists, underlying a convergence path. Dolado *et al.* (2005), analysing gender differences in publications find similar trends: both women's and men's publications fall into several fields with no gender differences in the level of specialisation.

✓ **Diversity of ideas**: Considering the bipartition between mainstream and heterodox economics (for a complete review about the identification and definition of what is mainstream and what is heterodox see D'Ippoliti 2020; Kvangraven and Alves 2020; Lee 2012), I tried to identify, using the JEL codes, heterodox economists, or better those who, by definition, embody "an egalitarian pluralism that is committed to intellectual tolerance and diversity as well as to capabilities-enhancing reforms in economic education, scholarship, and professional development" (Garnett 2006, p. 522). Heterodox economics is defined by a combination of JEL codes at a lower level of aggregation (not only one letter) that characterises a certain numbers of schools (for example, B51 – Socialist, Marxian, Sraffian; B52 – Institutional, Evolutionary; B54 – Feminist Economics). Following Corsi *et al.* (2018), I classify as "heterodox" economist an author who has published at least one publication with a heterodox JEL code and/or in a journal that is publicly recognised as heterodox (for a complete definition see Corsi *et al.* 2018). According to this criterion, I calculated the share of heterodox authors among top economists in the eight time periods considered. The shares are really low for all economists, never exceeding 1.2%, with no differences by gender or inclusion in top ranking of authors.

The profiles of the few women considered excellent according to the list of top 10% authors in RePEc increasingly converge to those of their male colleagues. However, while looking at measures of academic production, like the number of articles published and citations received, differences with respect to women not included in the top 10% authors list in RePEc are evident. The main differences in fact are between individuals that adhere to excellence criteria and those who do not, producing or reproducing hegemonic structures and prevailing order with few women adopting an "overperforming" strategy.

Instead, when measures accounting for the content of research are used, like the level of specialisation or the heterodox focus of the research, these differences disappears and there is a clear convergence path for all economists considered with no differences based on gender or different measures of excellence used. These trends are alarming in the logic of preserving pluralism and intersectional diversity in the economics profession, since some practices in the research activities, seem to have indirectly created an univocal, widely accepted model of excellence in such a way that all the researched analysed try to converge to it, which in turn supports existing power relation and gendered status quo in the profession.

1: Top economists' academic production: mean # of journal articles by period, 1982-2017

Women in top 10% authors ranking ······ Women not in top 10% authors ranking ── Men in top 10% authors ranking

2: Top economists' visibility: mean # of citations per year, 1982-2017

Women in top 10% authors ranking ······ Women not in top 10% authors ranking ── Men in top 10% authors ranking

3: Top economists and specialisation: median HHI of JEL codes per period, 1982-2017

Women in top 10% authors ranking ······ Women not in top 10% authors ranking ── Men in top 10% authors ranking

4: Top economists and heterodox economics: share of authors with at least one heterodox publication by period, 1982-2017

Women in top 10% authors ranking ······ Women not in top 10% authors ranking ── Men in top 10% authors ranking

Source: Elaboration of RePEc da

5. Conclusions

I proposed in the paper a fresh analysis of the problem of the under-representation of women in economics from an offer-side (i.e. less interest in economics among women, or less competitive attitudes) to a demand-side, in particular to the barriers that women in economics face to reach the top of the economics profession. An adversarial, aggressive and stereotypical culture within academic economics is often proposed as an explanation for women's stalled progress (Lundberg 2020; for an historical prospective on the issue see Marcuzzo and Rosselli 2008; Chassonnery-Zaïgouche *et al*. 2019), but I also believe that the assumption about neutrality of excellence and its measurability in terms of ranking of individuals *per se* is gender biased and it contributes to limit the success of women in the field. In this sense, rankings have a transformative power, since they can reinforce a power-related male dominated apparatus in the economics profession (Maesse 2017).

I empirically tested, using RePEc as dataset, that commonly used rankings of authors are gender biased and that definitions of excellence based on the number of publications can systematically disadvantage women. In fact, despite their efforts to increase their visibility in terms of citations received, women tend to be penalised in rankings for their lower productivity in terms of number of articles published. Despite the performance in the top 10% author ranking in RePEc holds a power, in terms of 'gate keeping' role in academia, just for women, the results show a problematic relationship between gender and excellence that sets the bar higher for women in reaching the top of the academic career. In fact, within all the criteria of excellence addressed in this study, the systematic underestimation and minimization of women's qualifications is reproduced in way that the criterion where they excel receives lower recognition in terms of promotion to full professorship. These results are strictly connected to the open debate about which criteria to use in evaluating economics research in order to not systematically exclude minorities (Baccini *et al.* 2019b; Colussi 2018; Zacchia 2017).

The quantitative analyses allow me to conclude that interventions to support women's careers in the economics profession, as identified by Foley and Williamson (2019) for the public sector organizations, should not be focused on how individual women can overcome barriers they may encounter, but should involve a more fundamental organizational 'critical reassessment of what merit means' (Foley and Williamson 2019, p. 42) and a multi-dimensional approach to conceptualizing excellence and diversity. The assumption that merit and therefore excellence are gender-neutral fails to recognize there are numerous structures, norms and practices in the economics profession that are inherently gendered, and which may disadvantage women throughout their careers (Haynes 2017). In fact, "gender", "diversity" and "excellence" are all socially constructed concepts. Standardization of scientific performance with rationalised performance standards modelled on the profiles and characteristics of already successful majority of economists, are at high risk of reinforcing gendered status hierarchies. Moreover, a narrow focus on gender, conceived as a binary dimension (women vs men), fails to provide the heterogeneous picture of experiences that are diverse and affected by complex intersections of sex, ethnicity, age, class and also educational backgrounds, political ideas and focus of the research outside the mainstream. It is increasingly important to use an intersectional lens to understand the challenges and opportunities for economists to be properly recognised. However, the main difficulty to conduct an intersectional analysis of the economics profession is the lack of available data disaggregated for different social identities than sex, that can be integrated by observation and surveys (i.e. the 2019 AEA Professional Climate Survey for US). I tried to account for heterogeneity of women economists in this study comparing the trend in academic production for women economists ranked in top authors list in RePEc and those who are not. The differences are evident but I hope that further research will add more important dimensions that are not considered in this study.

Unfortunately, there are no easy solutions when it comes to overcoming resistance to gender equity on top of the economics profession, but a first step in this direction could be both to formally acknowledge the value of diversity and the impact of diversity in teaching and researching economics. The emphasis on the quantity and quality of publications in academic peer-reviewed journals may lead to under-valuate other skills, including teaching, professional activities, international project coordination, social engagement. All these activities are mainly associated, in academia, with untenured contracts and lower-level positions that constitute one further source of gender inequality.

I hope that this first exploration of the gendered nature of excellence might provide a hint to the direction of further research about the biased nature of merit in the economics and the urgency of fundamental critical reassessment and reconceptualization of how economists are evaluated and selected in academia. More in-depth quantitative work, using network analyses, and qualitative analyses might be a fruitful avenue for future research in linking the concepts of merit, excellence, diversity and inclusion within the economics profession – a task even more necessary in a post COVID-19 pandemic era. In fact, the COVID-19 experience is changing the way research is done. New mechanisms of accelerated peer review and the rising importance of research focused outside the mainstream (i.e. the care economy) are changing the equilibria of the academic world, and a special attention to the effects this has on gender disparities is crucial. Moreover, COVID-19 has led to unprecedented burden of day care within households and families, and early data show that it significantly affects only women's publishing (Amano-Patiño *et al.* 2020; Kim and Patterson 2020). If the pandemic disproportionately affects the research productivity of women economists, the negative effects on gender-related equalities in academia will only increase for years. The academic community needs to take bold action to address these challenges. Scientific expertise and knowledge from all genders and minorities are essential to build diverse, inclusive research organisations and improve innovative and sustainable research to tackle post COVID-19 economic and social crises.

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