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# Women in research in Economics in Uruguay

Verónica Amarante\*, Marisa Bucheli \*\*, María Inés Moraes \*\*\*, Tatiana Pérez\*\*\*\*

## Resumen

Se analizan brechas de género en la producción escrita en Economía en Uruguay. Se describe el contexto profesional y la participación femenina, se analizan los productos de investigación, considerando documentos de trabajo y técnicos y artículos en revistas. Los resultados principales son: a) los hombres producen más artículos en revistas que las mujeres; no hay brechas en la producción de documentos de trabajo; b) mujeres y hombres se distribuyen diferente entre áreas; c) la coautoría con autores no locales es más probable entre los hombres; d) esa coautoría está asociada con la brecha de género en la producción de artículos.

Palabras clave: brechas de género; investigación académica; mujeres y hombres economistas

Código JEL: J16; J44; I23; O30

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## Abstract

We analyze gender gaps in written production in Economics in Uruguay. We first describe the evolution of professional context and female participation. We then provide an empirical analysis of the research output based on two databases: working papers and technical documents and articles published in journals. The main results are: a) men produce more journal articles than women but there is not a gender gap in working papers; b) women and men are unevenly represented across fields; c) non-local partnership is more likely among men than women; d) non-local partnership is strongly associated with the gender gap in journal articles production.

Keywords: gender gaps; economic research; networks; men and women economists

JEL Classification: J16; J44; I23; O30

## 1. Introduction

The concern about the disparities between women and men in the economics profession is not new, but in the last years there has been a reawakening of the topic, and an extended interest in this issue both in developed and developing countries. The literature has focused on identifying some stylized facts and trying to understand their underlying reasons. A common fact both in the USA and in European countries refers to the missing women in economics, as reflected by the underrepresentation of women in the discipline. Strictly, time-series data about this topic refers to academic economists. In the USA, there has been little improvement in female representation among first-year Ph.D. students or senior undergraduate economics majors, and economics remains solidly within the lowest group in terms of female faculty shares at all levels, alongside physics, maths, and engineering and far below the biological and other sciences (Ferber, 1995; Lundberg and Stearns, 2019). In Europe, data about men and women at different stages of the academic career also support the idea of the existence of a “leaky pipeline” which has been stable over the years, with the resulting underrepresentation of women among full professors (Auriol et al, 2019). The literature has also advanced in discussing the existence of discrimination against women economists – including disparities in recruitment, salary, and promotion- and its causes and consequences. A recurring question refers to why we should worry about women being underrepresented in economics. Bayer and Rouse (2016) point out that fairness is not the only reason to worry about this: diversity within the profession ensures higher quality knowledge. As female and male economists hold different opinions and preferences about the role of government, the importance of labor and distributive policies, and other topics, female underrepresentation may reduce the scope of the public discussion or change its focus. Based on previous behavioral evidence, they also argue that mixed gender composition in research and professional groups derives in richer interaction and better results.

Given that academic publication is especially relevant for career progress and peer recognition, the literature has focused on the research output of women and men in economics by analyzing gaps in peer-reviewed publications. The significant gaps in promotion rates for males and females in the academic career in developed countries are in part explained by the fact that women economists do publish fewer papers than men (Broder, 1993; Ginther & Kahn, 2004; Hopkins et al. 2013; Ductor et al., 2018), though the gap in publications is narrowing for recent generations (McDowell, Singer and Stater 2006). This is not a specific feature of economics: for decades, multiple studies have been confirming the ‘productivity puzzle’ referring to lower female publications in diverse disciplines (Cole and Zuckermann, 1984; Ceci et al., 2014). Reasons for these differences in productivity are not clear cut, but the following factors are potential candidates: i) differential academic experience related to female interruptions of lower intensity due to family engagement; ii) selection of less able women into research iii) gender differences in confidence or preferences for competition; iv) gender bias in peer review; v) women dedicating more time to tasks with low promotability in detriment of research; vi) women sorting in fields with lower impact or intensity of publications vii) role of co-author networks or team composition. The difficulties when trying to test these explanations imply that many times just a reasonable hypothesis can be put forward, and the discussion remains open.

The first three factors are barriers that are common to other activities in the labor market -outside the research arena-. For example, the effects of motherhood on labor market outcomes, in general, have been widely documented (Kleven et al., 2018, 2019), and the idea that non-random selection in unobservables (among others, ability) in certain sectors or occupations may be relevant to understand differences in labor market outcomes is also widespread in labor economics. In our case, this may imply that less able women self-select into research as a way of avoiding strong competition pressures as economists in the private sector. On the same token, experimental evidence has reported gender differences in competitive performance and overconfidence (Gneezy and Rustichini, 2004; Larson, 2005) resulting in women shying away from competition and men embracing it (Niederle and Vesterlund, 2007; Buser et al, 2013). Although no specific evidence for researchers is available, it is reasonable to assume that these factors may operate given that academic publication involves a very competitive environment where feedback in the form of peer reviews is essential. In this context, the attitudes towards competition and the personal traits related to self-confidence may play crucial roles.

Among the potential explanations for productivity gaps that are specific to research, a strand of literature has tried to understand lower female productivity in terms of research outputs considering potential gender bias in peer review. In the case of economics, no evidence was detected in a set of studies (Abrevaya & Hammermesh, 2012; Chari and Goldsmith-Pinkham, 2017), although recently it has been suggested that women are held to higher standards for publication in Economics, using citations as a proxy for manuscript quality (Card et al., 2019; Hengel, 2020).

It has also been argued that the productivity gap may be related to differences in the allocation of time to tasks. Although we are not aware of specific evidence for economic departments, the available studies suggest that female faculty tend to spend more hours advising students or providing service in different committees (Misra et al, 2012; Mitchell and Hesli, 2013; Babcock et al., 2017), so gender differences in the frequency of requests and the acceptance of requests for these tasks may help explain why women have lower academic production than men.

The other two potential explanations (women sorting in fields with lower impact or intensity of publications and the role of co-author network or team composition) are directly explored in our research. The choice of research fields may influence academic careers and publication prospects, helping to understand productivity gaps (Beneito et al, 2018; Dolado et al., 2012). Concerning networks, their crucial role in the shaping of research output may explain different results of men and women (Ductor et al, 2018; Boschini and Sjogren, 2007). Given the direct connection between this literature and the hypothesis explored in our article, we further discuss its findings concerning our results. It is relevant to note that both these factors may also be related to risk-taking, personal traits, or the propensity to compete.

Unfortunately, the discussion and the evidence about these issues are less widespread in developing countries and specifically in Latin America, where -up to our knowledge- there are no systematic studies of gender differences in the economics profession and discipline. An exception for Uruguay is the work of Cáceres et al. (2013), who studies

research in economics based on the papers presented at the Annual Economic Meetings organized by the Central Bank of Uruguay in 1986-2011. They detect the prevalence of applied research, and also a change in the relative importance of topics: until 1990, macroeconomic papers were around 70% of all papers, whereas during the following twenty years 60% of papers had a microeconomic approach. They also report an increase in female participation in authorships.

Our contribution to the ongoing research about the role of women in economics is to provide both a historical perspective and new empirical evidence for a Latin American developing country. After analyzing the institutional and political context in which the profession of economist developed in Uruguay, we show that the country has moved from an initial female underrepresentation among economists to equal participation of men and women at present. We also provide an empirical analysis of the research output of Uruguayan economists, based on two databases, one mainly reflecting working papers and technical documents (WP) and the other one including articles published in peer reviewed journals (JA). Our descriptive results show that: a) in both databases the share of female Uruguayan authors increased over time; b) in WP female share in authors, considering only Uruguayan residents, is 36% whereas, in JA, it is 49%; c) the male average production of documents is higher than female's in JA but no gender gap is found in WP; d) women and men are unevenly represented across fields; e) partnership with non-local authors is more likely among men than women. The multivariate analysis shows that non-local partnership is strongly associated with the production gender gap.

## **2. The economic profession in Uruguay**

### *An overview of the development of the profession*

Given that institutional and political contexts may shape different professional and disciplinary configurations, it is relevant to provide contextual meaning to the study of research and publication patterns among female and male economists. The boundaries within which the profession has emerged and structured, which we discuss in this section, help to understand our original evidence about scholarly publications and research agendas in Uruguay. According to our hypothesis, from the 50' until now the development of economics as a profession in Uruguay underwent three periods. The identification of these periods is based on three dimensions: the academic setting for the training of economists, their labor market, and their role in the public debates.

The first period or starting point goes from 1954 to 1966. The beginning of this period is determined by the moment in which Economics was conceived as a specialization within the academic curricula of the career of Public Accountant at Universidad de la República, the only university in the country until 1985. Until 1966, only 23 of 246 Public Accountants got their degrees with specialization in economics; 4 of them were women (Table 1). On the labor dimension, in the context of an interventionist state and the peak of planning strategies, the public sector was the main employer for economists. Even in this context, labor market possibilities were limited for the profession. Finally, in the arena of public debate, this period was characterized by the irruption of economists in a central role.

The second period is characterized by identity disputes in the conception of the role of economists, going from 1967 to 1990. The main features of this long period -shared with other countries in the region- are the economic instability and political radicalization that reached the professional practice of economists: some leftist economists conceived their role as a mixture of technical and political activity, with no clear boundaries between them (Jung, 2018; Messina, 2018). This effervescence ended in 1973 when a coup d'état installed a dictatorship and leftist professors were expelled. Two curricula reforms were incepted with the final result of a shorter career of an economist, more similar to the programs that prevailed in the USA. Biglasier (2002) tracks in this period the first try to develop a professional profile inspired in the American model (that co-existed with a different profile linked to private research centers related to CLACSO network. With the restoration of democracy in 1985, the tension about the formation and role of economists emerged: some were prone to adopt international standards for professional practices, whereas others questioned that choice. Closely related to this, a new curricular reform in 1990 raised the duration of the undergraduate program, with an increase of both social sciences and quantitative courses.

In this period, the number of economists increased in a context in which the private sector gained importance as an employer. But the profession was still male-dominated: one female economist graduated for every four male economists.

**Table 1. Three periods in the development of the economist profession**

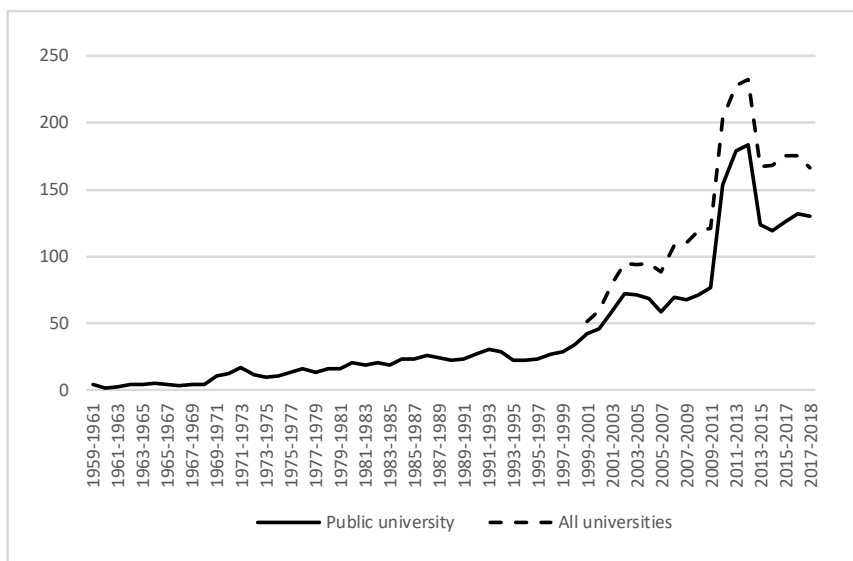
	Starting point	Identity disputes	Expansion and global economists
Period	1954-1966	1967-1990	1991-2017
Number of graduate economists	23	397	2551
Graduate economists per year	4	17	69
Female participation in total graduate economists	17,4	21,9	49,3

Sources: based on data from Universidad de la República and Anuarios Estadísticos del Ministerio de Educación y Cultura.

The identity dispute that characterized the previous period was solved in the third period (1990 until now) in favor of what Fourcade (2006) called the “global economist”: pursuing a universal agenda, with specific methodological tools and validation criteria for professional practices which are influenced by the American model. In this period the growth in the graduation of economists is higher than any other (Figure 1). Relevant changes in the curricular arena took place in this period. Private universities incorporated the career of economist into their supply of degrees and became relevant actors in the production of economists since the mid-nineties. In the public university, a new study plan was put in force and the duration of the career was again reduced to four years (with a great impact on the number of graduates around 2012). Graduate programs were opened and the labor market for economists diversified significantly, giving a place for a wide range of professional profiles in the public and private sector, academia, international organizations and even in press media.



**Figure 1. Number of degree graduates from Economics. 1961-2017**



Source: based on data from Udelar and Ministerio de Educación y Cultura

In this context, the orientation of Uruguayan academic economists and their ways of conceiving their activity and communicating with their peers changed. The National Agency for Research and Innovation (ANII for its initials in Spanish), created in 2008, probably constitutes a relevant landmark for researcher’s careers. The agency implemented a nationwide system of subsidies for researchers and projects that has meant, besides the monetary transfer, prestige and public recognition (National System of Researchers, SNI for its initials in Spanish). The selection and promotion criteria are strongly (but not only) based on the record of publications that influenced the profile of academic economists and their efforts towards peer-reviewed publication.

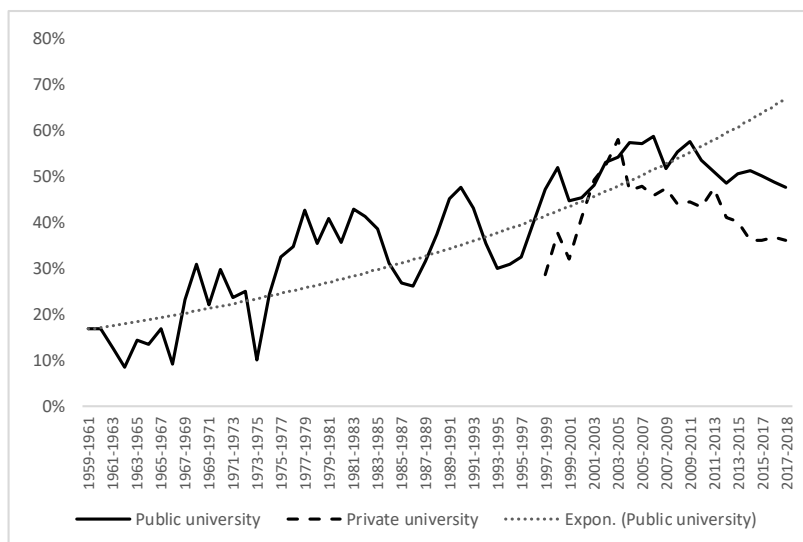
It is interesting to note that an analysis of the SNI reports a gender gap in the probability of being accepted of 7.1 percentage points detrimental to women; most of it (4.9 percentage points) can be attributed to lower academic achievements of women (Bukstein and Gandelman, 2019). But the gender gap in the probability of acceptance is larger in the higher ranks of the system and the observable characteristics of women and men explain less at the top than at the bottom of the SNI, consistent with the idea of a glass ceiling in the academic career in Uruguay. This glass ceiling is present in the three areas where women are most active (health-related sciences, natural sciences, and humanities), but no evidence is found for social sciences (where economics is included), agricultural sciences, or engineering.

*A gendered picture of economic professionals and academic staff*

As discussed above, the representation of women in the discipline has increased going from around 15% of total graduates in economics at the beginning of the 60s, to around 48% in the last five years. Interestingly, women are more likely to attend public university than men. Indeed, in the last five years, females accounted for 50% of graduates in the public university and 37% in private ones (figure 2). In their analysis of some Latin American countries (Argentina, Bolivia, Colombia, Chile, and Mexico), Lora

and Ñopo (2009) find that women represent between 30 and 40% of Economics undergraduate students, except in Colombia where they reach 60%. The authors also state that in all the countries considered, the female share is higher in public universities when compared to private ones, as detected in Uruguay.

**Figure 2. Percentage of women among graduates in Economics.1959-2018.**



Source: based on data from Udelar and Ministerio de Educación y Cultura

Two facts about this Uruguayan data are relevant to discuss. The first one is that, contrary to what happens in developed countries and the Latin American countries with available data, the economics profession does not attract fewer women than men in Uruguay. For the USA, studies report between 28 and 35% of women with a bachelor's degree in economics, whereas for the UK female undergraduate students of economics were around 30% in 2013, and in Spain, 36% in 2017 (Beneito et al, 2018). The second fact is that, at present, women account for around 68% of all graduates when all careers at Universidad de la República are considered, so economics is not a feminized career when compared to others in Uruguay. For example, the situation in Sociology resembles that of the whole University (with 68% of women) and shows a rather stable pattern in the last three decades.

Finally, according to a census that took place in 2017, there were 138 PhDs in Economics in Uruguay, 30% of them being women. Half of these PhDs in Economics got their doctoral degree after 2011.

The progress in terms of female representation among economists is also reflected in the female share of faculty staff. Women teaching in the core courses of the Economics career offered by Universidad de la República accounted for 25% of the staff in the 1980s and 44% in 2010-2019, with lower shares at the top than at entrance levels. In 2019, the 9 institutions that researched Economics in the country employed 163 researchers. The staff was composed of 56% of men and 44% of women. Women were 53% of the junior researchers but 37% at the senior level. Unfortunately, we lack longitudinal data

describing the trajectory of these researchers, so we can only document the existing differences.

Thus, although there has been progressing for women in terms of their professional and academic participation alongside the development of the discipline of economics, differences prevail for the top positions in the teaching and research careers. In the following sections, we explore how these patterns translate when we consider research publications and agenda.

### **3. Data and methods**

#### *Construction of databases*

Our analysis of academic production uses two bibliographic databases, which we briefly present in the following paragraphs; more details about their construction are available on request.

The first database was conceived by the Department of Economics in 2004, to facilitate bibliographical references reflecting the research of Uruguayan economists. Online bibliographical repositories were unusual at that time, so existing documents were scattered in different libraries. The general selection criterium was the inclusion of documents presented in Uruguayan congresses of Economics and/or written by authors affiliated with Uruguayan economic research institutions. It mainly contains working papers and technical documents and will be named as WP from now on.

After a thorough analysis of the records of this repository, we kept 814 records representing the academic production written between 1986 and 2004 in Uruguay. All records include title, year of publication, name of authors, and abstracts. We use the first name to gender codify the authors and the abstracts to classify the references according to the current JEL classification. Finally, we codified authors as local or non-local individuals. We defined a local author when she/he is affiliated to an Uruguayan institution in the year of her/his publication, except in the case of students living abroad who came back after that stage who were always considered local authors. This task was done on a case-by-case basis using all possible sources. WP involves 145 local female authors, 254 local male authors, and 49 non-local authors.

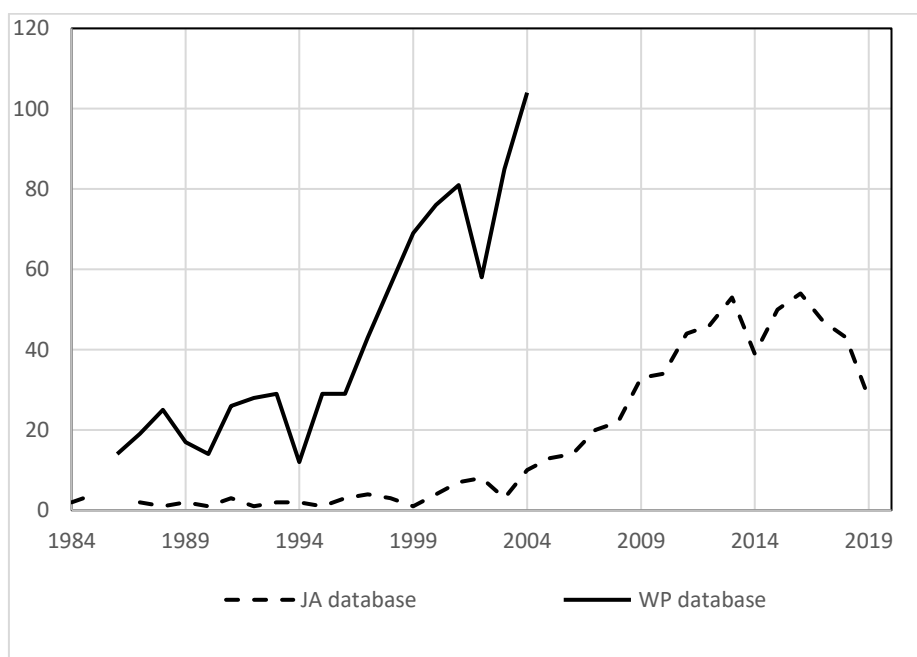
The second database uses information from free access to the online bibliographical portal from ANII (Timbó). This platform allows access to scientific and technological literature published at collections as Jstor, Scopus, EBSCO, Springer, Scielo, Directory of Open Access Journals, among others, which have different journal coverage. We identified the academic production of Uruguayan researchers, considering all current active researchers from the main academic institutions in Uruguay and all local authors of WP; we added all their co-authors whose research focuses on Economics. The obtained bibliographic database informs the year of publication, names, and abstracts. As in WP, authors were gender-coded on the base of their first name, JEL codes were imputed on the base of abstracts and the local / non-local condition was assigned case-by-case. This second database has 604 journal articles published between 1984 and 2019 and will be named JA from now on. These publications involve 117 local female authors, 121 local male authors, 221 non-local authors. 63 local authors whose main focus is not Economics

but were coauthors with Uruguayan economists were not included in our database. It is relevant to acknowledge that in our research, every publication in JA is counted equally, and differences in publications in terms of quality are not taken into account. This obeys the difficulties faced to find a consensual indicator to measure scientific quality or impact of publications from a developing country.

Databases differ in the coverage period; JA better reflects the most recent years. Besides, JA collects peer-review publications but WP consists basically of the first version of written documents which the final version eventually will not end in JA (because it is a consultancy or technical report, the document is published as a book or ends up being a working paper, etc.). Moreover, WP includes documents by economists that are not subject to academic rules (for example, professionals of the Central Bank or private sectors' advisors) whereas JA reflects research production.

Both databases capture an increase of documents (though a recent downturn in the last years in JA), authors, and female share over time (Figure 3 and Table 2).

**Figure 3. Number of publications in WP and JA**



Source: Authors based on WP and JA

The number of documents in WP increased significantly after 1996. But JA reflects that peer-reviewed publications were almost an exception for Uruguayan economists until mid 2005s. From then on, a significant increase in this type of publication took place. We argue that, in line with the new profile of economists, Uruguayan researchers were affected by the globally permeable nature of professional boundaries and began to subject themselves to international standards and major competition to publish their work. This is also consistent with the increase in the number of young PhDs mentioned before.

A relevant difference between these databases refers to the author's composition. The female share in local authors is 36% in WP and 49% in JA. Another interesting fact is that non-local authors are much more important in JA than in WP: indeed, in JA there is almost 1 non-local author per local author (Table 2). We interpret that networks with non-local authors are more important in JA than WP given the more prevalent academic nature of JA.

**Table 2. Main characteristics of WP and JA**

	WP				JA			
	Number of local authors	Female share	Number of non-local authors	Ratio non-local to local authors	Number of local authors	Female share	Number of non-local authors	Ratio non-local to local authors
Total	399	36%	49	0,12	238	49%	230	0,97
	<i>Annual average</i>							
All period	399	36%	49	0,12	238	49%	230	0,97
Up to 1990	80	25%	2	0,03	12	25%	5	0,42
1991-1996	129	36%	11	0,09	12	50%	4	0,33
1997-2004	309	36%	41	0,13	34	47%	21	0,62
2005-2013					133	41%	95	0,71
2014-2019					153	49%	128	0,84

Source: Authors based on WP and JA

### *Empirical strategy*

As discussed in the literature, determining the “gender” of a paper is not straightforward. For the descriptive analysis, we considered three bibliometric indicators used to analyze publications produced by co-operation among authors of a different gender: participation, contribution, and count index (Kretschmer et al, 2012).

Participation counts the number of publications with at least one author of a given gender. Denoting the bibliographic reference as  $r$  ( $r=1,\dots,R$ ), author as  $a$  ( $a=i,\dots,A$ ), gender as  $g$  ( $g=1,2$ ), the condition of being an author as  $I$  ( $I=1$  if the condition holds and 0 if it does not), the participation of gender  $g$  in the publication  $P_r^g$  and the participation of gender in the database  $P^g$  are:

$$P_r^g = \begin{cases} 1 & \text{if } \sum_a I_{a_r}^g \geq 1 \\ 0 & \text{if } \sum_a I_{a_r}^g = 0 \end{cases} \quad \text{and} \quad P^g = \frac{\sum_r P_r^g}{R} \quad (1)$$

The contribution index measures the share of each gender in the production of a publication assuming that each author contributed the same amount. The contribution of gender  $g$  ( $C_r^g$ ) to one publication and the average contribution of gender  $g$  in the database ( $C^g$ ) are:

$$C_r^g = \frac{\sum_a I_{a_r}^g}{\sum_g \sum_a I_{a_r}^g} \quad \text{and} \quad C^g = \frac{\sum_r C_r^g}{R} \quad (2)$$

The count index takes into account the number of authors of a given gender in each publication. The count index of gender  $g$  in a publication ( $T_r^g$ ) and in the database ( $T^g$ ) are:

$$T_r^g = \sum_a I_{a_r}^g \quad \text{and} \quad T^g = \sum_r T_r^g \quad (3)$$

Note that the count index of gender  $g$  in the database is higher than the number of authors of gender  $g$  because each author is counted each time that he/she appears in a document. We calculated the female share based on the count index, dividing the total female count by the sum of the total female and male count.

We carry out multivariate analysis to analyze the gender gap in production measured by the number of authors' publications. Thus, the dependent variable takes positive numbers and justifies the estimation of a count model. We assume that the dependent variable is over-dispersed (in both databases, the number of documents' variance is larger than its mean) so a negative binomial regression model is estimated. The negative binomial distribution is a form of the Poisson distribution in which the distribution's parameter is itself considered a random variable. The estimation of the dispersion parameter allows testing if it is equal to zero, that is if it is more appropriate to assume a negative binomial than a Poisson distribution (which is based on the restrictive assumption of equidispersion). We report the estimated coefficients, the average marginal effect, and the marginal effect at means of the explanatory gender dummy variable.

## 4. Results

### *Participation, contribution, and productivity*

To analyze the role of female and male economists in the written production we calculated indicators on the base of local teams. As reported in Table 3, female authors are 36% of local authors in WP and the three bibliometric indicators for females (participation, contribution, and share based on count index) present similar levels. The analysis based on JA shields somehow different results. The female share is 49% of local authors. They participate in 44% of articles, contribute to 34% of local teams' research production, and take account for 39% of local authorships. Thus, the bibliometric indicators for JA suggest a less important female role in production than their share in authors. This overall picture is summarized in the per capita number of documents: there is no gender difference in WP at usual statistical significance levels (with an average production of 3.4 documents per author) but male production is significantly higher than female in JA. Indeed, women produced 3.1 articles per capita and men, 4.8. We cannot reject the hypothesis that this difference is null with p-value equal too.026. The lower

contribution and productivity of female economists in peer-reviewed articles is consistent with previous evidence for developed countries (Ginther & Kahn, 2004; Hopkins et al. 2013; Ductor et al, 2018; Lundeberg and Stearns, 2019).

**Table 3. Participation, contribution, and count index**

	WP		JA	
	Female	Male	Female	Male
Share in authors (%) <sup>a/</sup>	36,3	63,7	49,2	50,8
Participation index (%)	43.2	78.3	44,2	76,5
Contribution index (%) <sup>b/</sup>	32.3	67.7	34,4	65,6
Count index	472	886	360	576
Share based on count index	34.8	65.2	38,5	61,5
Average number of documents	3.3	3.5	3,1	4,8

Notes: <sup>a/</sup> share in local authors <sup>b/</sup> contribution to a document is measured as the share of each gender in the local team

Source: Authors based on WP and JA

We interpret differences in results between the two databases as a consequence of their different nature. As mentioned, WP includes not only academic production but all type of economics-related reports, whereas JA contains peer-reviewed articles. In sum, a gender gap is not present in broad economists' written production but women write less academic journal articles than men. We may speculate about the reasons for this result. One possible explanation is that the academic environment, and more specifically journal publication, is a more competitive arena and men adapt better than women to these conditions. Another possible explanation is that self-selection into the academic and non-academic sectors is not gender-neutral, particularly in a country in which most academic positions are located in the public sector. We may speculate that positions suitable for economists in the private sector are more likely subject to gender discrimination than positions in the public academic sector. Under this scenario, private sector female economists may be selected among the pool of the ablest candidates. To have some insights about this explanation we analyze the grades of 24% of JA authors. We do not find a statistically significant grade gender gap, which suggests that gender differences in the ability within academic researchers are not a relevant explanation for differences in productivity.

Leaving aside the relevant discussion about how productivity should be measured throughout scientific careers, it is important to note that evidence for the developed world indicates that women tend to adopt publication strategies more focused on producing books or chapter books (see Mayer and Rathmann, 2018 for psychology and Davis et al., 2001 for economics). This implies that the study of research products based on articles may be non-gender neutral, even acknowledging that journal articles play a dominant role in the publications of economists. Based on the information provided by CVs uploaded on the web page of the SNI, we calculated the average number of published journal articles, book chapters and books by researchers in economics. Women published on average 9.0 journal articles, 5.2 book's chapters, and 2.5 books. For men, these numbers are 13.2, 4.9, and 1.6, respectively. Note that if we give the same weight

to each type of publication, the average number of published documents remains higher for men (19.7) when compared to women (16.7).

Given the important role of journal article publications in promotion, women's strategy is still a puzzle to be understood. Two additional factors related to gender gaps in academic production are explored in this paper. One is the potential gender gap in field selection and the other is the importance of team composition. The following subsections address these issues, and then we provide multivariate analysis trying to disentangle the role of each factor.

### *Gender distribution across research fields*

If there is gender segregation by research field, different standards of publication requirements among fields may contribute to explain the gender gap in publication. A challenging methodological problem related to this issue is the causality between uneven gender distribution by research fields and production gender gaps. Do women produce less than men because of the field of concentration or do women select fields with low-standard requirements of publication? In any case, the research field of an author may influence her academic career and may be relevant to understand women's performance in economics.

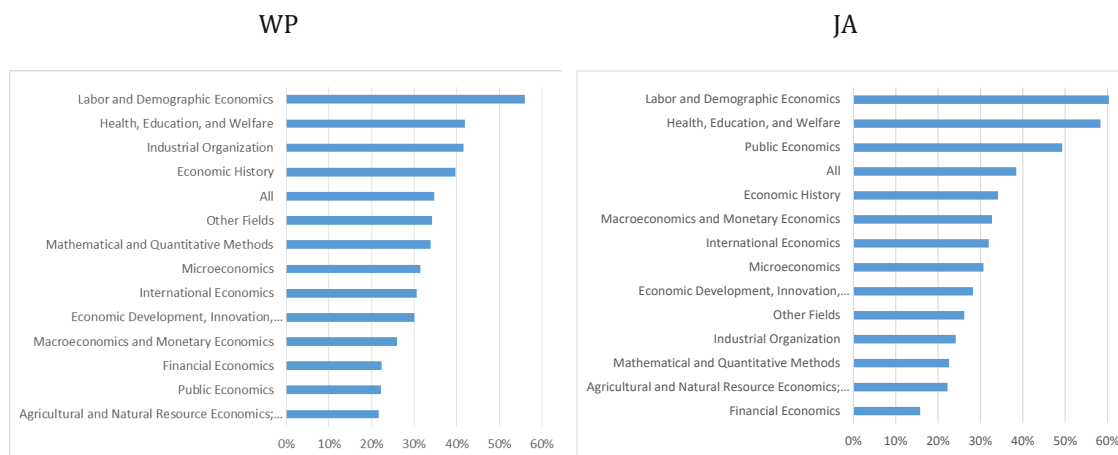
The evidence about gender segregation by research fields is quite clear. Beneito et al. (2018) look at scientific programs of the annual meetings of the American Economic Association in recent years, finding that there is a considerable gender bias in the choice of research areas, with a higher presence of women in research topics under microeconomics. They provide evidence that this gender-based inclination towards specific subfields in economics appears at the undergraduate level. Previously, the study of Dolado et al. (2012) covering European faculty members, had also documented significant gender differences in the distribution across specific areas of research. The authors argued that female academic economists may skip male-dominated fields to avoid mixed-gender competition –in line with the arguments of Gneezy and Rustichini (2004) about gender differences in the propensity to compete-. Another potential explanation for high female segregation in certain subfields refers to the role of mentoring (Carrell et al 2010; Bettinger and Long, 2005).

To explore gender segregation by research field among Uruguayan economists we consider the classification of documents by 1-digit JEL codes; a document with two JEL codes is counted in both fields. Female shares based on count index in each field are presented in Figure 4. Results are similar between both databases but overlapping is not complete. Using WP, the research fields where the female share is above the average are Labor and Demographic Economics, Industrial Organization, Health education and welfare, and Economic History. In the case of JA, the three more feminized research areas are Labor and Demographic Economics, Health education and Welfare, and Public Economics. In these three cases, the female share is between 50 and 60% whereas the average female share is 38%. JA also reflects that academic production in the areas of Financial Economics and Mathematical, Agricultural Economics and Quantitative Methods is male-dominated in Uruguay. Similar patterns were found under the contribution index. This pattern of gender segregation by research fields in Uruguayan



academic research had already been noticed by Cáceres et al (2013) based on presentations in Uruguayan congresses in 1886-, and is consistent with international findings.

**Figure 4. Female share based on count index by research area**



Source: Authors based on WP and JA

In effect, Dolado et al. (2012) find that European female researchers concentrate in Labor Economics, International Organization and Public Economics (with a share of 25%) meanwhile Mathematical Economics, Agricultural Economics, and Other Special Topics are the least popular fields among women (less than 10%). Boschini and Sjögren (2007) analyze top journals and conclude that the highest participation of women (around 20%) is observed in Health, Education and Welfare and Labor and Demography whereas the lowest (less than 10%) correspond to Financial Economics and Macro and Monetary Economics. Based on conference programs at the NBER Summer Institute, Chari and Goldsmith-Pinkham (2017) find that the share of women in Microeconomics Topics is almost 26% whereas it is 16% in Macro and International Economics and 14% in Finance. Considering meetings of AEA, Beneito et al. (2018) also find a higher presence of women in research topics under microeconomics; interestingly, they also provide evidence that this gender-based inclination towards specific subfields in economics appears at the undergraduate level. On the base of doctoral dissertations of the USA, Lundeborg and Stearns (2019) provide evidence that women are more likely than men to study topics in labor and public economics and less likely to research in macro and finance. They argue that this gender choice bias could be sustained over time because of differences in the research environment: the higher share of female faculty in a field might encourage female students to choose it because of role model effects.

The above-mentioned shares indicate that segregation is deeper in Uruguay than in Europe and the USA. We estimated the Duncan index to compare the results obtained for developed countries.<sup>1</sup> The Duncan index is 0.29 and 0.18 when using JA and WP,

<sup>1</sup> The Duncan index is the proportion of female authors who would have to trade fields with a man for both sexes to be represented in all research fields in proportion to their representation in the whole system.

respectively, whereas it ranges from 0.11 to 0.13 in the study by Dolado et al. (2012). As there is evidence about convergence trends in developed countries, the highest segregation level in Uruguay may be related to the relatively recent development of the discipline and entrance of women. We calculated the Duncan index for sub-periods to further consider this hypothesis. We found a time trend in terms of gender segregation in JA: it is 0.442 before 2008 and 0.275 when considering the last ten years. However, we are aware that the number of cases is very low to obtain robust results.

### *Team composition*

Given that research is a collaborative activity and that feedback from peers is crucial for the quality of work, collaboration between individuals may be a relevant aspect to understand academic performance. The role of networks of co-authorships and the composition of the research team has been widely analyzed in the literature. The increasing trend in co-authorships in Economics has been observed by Hamermesh and Oster (2002) and Card and Della Vigna (2013), among others. In this context, if there is gender sorting in team formation, the probability of finding 'good coauthors' is smaller for the gender in minority, and this may affect its productivity.

Given our condition of a developing country with a high incidence of migration of high-educated population, partnership with non-local researchers or technicians stands as a significant feature. Partnership with non-local authors has potentially positive effects on local authors' productivity. Indeed, it provides training to develop publish-related skills which are particularly important in a context where publication in international academic journals is relatively recent. In sum, systematic gender differences in the likelihood of non-local partnership, as the ones detected, may affect (eventually reinforce) gender gaps in academic production originated in other factors. Previous evidence suggests that networks are relevant to understand gender gaps in production. Ductor et al. (2018) find significant gender differences in research output and link these gaps to gender differences in specific features of co-author networks. Their results show that women have a higher share of co-authored work, they co-author more with senior colleagues, they tend to have fewer co-authors than men, and exhibit greater overlap in their co-authors. After controlling for these network indicators, gender gaps in output decline, but they do not disappear. Based on circumstantial evidence, the authors argue that women -as a consequence of preferences or environmental factors- make less risky choices with regards to academic collaboration, resulting in lower academic output. Given the importance of international networks in the Uruguayan case, the role of this type of partnership deserves a closer look.

According to WP, around 10% of local authors have written production with non-local authors and there is no statistically significant gender gap in this probability (table 4). But JA shows different results, non-local partnership incidence is notoriously higher (37%) and the gap between men and women is statistically significant. Indeed, 45% of men and 30% of women co-authored at least once with a non-local researcher. Within this group, the non-local count index is higher for men than women within these groups. Besides and consistently, also within the group, the share of articles produced with non-local researchers is higher among men than women. In sum, all the indicators show that non-local partnership is more likely among men than women.

JA reflects that researchers who have at least one non-local partnership in their observed publication life have published more articles than researchers who never had (table 5). This holds even if we compare exclusively the number of articles written by local teams. We do not know the source of this difference but there are at least two plausible explanations. First, if networks increase with age, it is possible that the pool of researchers without non-local partnership are younger and then, have still a lower number of publications. Second, as already mentioned, productivity may be positively correlated with non-local partnership whatever the causal relation.

**Table 4. Non-local author's partnership**

	WP			JA		
	Female	Male	All	Female	Male	All
<b>All authors</b>						
Share with at least 1 non-local partnership	10.3	11.8	11.3	29.9**	44.6	37.4
<b>Local authors with at least 1 non-local partnership</b>						
Average count of non-local authors	1.9	3.0	2.6	3.1**	5.9	4.8
Average number of documents	10.5	10.6	10.6	6.6	8.3	7.6
<i>Co-authored by non-local authors</i>	1.5*	2.4	2.1	2.1*	3.7	3.1
<i>Without non-local partnership</i>	9.1	8.2	8.5	4.5	4.5	4.6
<b>Local authors without non-local partnership</b>						
Average number of documents	2.5	2.5	2.5	1.6	1.9	1.7

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1 for a test of means (proportion) testing the null hypothesis that female-group is equal to male-group.

Source: Authors based on WP and JA

Finally, we use JA to analyze the country of origin of journals in which academic production is published. European and Latin American journals are the most frequent destination of articles (Table 5). But the importance of destination varies depending on whether there is a non-local author or not. Latin American journals take account of 53% of articles when written only by local authors; this share declines to 36% for Europe and is only 10% for the USA. In the case of non-local partnerships, Latin American journals' share falls to 22% whereas the share of European and American journals increases to 55% and 23%, respectively. Because there is a non-local partnership gender gap, we may expect gender differences in the geographical area destination of articles. Indeed, female authors are more likely to publish in Latin American journals than males but the magnitude of the gap is low.

**Table 5. Distribution of articles by journal**

	Latin America	USA	Europe	Other areas	All
<b>Documents</b>					
All	41,7	14,4	42,9	1,0	100.0
By at least 1 non-local author	21,7	22,6	54,8	0,9	100.0
By only local authors	53,3	9,7	36,0	1,0	100.0
<b>Authors</b>					
All	45,2	13,7	40,4	0,7	100.0
Female	50,3	14,4	34,7	0,6	100.0
Male	42,0	13,2	43,9	0,9	100.0

Source: Authors based on JA

### *Estimation of the production gender gap*

To explore the potential explanations for the gender gap in journal articles, we perform a multivariate analysis where the observations are the local authors and the dependent variable is the number of publications collected in JA. Under all specifications, the negative binomial model is preferred to the Poisson estimation, suggesting the prevalence of the zero-dispersion parameter. Our main results are displayed in table 6.

In column (1) we report the results of an estimation in which the only independent variable is a female dummy variable that takes value 1 for women and 0 for men; the marginal effect of this variable captures the raw gender difference in the number of articles, resulting in a coefficient of 1.7 in favor of men. In column (2) we include the author's first year of publication. As expected, the estimated coefficient of this variable is negative: recent authors are probably younger and are starting their academic life, so their number of publications is lower. The introduction of the author's first year of publication reduces the female marginal effect, consistent with their latest entrance in the economic discipline and the academic labor market. Thus, part of the gender gap may reflect that we are not able to observe the true complete periods of academic life, and given the latter female incorporation, we observe shorter periods of academic life for women than men.

In column (3) we introduce the female proportion in the author's main field, defined as the most frequent JEL within the documents produced by the author. The sign of the estimated coefficient is positive indicating that publication is higher in more feminized subfields. This result holds even when the female dummy variable is not included. Thus, the marginal effect of the variable female widens for column (2). However, we are aware that the field variable is not exogenous because women may choose the specialization field based on the ease or difficulty of evolving in it. In any case, we argue that, after controlling for potential differences in publication across fields, the gender gap in journal article production remains.

In column (4) we attempt to control partnership with non-local authors. Specifically, for each author, we calculate his/her number of non-local co-authors per article and we include this variable in the estimation. The estimated parameter is positive. We also include the interaction of this variable with the female dummy. We obtain a positive

coefficient but we cannot reject that it is null. Once again, we have to be cautious in the interpretation of the relationship between non-local partnership and productivity, as unobservable abilities may increase both the likelihood of publishing and partnering with non-local researchers. However, we may speculate that production increases with the non-local partnership due to the beneficial effect of the enlargement of networks on productivity. The most interesting result is the reduction of the effect of the female dummy variable: the average marginal effect of the female dummy variable declines from -1.857 in column (3) to -1.310 in column (4). Thus, we may interpret that non-local partnership plays a role in the gender production gap.

We finally control the estimation by the proportion of articles that were written by a sex-mixed local team and its interaction with being female. As reported in column (5) the estimated coefficient of the first variable is negative and the second one is positive but none of them is statistically significant. The marginal effects of being female decline slightly the ones obtained in column (4).

**Table 6. Negative binomial estimation results. Dependent variable:  
Number of documents.**

	(1)	(2)	(3)	(4)	(5)
Female	-0.436*** (0.136)	-0.337** (0.131)	-0.466*** (0.139)	-0.404** (0.159)	-0.452** (0.230)
1st year of publication		-0.0584*** (0.00949)	-0.0519*** (0.00953)	-0.0492*** (0.00895)	-0.0491*** (0.00895)
Female proportion in main field			1.171** (0.464)	1.518*** (0.453)	1.570*** (0.476)
Non-local authors per article				0.556*** (0.152)	0.550*** (0.153)
Non-local authors per article*Female				0.152 (0.301)	0.162 (0.304)
Mixed local team					-0.101 (0.285)
Mixed local team*Female					0.129 (0.382)
Constant	1.560*** (0.0925)	118.7*** (19.05)	105.2*** (19.16)	99.49*** (18.01)	99.31*** (18.01)
Observations	238	238	238	238	238
Lnalpha	-0.191* (0.109)	-0.351*** (0.113)	-0.391*** (0.115)	-0.497*** (0.119)	-0.497*** (0.119)
<i>Marginal effect: female</i>					
Average marginal effect	-1.683*** (0.536)	-1.378** (0.537)	-1.857*** (0.564)	-1.310** (0.626)	-1.294** (0.634)
Marginal effect at means	-1.683*** (0.536)	-1.190** (0.468)	-1.631*** (0.498)	-1.203*** (0.464)	-1.180** (0.477)

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

Source: based on JA

We carried on several robustness checks, estimating for each alternative specification the average marginal effect and the marginal effect at means of the female dummy variable. First, we introduced the main field's author through a set of dummy variables instead of the proportion of women in the field. As we may see in the first of row Table 7, results regarding the gender gap remain negative and significant although weaker than in the main specification

We also tested an alternative indicator of non-local partnership: the number of non-local authors. We cannot reject that the marginal effect of the female dummy variable is null at usual statistically significant levels, indicating again the important role of non-local partnership to explain the difference of production between women and men.

We also did a robustness check using a sub-sample of authors. We dropped authors with production over the 9<sup>th</sup> decile of per author article distribution (30 or more articles). Now the raw gender gap is close to 1.3 articles, capturing that “super-producers” are more likely men. However, the average marginal effect and the marginal effect at means of the female variable in the complete specification remain non-significant, confirming our previous results. If we exclude “super-producers”, the gender gap in production disappears once we control for production with non-local authors.

Finally, we estimated a (left-censored) Tobit model in which the dependent variable is the number of documents weighted by contribution (measured as the share of the author in total authors). We arrive at the same conclusions as the ones reported above. Indeed, the marginal effects of the female dummy have the same signs and statistical significance as in the original model. Again, once we control for the collaboration with non-local authors, the gender gap loses statistical significance.

**Table 7. Robustness checks. Average marginal effect and marginal effect at means of the female dummy variable.**

	Average marginal effect	Marginal effect at means
Raw gap - Table 6, col. (1)	-1.683***	-1.683***
Full main specification - Table 6, col.(5)	-1.294**	-1.180**
Robustness checks:		
1. Fields: dummy variables	-1,165*	-1,101**
2. Non-local partnership: count index	33.69	-0.560
3. Sub-sample: without "superproducers"		
Raw gap	-1,334***	-1,310***
Full specification	-0,674	-0,672
4. Dependent variable: contribution		
Raw gap	-1,503***	-1,503***
Full specification	-0,857*	-0,158*

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: based on JA

## 5. Final comments

Since 1954, when the economics profession was conceived as a discipline with its own academic curricula, the representation of women has increased slowly but steadily. Nowadays women feel as attracted as males to the economics discipline, and the levels of female participation are higher than those observed in other Latin American and developed countries. However, Economics is not a feminized career when compared to other disciplines in Uruguay. The progress in terms of female representation among Uruguayan economists is also reflected in the female share of faculty staff and research institutions, although gender differences prevail for the top positions at the teaching and research careers.

Our analysis about research production in Economics shows that female and male-dominated subfields are similar to the ones reported for developed countries, but the segregation index by subfields is notoriously higher in Uruguay. The links between

segregation in Economics in developed countries and countries with later development of the discipline, such as Uruguay, remain an open question for future research.

Our main results reflect that men contribute more than women to the production of journal articles but there is not a gender difference in the production of working papers and technical documents. A relevant feature of Uruguayan research production in Economics is the high contribution of non-local authors, especially in the case of journal articles. Partnership with non-local authors is more likely among men than women and is positively correlated with the production of journal articles. The fact that international networks and co-authorships impact the probability of publishing and that there are gender differences in their access is relevant for the design of public policies to foster and support academic research. The reasons for lower female partnership with non-local authors need to be further explored to better inform policies. Does international collaboration imply a higher burden for women? Is the lower probability of non-local partnership for females associated with personality traits or preferences, or is it productivity-based? Does the male-dominated nature of Economics at the world level explain this unequal distribution of international collaborations between men and women? Academic interactions and resulting networks can be shaped by institutions to broaden the opportunities for Uruguayan researchers, and especially for females.

Two other avenues for further research on this topic can be identified. First, both at the international level and in Uruguay, women tend to adopt publication strategies more focused on producing books or chapter books than peer-reviewed articles. Understanding the reasons behind these strategies is important for the discussion about how productivity or performance should be measured throughout scientific careers, a crucial aspect in the design of policies to strengthen national research systems in developed countries. Second, our analysis does not take into account the quality of publications. The relatively recent expansion of peer-reviewed publications in Uruguay and the ongoing debate about the adequate metrics for publication-quality are complexities to face to progress on this line of research, which may shed more light on the nature of gender gaps in academic production.

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