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Diversity in economics: a gender analysis of Italian academic production

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ABSTRACT

Economists' infamous failure at predicting the recent financial crisis has brought new impetus to studies on diversity in the economics profession. Such studies have underlined how diversity plays a prominent role in enriching economic analyses. The main purpose of this article is to provide new insights into the degree of gender diversity: rather than looking at women's presence in academia only, we extend our focus to the research production by academic economists in the last few decades. The tendency to identify research quality with standardised bibliometric indicators –i.e. impact factor or h index – had consequences in term of heterogeneity of researchers within institutions (at all levels), and, most of all, in terms of pluralism of research interests. Our new data uncovers a double convergence path: i) a progressive reduction in the variety of research interests of women and men economists; ii) a tendency to "homologate" with international standards of perceived research 'excellence'.

As a consequence of such an impoverishment of pluralism in research, the academic production of both men and women has been drifting away from non-mainstream fields, and, in particular, from heterodox approaches and from the history of economic thought. Since women's academic careers remain markedly characterized by a strong vertical segregation, we find that for women this effect is even stronger since they are more subject to homologating their research activities with respect to that of their male colleagues.

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"(...) there are not enough women within economics to provide a good statistical evidence. The only reason to research gender differences in economics should be to learn about economic profession (...)" (Kahn, 1995, p. 203)

1 Introduction

In a recent article published in the *Journal of Economic Perspectives*, Bayer and Rouse (2016) redrew attention to the importance of increasing diversity in the economics profession. With this in mind, they proposed a new approach to investigate, disseminate and discover data, analyses, and prescriptions. They concluded that: "the field of economics is behind others in its progress on diversity concerns" (p. 238) and described "institutional discrimination" as the adverse treatment of members of minority groups due to explicit or implicit behavioural rules.

In this work, we argue that the concept of diversity in the economics profession is two-dimensional, including not only heterogeneity (in terms of gender, ethnicity, and so on) of researchers within institutions (at all levels), but also pluralism of research interests. In order to combine those two dimensions, our analysis focuses on detecting gender differences in publication topics of Italian academic economists in the last two decades. We consider Italy as case study because, from the 2010 reform of university system, bibliometric indexes have been increasingly used for the purpose of personnel selection, in particular in economics. Those new rules for recruitment of academic staff are creating a more competitive environment heavily founded on rigid standardised indexes of perceive "scientific" excellence. Therefore, we have the opportunity to analyze how social context, mainly in terms of institutional changes, can affect the development of economic thought within the economic profession and if women tend to be more exposed to those phenomena.

The first crucial step consists in the identification of men and women economists' research interests. From this point of view, our work builds on a small but growing literature that departs from Backhouse et al. (1997), which provides a quantitative analysis of economists' output. More recently, the same type of analysis has been carried out by Kelly and Bruestle (2011), Kosnik (2015), and Rath and Wohlrabe (2016). All these studies investigate the changes in general research interests of economists over time. Specific quantitative analyses to isolate trends in single sub-fields in economics, such as the field that focuses on the history of economic thought, have been carried out by Marcuzzo and Zacchia (2017) and Duarte and Giraud (2016) but not much work exists that maps publication trends from a gender perspective. Among the few contributions, Forget (1995) considers the differences between the subject of PhD dissertations in economics and articles published by women in academic journals from 1912 to 1940 in the US. She identifies four

different survival strategies pursued by women economists to compete in academic career paths with their male colleagues.[2]

Inspired by Forget's (1995) analysis, this article concentrates on gender differences in the evolution of academic production mainly in terms of research fields to describe recent trends among economists and also across generations.

In line with the recent tendency to move to mainstream fields of research in economics, detected in the Anglo-Saxon world by Lee et al. (2013) as well as in France by Chavance and Labrousse (2016) and in Italy by Corsi et al. (2010, forthcoming), we found that women are following a "homologation"[3] strategy: they are gradually changing their main research areas to fields where they had been traditionally under-represented (i.e. industrial organisation and microeconomics).

Moreover, they decreased, more than their male colleagues, the production of research in heterodox approaches and history of economic thought, which are usually less visible and therefore characterized by lower bibliometric indexes. Analysing the PhD dissertations, we find that the degree of gender convergence in research increases along the hierarchical structure of the academic career path: homologation is stronger for full and associate professors than it is for PhD students.

The paper is organized as follows: section 2 presents a literature review on gender differences in scientific production in economics and introduces the Italian context. In the process we provide evidence of the under-representation of women in academia and of the gender differences in the career paths in economics in such context. Section 3 describes the data and methodology used for the identification of trends in academic production. In section 4, we present the results of the analysis, focusing mainly on non-mainstream fields (such as heterodox approaches and history of economic thought) while in section 5 we analyze differences across generations by studying gender differences in PhD dissertation topics. Finally, we draw some conclusions providing research policy recommendations and some directions for future research.

[2] The four strategies identified by Forget (1995) are: (i) separatism, or better, concentration of women's publications in research fields where there is a comparative advantage and less male competition; (ii) subordination, defined as women's willingness to remain in second-class role positions or second-rate institutions; (iii) super performance, in the sense of the effort to out-perform male colleagues; (iv) and finally innovation meant as research and work outside the traditional standards of success.

[3] We use here the term "homologation" following Pottage's perspective that embodies also the gender dimension since homologation deny the possibility of a specific feminine culture. According to Pottage (1994), in fact, "homologation (…) preserves the reproduction of culture in the image of a masculine morphology - a morphology sculpted and sustained through techniques of identification and attachment, which institute a self-predicated upon the denigration of otherness; or, specifically, an otherness, which has been attributed a feminine gender".

2 Background

The chronic underrepresentation of women researchers across the European Union (EU) has been reported by the League of European Research Universities (LERU)[4], which underlines how "academia in Europe is still losing a considerable amount of its female intellectual capacity. Whereas the ratio between men and women is relatively balanced up to the doctorate, there is a significant decrease afterwards".[5] This triggers a 'leaky pipeline' phenomenon, whereby an increase in the number of women graduates does not lead to an increase in the proportion of women amongst researchers (Jensen, 2005) and especially at the top levels of the academic career.

In fact, women and men have different career paths in research: at a lower grade (among researchers) gender differences in terms of presence stand at 10 percentage points, while at career top – full professor level - it reaches 58 percentage points. According to the last data available (She Figures 2015[6]) in Europe women count for only 20.9% of full professors, showing very limited progress compared to 2010 (19.5%). There are, of course, notable country and research field-specific variations. For example, in the social science fields in US universities, Ginther and Khan (2004; 2006) report that gender gaps in tenure and promotion rates in economics are higher than in other areas. Ceci et al. (2014) also find evidence of larger gender gaps in tenure rates, salaries, and job satisfaction in economics than in any other math-intensive field.

In the literature the causes of this disparity remain controversial. Different methods are used to investigate the main determinants of gender imbalance in academic positions: qualitative research based on interviews (Bagilhole, 1993), quantitative research based on surveys and questionnaires (McGuire et al., 2004; Wright et al., 2003), as well as analyses of selection procedures within academic departments and faculties (Bagues et al., 2017; Ceci et al., 2014; De Paola, 2016) or public selection procedures (Bosquet et al., 2013; Pautasso, 2015). Researchers have attempted to explain gender differences in promotion rates by looking at discrepancies in productivity (Bettio and Rosselli, 2001; Ginther and Khan, 2004; Sarsons, 2015; Baccini et al., 2014), in task allocations at work (Vesterlund et al., 2013), and at the effect of child-bearing and motherhood on women's career (Ceci et al., 2014; Ginther and Khan, 2006). Recent behavioural and experimental studies stress the relevance of gender differences in competitive environments and highlight the impact of the gender composition of selection committees on the likelihood of obtaining tenure (Bagues et al., 2017; De Paola et al., 2016; Checchi et al., 2015). Many studies, supporting the idea of a male homophily bias, point out that gender inequalities in universities are driven by mostly male-dominated networks, or, as in the case of Italy, by male-dominated networks in Italian economic journals' editorial boards (Addis and

[4] LERU is an association of 21 leading research-intensive universities in the EU created to define concrete recommendations for policymakers, universities, researchers and other stakeholders for an inclusive and innovative academic environment.
[5] Maes et al. (2012, p. 5).
[6] The She Figures report is a complete report about gender differences in careers and decision-making in Science.

Villa, 2003). Studying networks, Blau et al. (2010) and, for economics, Hale and Regev (2014) report that the lack of role models in more senior positions in academia is a key factor that can affect young researchers' choices and their career path. In this sense, women students may expect less discrimination and better outcomes when they study under women's instructors or work with women mentors (Carrell et al., 2010). Even if the results of these studies lead to heterogeneous conclusions, what clearly emerges is the reduced probability of women achieving promotion or tenure, a lower probability of obtaining leadership roles, such as division head or department head, as well as lower salaries with respect to their male counterparts.

Focusing on gender psychological differences in self-confidence, risk aversion, and competitiveness, a new strand of literature (Abramo et al., 2016; Bagues et al., 2017; De Paola et al., 2016) investigates if, in Italian academia, the number of women present in search committees for promotion to associate and full professorship has an impact on the number of women candidates and their probability of success. As far as Italy is concerned, most of the literature[7] reveals that the introduction in 2012 of the new recruitment and promotion system[8] has not increased women's probability of being effectively promoted both for associate and full professorship. According to De Paola et al. (2016) the probability of women of being promoted is, *ceteris paribus*, 12% and 20% less than that of their men colleagues, respectively.

The new promotion mechanism, while bringing higher transparency both in committee selection and evaluation procedures, has not mitigated the 'leaky pipeline' effect in Italy. It is still significantly more difficult for women to access Italian academia, as it is to progress in their career. The analysis of recent data[9] reveals that women represent 36.5% of Italian academic staff. In economics, the share of women is even lower (30.3%); women account for 16% of full professors and 32% of associate professors, while in the lower ranks they represent 46% of researchers.[10]

[7] In table A of the Appendix, we provide a detailed review of studies about gender differences in the economics profession in Italy.

[8] In Italy, from a gender perspective, it is possible to identify two main turning points in the recruitment and promotion system in universities: (i) In 2008 (Decree-Law no. 180), a new system of selection for commissioners was introduced. It involves a random drawing (by lottery) of four external commissioners (to be added to an internal commissioner appointed by the Faculty that holds the competition) out of a pool of previously elected professors of the same research field. This procedure aims to avoid the creation of ad hoc committees and to expand the circle of 'gate keepers'. The mechanism of random selection of the members of the committees had a significant effect: in 2008, there was the highest percentage of competitions with at least one women commissioner (from 34.7% of all pre-2008 competitions in economics to 44.4% in 2008). (ii) In 2012 the rules governing competitions for associate and full professors have undergone a significant change (Decree Law no. 76). Since 2012, researchers who wish to be promoted to full and associate professorship must be eligible for National Scientific Qualification (Abilitazione Scientifica Nazionale, ASN). For each research area, candidates are evaluated by a committee made up of 5 members; only those who meet the minimum requirements, in terms of research production, fixed at the national level by the National Agency for the Evaluation of University and Research (Agenzia Nazionale per la Valutazione dell'Università e Ricerca, ANVUR) may be eligible to compete for promotion to a higher academic rank.

[9] Data by the Ministry of Research and University, updated to 12/31/2015, available at: http://cercauniversita.cineca.it/php5/docenti/cerca.php

[10] I consider the subfield of Economics named SECS-P01.

The gender gap in academic promotion in economics is evident in the persistent gender differences in the hierarchical structure: for women, there is a classic pyramid structure with only 19% of women full professors at the top, followed by associate professors (27%) and researchers at the base of the pyramid (54%). By contrast, for men, the hierarchical structure assumes the form of a reverse pyramid with the largest percentage represented by full professors (41%), followed by associate professors (30%) and finally by researchers (29%). Since 2000, the pyramidal structure has remained the same for women, even if the share of full professors has moved from to 15% to 19% (Fig. 1).

Looking at PhD students, on the other hand, the picture is completely different; even though the number of courses in economics offered by Italian universities has been rather stable in the last decade (43 courses, on average), the number of students has more than doubled (45 students in 2002 and 108 in 2014). From 2002 to 2014 (last data available),[11] the share of women pursuing PhDs in economics increased from 41.8% in 2002 to 42.5% in 2014. In order to account for the difficulties faced by women in gaining access to top positions we compute the Glass Ceiling Index (GCI) for Italian academic economists[12]. The GCI amounts to 1.85 in 2015 compared to 2.55 in 2000, indicating that there has been some progress towards reducing the glass ceiling effect, although women continue to be less represented in full professorship than in general academia.

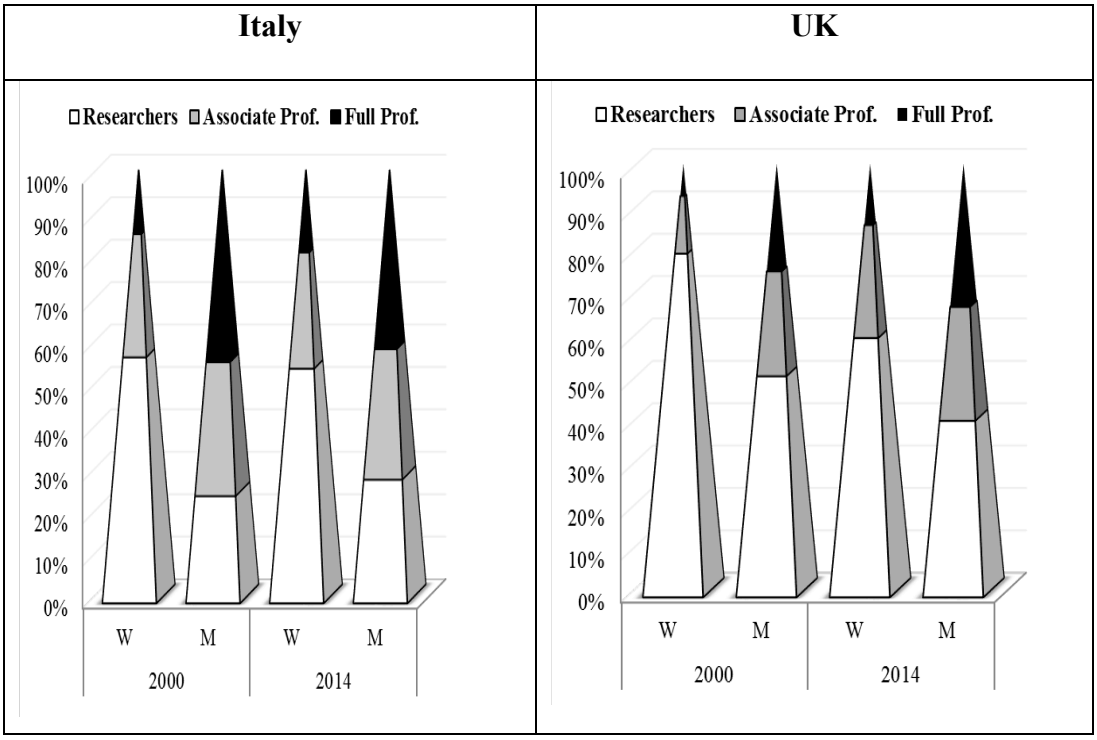
The under-representation of women in economics is not only an Italian phenomenon; in the UK, for example, women account for only less than 27% of academic staff.[13] By academic position, only 14.1% of full professors are women, while at the bottom of the pyramid (considering full time and part time lecturers and researchers altogether) women are more numerous (60%) than their male colleagues. Despite this, women at the top of the academic profession passed from only 7% in 2000 to 14% in 2014. Instead, for men, the inversed-funnel-shaped hierarchical structure observed in 2000, with the largest number represented by researchers, followed by associate and full professors equally distributed, has turned into a hourglass-shaped structure thanks to the increase in the share of full professors (from 24.8% to 33%).

[11]Data by the Ministry of Research and University, available at:
http://statistica.miur.it/scripts/postlaurea/vpostlaurea.asp

[12] The Glass Ceiling Index (GCI) is elaborated by the European Commission in the She Figures report. The index compares the proportion of women in academia to the proportion of women in top academic positions (full professors). The GCI can range from 0 to infinity. A GCI of 1 indicates that there is no difference between women and men in terms of their chances of being promoted. A score of less than 1 means that women are more represented at the top level than in general academia and a GCI score of more than 1 indicates the presence of a glass ceiling effect, meaning that women are less represented in full-professorship positions than in general academia. In other words, the interpretation of the GCI is that the higher the value, the stronger the glass ceiling effect and the more difficult it is for women to move into a higher position.

[13]Mitka et al. (2015).

Fig. 1 Hierarchical structure for academic economists by sex: Italy and the UK



The definition of heterogeneity in research activity in economics from a gender perspective is more complex. Albelda (1997) finds that male economists who are members of the American Economic Association (AEA) are much less interested with respect to women in topics such as women's participation in the labor force, the impact of fiscal and monetary policies on women and family structures, wage discrimination, and the economic status of minority women. Boschini and Sjögren (2007) also find large differences in the share of women across research fields, as "female presence is roughly three times higher in Health, Education, and Welfare than in Macroeconomics and Monetary Economics" (p. 328). Moreover, both Hale and Regev (2014) and Dolado et al. (2008) report that women's interests are concentrated in fewer research fields, influenced by a path-dependence effect: the higher the share of women in a given research field, the higher the percentage of women academic economists who write about that specific research field. However, Dolado et al. (2008) underline that this effect is less evident for new generations, since younger women researchers increasingly seek to access research areas in which women were previously under-represented. All of the above-mentioned studies focus on 'excellence': Hale and Regev (2014) analyze members of the AEA in ten of the top economics departments in the US, Boschini and Sjögren (2007) study co-authorship of articles published in three top economics journals, and Dolado et al. (2008) consider authors in distinguished

economics departments. Here we prefer to abandon the dimension of 'excellence' and study, from a gender perspective, the scientific production of tenured economists, in order to detect the status quo in diversity in economics in Italy and how it has evolved in the last decades.

We believe that the case of Italy, beside its intrinsic interest, can be paradigmatic because of some significant changes in the evolution of diversity in the economic thought probably driven by recent institutional changes, mainly in terms of the abuse of bibliometrics for personnel selection and for the allocation of public resources to universities and public research institutions. Since World War II, pluralism has been a key element of economic thought in Italy. As reported by Pasinetti and Roncaglia (2006), the plurality of schools of economic thought can be considered a reaction to Fascism, which forced many economists to emigrate. Consequently, there has been a simultaneous development, after the war, of different schools of economic thought, particularly studies outside the mainstream, mainly close to post-Keynesian, neo-Ricardian and Sraffian economics, and to evolutionary economics and the history of economic thought. However things are changing; as reported by Corsi et al. (2010, 2017), pluralism could be at risk because the current Italian evaluation assessment, implicitly based on criteria of closeness to mainstream economics, could be determining a change in research interests, in the middle- or long-run. Such a change is expected to induce a homologation towards mainstream economics and the progressive disappearance of heterodox economics, as described by Lee et al. (2013) for the UK as a consequence of the Research Assessment Exercise (RAE)[14].

3 Data sources and research design

To explore the evolution of gender differences in economics, we used *Econlit* as a database. The choice of *Econlit* with respect to other similar databases was dictated by the fact that it includes journals that are selected for having peer-reviewed economic content[15] and detailed information about the articles' sub-field classification.

We follow the methodology reported by Dolado et al. (2008) for identifying research fields using the JEL codes recorded in *Econlit*. JEL codes are alphanumerical codes made up of three levels used by authors or editors to classify scholarly literature in the field of economics. The first level of a JEL code, that is the information analysed in this paper, is a letter. The letter points to a broad classification made up of 20 classes (there are 19 codes plus one residual category). The second level (128 classes) consists of a single letter followed by a single digit. At the third level, the code consists of a single letter followed by two digits. The

[14]Lee et al. (2013) empirically test the progressive decline in variability in approaches and pluralism in research since 1992 in UK in the context of the RAE (for the public resources allocation to Universities) and local department decision making.

[15] This is not the case of RePEc, where journals are not selected, even if they are now creating a committee on quality control for journals admitted to be indexed in RePEc (see https://blog.repec.org/2016/06/13/quality-control-committee-looking-for-volunteer/).

current classification of research areas in *Econlit* was introduced in 1991.[16] Our analysis focuses on JEL codes rather than publications. This means that we double-counted an article with two JEL codes, since it belongs to two different fields. We could not weigh the JEL codes to account for their importance in a single article because *Econlit* mainly records them in an alphabetical order rather than in order of priority as reported by the authors.

Thanks to a careful data collection activity and scrupulous data cleaning aimed at limiting problems of homonymy as much as possible, we have created two databases. Those are used to analyze the scientific production of economists by gender both within the same cohort (we refer to academic position rather than age, since this information is not available) and among different cohorts (structured professors and PhD students).

The first database refers to the time span 1991-2014.[17] It contains the academic production of permanent faculty in economics that were associate or full professors in Italian universities in the period 2004-2014. Such information has been gathered from the Italian Ministry of Research and University. This enables us to perform a panel analysis of the publications of 804 full and associate professors. Women account for 24% of the sample. The total number of publications analysed is 12,931, 18% of which are written by women (see Table B in appendix for a description of the sample). We decided to analyze the evolution of academic production by creating five sub-periods (1=1991-1995; 2=1996-2000; 3=2001-2005; 4=2006-2010; 5=2011-2014) of five years each.[18]

With the purpose of analysing gender differences among Italian economists, we compute the evolution of the Duncan (1955) segregation index across the different research fields in the five identified sub-periods. The index is defined as:

$$S = \frac{1}{2}\sum_{i=1}^{n}\left|m_i - w_i\right|$$

where w_i (m_i) is the proportion of women (men) who wrote in the research field *i* in the considered sub-period. This index computes the proportion of women (men) who have to swap fields with a man (woman) for both sexes to be represented in all fields in a way that reflects their proportion in the whole system. It describes the extent to which women and men are unevenly distributed over the 19 research fields in

[16] For a complete review of the history of JEL code system see Cherrier (forthcoming).

[17] We consider publications only from 1991 in order to avoid conversion problems with earlier JEL codes classifications.

[18] These coincide with those used by the Italian National Scientific Qualification (Abilitazione Scientifica Nazionale) in order to evaluate the overall number of articles published in scientific journals and book chapters written by researchers applying for a promotion to associate professorship. Moreover, Björk and Solomon (2013) report that economics journals typically have average review-times (submission to publication) close to two years, so a five-year period seems appropriate to allow us to detect changes in trends.

economics (JEL codes[19]), so it measures the distance (in percentage) from an equal distribution of women and men across JEL codes, under the hypothesis that homologation implies an identical distribution of women and men over all areas. In particular, 0% indicates equal distribution across fields, while 100% indicates that women and men are interested in completely different research fields.

We also propose a different index of segregation under the hypothesis that homologation implies a distribution of women (or men) across fields identical to the distribution of research fields in the top 10 economic journals,[20] according to the following formula:

$$S_g = \frac{1}{2} \sum_{i=1}^{n} \left| g_i - t_i \right|$$

where g_i is the proportion of women or men that wrote in the JEL code i and t_i the share of JEL code *i* in the 10 top journals. The evolution of the index over years is used as a proxy of the convergence rate to a univocal profile of 'top economist'. The new segregation index has been computed, separately for women and men, in the five sub-periods.

The second dataset enables an analysis of gender gaps in research fields at different stages of the academic career that reflects the situation among younger Italian economists. The identification of younger generations of economists is connected to the academic position rather than age. We consider the award of a PhD as the first step of an academic career that may culminate with full professorship, following the analysis of Italian PhDs in economics by Baccini and Marcuzzo (2009).[21] For this purpose, we created a database containing information about PhD dissertations, gathering data from OPAC. This is a data set created and managed by the National Central Library of Florence, which, in accordance with the Presidential Decree 382/80 and Ministerial Decree 224/99, collects PhD theses from all Italian universities. For economics, by now, the most detailed information is available from 44 Italian universities from 2003 to 2006. The research fields of the PhD theses are identified according to the JEL codes in *Econlit*. For those not recorded in *Econlit*, we assigned JEL codes by looking at the title of the dissertation and the information reported in the OPAC database. We also collected the number of publications of their authors in the five years after the thesis defence and their academic position, if any, in the Italian universities after 10 years from the end of their studies. We analysed 536 PhD theses in economics; women represent 43.5% of the PhD candidates considered.

[19] We do not consider the miscellaneous JEL code (Y) because it is a residual category created to include unclassifiable objects in the classification system, mainly for editorial convenience. It includes table and charts, introductory material or book reviews that do not give any information about the research field preferences.

[20] We consider the first 10 economic journals ranked in Kalaitzidakis et al. (2011): American Economic Review; Quarterly Journal of Economics; Journal of Political Economy; Econometrica; Review of Economic Studies; Journal of Monetary Economics; Review of Economics and Statistics; Journal of Economic Perspectives; Journal of Economic Theory; The Economic Journal.

[21] Baccini and Marcuzzo (2009) find that in Italy PhD students, after they have defended their thesis, are mainly employed in Italian universities (38.9% as research fellows and 23.7% as full-time academic staff).

4 Main results: *Econlit* database

We analysed the aggregate JEL codes of all publications authored by men and women economists from 1991 to 2014, and we find two main trends in the production of Italian academic economists: (i) a decrease in specialization, more evident for women, that is in the tendency, common to both men and women, to concentrate publications in few research areas; (ii) an increase in authors' visibility, in terms of number of publications recorded in *Econlit*, in particular in the 2006-2010 period.[22] It is worth noting that the first national three-year research evaluation exercise (VTR 2001-2003), introduced in Italy in 2006 by Decree N. 2206 of 16 December 2003, has raised a harsh debate about bibliometric criteria.

In the VTR 2001-2003, it was explicitly stated that 'quality', 'relevance', 'originality' and 'internationalization' of research products were central to the allocation of public funds. In this scenario, women academic economists seem to quickly adapt to the new rules of the game, by being more productive and visible in their scientific communities. In fact, women's visibility has increased from 14% in 1991-1995 to 20% in 2011-2014. For all the different types of publications recorded in *Econlit* (book, collective volume articles, journal articles and working papers) the share of women authors eventually increased. From a gender perspective, in the last time span considered, we find a substantial change in the share of women in different research fields. In particular, women have begun writing more in research fields where they had been previously under-represented, such as economic history (N) (their visibility in this field has grown from 7% in 1991-1995 to 40% in 2011-2014)[23] and mathematical and quantitative methods (C) (their presence has increased from 7% to 21%). In public economics (H) alone women have reduced their visibility as compared to the 1991-1995 period. In order to trace some tendencies in the research preferences of Italian economists, we calculate the JEL codes' mean frequencies by periods and sex. We performed a χ^2 test to confirm whether there are significant differences in the distribution of men and women across research fields by period. The results (see Tab. 1) indicate that the difference is significant in all the five periods considered.

There are mainly three common trends both for men and women:

(i) a sharp reduction in publications on the history of economic thought (HET), in line with the international contraction of the share of HET articles;[24]

(ii) a decreased interest in international economics (F), economic system (P) and macroeconomics (E);

(iii) an increase in output examining financial economics (G), economic development and growth (Q) mainly pulled by the international economic crisis and publications about environmental and ecological economics (R).

[22] For the 2011-2014 period the reduction in the number of publications is due to a delay in updating *Econlit* database, since the 2013-2014 production is under-represented.

[23] An increased share of women in economic history from 2000 has been detected also by Casalena (2016) in her study about trends in the historical profession from World War II.

[24] For a complete analysis of international trends in HET see Marcuzzo, Zacchia (2017).

There are indeed some important gender differences in the direction of the changes in research preferences for public economics (H) and labor and demographic economics (J); in fact, while women tend to reduce their specialization in these research fields, in recent years men have increased their publications. For microeconomics (D), instead, we observe the opposite phenomenon: women have increased their interest by 2.4 percentage points since the 90s, while men's interest has decreased by almost 1.2 percentage points.

Tab. 1. Research preferences by sex (%): mean period frequencies

	1991-1995		1996-2000		2001-2005		2006-2010		2011-2014	
	W	**M**	**W**	**M**	**W**	**M**	**W**	**M**	**W**	**M**
A. General Economics and Teaching	1.1%	1.1%	0.2%	0.8%	0.3%	0.7%	0.5%	0.7%	0.5%	0.4%
B. History of Economic Thought, Methodology, and Heterodox Approaches	**16.0%**	9.2%	4.6%	6.6%	4.9%	6.1%	3.0%	4.8%	3.5%	2.2%
C. Mathematical and Quantitative Methods	1.4%	3.3%	4%	3.6%	2.1%	2.5%	2.4%	4.1%	3.8%	3.8%
D. Microeconomics	10.4%	13.9%	11.2%	14.6%	9.9%	13.1%	10.3%	**12.9%**	**12.8%**	12.7%
E. Macroeconomics and Monetary Economics	7.3%	**21.0%**	11.1%	**16.9%**	8.6%	**13.9%**	7.8%	12.1%	5.4%	**13.1%**
F. International Economics	7.6%	9%	10.9%	8.9%	8.6%	8.4%	6.3%	6.4%	4.6%	4.9%
G. Financial Economics	6.2%	5.2%	4.7%	4.7%	5.8%	6.7%	6.8%	6.5%	6%	8.1%
H. Public Economics	10.9%	4.9%	7.5%	4.7%	7.6%	5.8%	7%	5.4%	6.5%	6.3%
I. Health, Education, and Welfare	0.8%	0.8%	1.6%	1.6%	2.2%	2.0%	5%	2.8%	7.4%	3%
J. Labor and Demographic Economics	14.3%	8.8%	**15.2%**	9.1%	**13.4%**	8.8%	10.3%	8.3%	12.3%	9.6%
K. Law and Economics	0.8%	0.6%	0.5%	1.1%	1%	1.4%	1%	1.5%	1.6%	1.3%
L. Industrial Organization	8.7%	6.6%	9.3%	7.7%	10.9%	11.3%	**12.9%**	12%	10.6%	11.4%
M. Business Administration and Business Economics, Marketing, Accounting, Personnel Economics	0.3%	0.5%	0.2%	0.4%	1.7%	0.9%	1.6%	1.5%	1.8%	1.3%
N. Economic History	0.6%	1.4%	1.1%	0.8%	0.4%	0.8%	1%	0.7%	1.3%	0.6%
O. Economic Development, Innovation, Technological Change, and Growth	5.9%	7.9%	8.1%	10.8%	9.3%	8.7%	8.3%	8.8%	8.5%	9.3%
P. Economic Systems	3.1%	3.1%	1.9%	2.8%	3.6%	2.1%	2.4%	1.7%	1.2%	1.6%
Q. Agricultural and Natural Resource Economics, Environmental and Ecological Economics	1.4%	1.4%	1.3%	1.9%	2.4%	1.9%	2.7%	3.3%	4.3%	5.1%
R. Urban, Rural, Regional, Real Estate, Transportation Economics	3.4%	1.3%	6.2%	2.9%	6.5%	4.5%	9.2%	5.3%	6.3%	4%
Z. Other Special Topics	0.0%	0.2%	0.3%	0.2%	0.9%	0.6%	1.8%	1.2%	1.7%	1.4%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Test χ^2 H_0: distribution of men = distribution of women	$\chi 2$ (18)=93.9***		$\chi 2$ (18)=125.7***		$\chi 2$ (18)= 150.5***		$\chi 2$ (18) =208.3***		$\chi 2$ (18)= 125.7***	
Test χ^2 H_0: distribution of women is the same in the five periods	χ^2 (72) = 464.8***									
Test χ^2 H_0: distribution of men is the same in the five periods	χ^2 (72) = 998.5***									

Note: main research fields per period in bold
asterisks denote level of significance *** 1%

Nevertheless, the main evidence emerging from the data is the following: while for men, the main research fields considered (macroeconomics, monetary economics -E- and microeconomics -D) have been the same in all periods, for women economists, main research fields have gradually shifted from history of economic thought (B) and labor and demographic economics (J) to industrial organization (L) and microeconomics

(D), fields where they had been traditionally under-represented. This evidence is in contrast with the results by Hale and Regev (2014), which suggest that academic disciplines with very few women attract fewer women. It would be interesting to keep analyzing this phenomenon in order to identify whether it is an outlier or a new trend to be studied.

We also examined the evolution of the Duncan segregation index to identify how gender differences in research fields' publications changed in the last period. As reported in Fig. 2.a, there is a clear trend towards a reduction in gender segregation among different fields; homologation is higher in 2001-2005, which means that women and men progressively tend to undertake research in the same areas, and their publications tend to converge towards the same research fields. From then on, the index has experienced only small variations. It is important here to stress that changes in the Duncan segregation index are only due to changes in preferences of researchers and not to changes in the sample (such as an increase in the number of women entering the academic profession), because we follow the evolution of the academic production of the same authors (804 tenured Italian economists see table B in appendix for details) throughout the years.

Since the Duncan index is bidirectional, it only provides us with information about the convergence process of publications by sex but not its direction (that is, whether women's publication topics are converging towards men's or vice versa). Hence, for a better insight on the level of diversity in the economics profession in terms of pluralism of research interests, we recalculated the Duncan segregation index separately for women and men considering the distribution of JEL codes within the articles published in the 10 top economic journals. The evolution of this index describes the rhythm of convergence/divergence to an international univocal profile of economist, characterized by the highest visibility and standard bibliometric indexes of quality (i.e. Impact Factor by Thomson Reuters and the Scimago Journal Indicator by Scopus). We focus on the articles published in the 10 top economic journals because they are characterized by a high segregation into few research areas (in all the five sub-periods more than 30% of all articles are concentrated in only two JEL codes) and less heterogeneity, since the variance among different JEL codes by period is on average higher than that calculated by Italian economists. Kosnik (2015), in her analysis of over 20,000 academic articles published in seven top research journals[25] from 1960–2010, finds that the targeted research categories (JEL codes) have remained relatively stable throughout the years.

As Fig. 2.b clearly displays, there is a common trend towards conformity, even if women Italian economists still tend to be more diverse in their research interests with respect to the top journals' JEL codes distribution than their male colleagues. Therefore, we have detected a double convergence path for Italian academic economists in the last decade: women and men tend to converge towards the same research interests and concurrently men tend to conform at a faster pace to a univocal concept of excellence in research.

[25] American Economic Review, Econometrica, Journal of Economic Literature, Journal of Economic Perspectives, Journal of Political Economy, Quarterly Journal of Economics and Review of Economic Studies.

The double convergence path just described implies a consistent reduction in diversity in economics, fundamentally connected to the concept of pluralism of research. This phenomenon becomes evident when studying how the scientific production in less mainstream fields, mainly heterodox economics and history of economic thought, has changed in the last decades.

To classify a product as heterodox, we use the same classification reported by Corsi et al. (2010),[26] while for HET we consider all the articles reporting at least one of the following JEL codes: (i) B1- History of Economic Thought through 1925 (ii) B2- History of Economic Thought since 1925 and (iii) B3- History of Economic Thought: Individuals. For heterodox studies, there has been a strong contraction in academic output since 1996, especially by women (see Fig. 2.c). In fact, there has been a real collapse of the scientific production on these issues authored by women: about 0.5% of the total scientific production in 2011 and 2012 and 0% in 2013 and 2014. The same declining trend is observed for publications in HET (see Fig. 2.d), although in this case gender differences are even more pronounced; their share has decreased from 22% in 1991 to 1.8% in 2014.

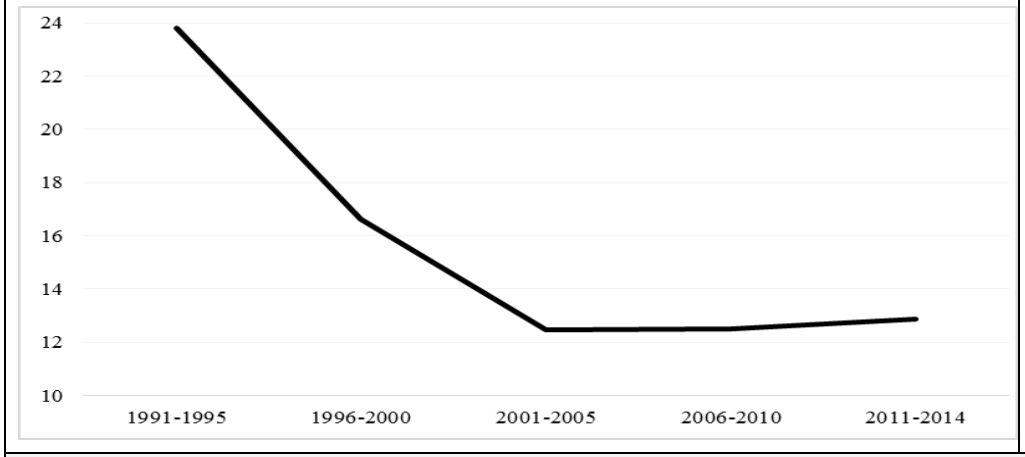
Both in heterodox economics and history of economic thought, from the mid-90s, there is a clear tendency among women to reduce their publications in these fields at a faster pace than their male colleagues, therefore to contribute less to the evolution of these research areas.

[26] Heterodox publications generally have the following JEL codes: B5 - Current Heterodox Approaches, B50 - General, B51 - Socialist; Marxian; Sraffian, B52 - Institutional; Evolutionary, B53 - Austrian, B54 - Feminist Economics, B59 - Other, E1 - General Aggregative Models, E11 - Marxian; Sraffian; Institutional; Evolutionary; E12 - Keynes; Keynesian; Post-Keynesian.

Fig. 2. Gender trends in academic production of Italian academic economists 1991-2014

Homologation paths in research by sex

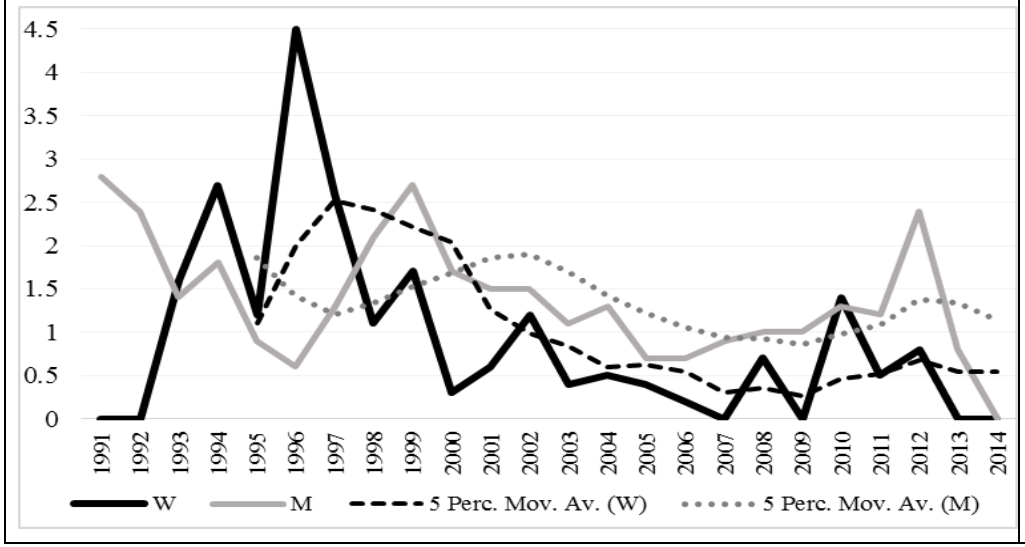
a. Duncan Segregation Index: Women – Men Italian economists



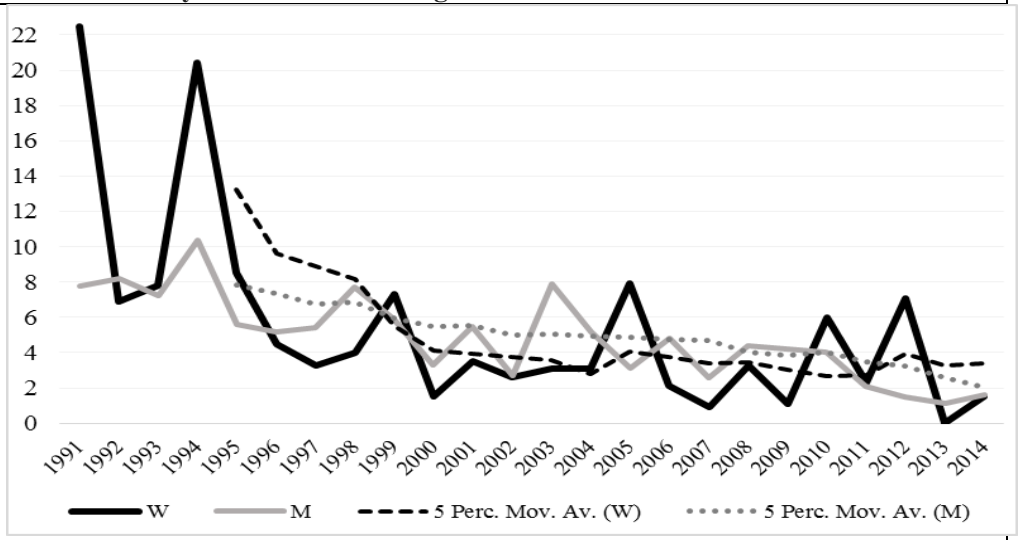
b. Duncan Segregation Index: Homologation toward top journal's JEL distribution

Publications' trends in Heterodox Economics and History of Economic Thought by sex

c. Heterodox Economics



d. History of Economic Thought



5 Diversity in PhD dissertation topics in economics

Finally, we study gender differences between younger economists, by analysing 536 PhD theses in economics presented in 44 Italian universities from 2003 to 2006, 43.5% of which written by women.
The first gender difference concerns dissertation supervisors: only 16.8% of all students are supervised by a woman.[27] For women students the percentage is higher: 21.1% have at least one woman supervisor, while this percentage falls to 13.4% for men. Only 4.7% of students have two women supervisors, with low gender differences (5.5% of women students compared to 4.1% of men students).

What emerges from the research is that half of the PhD theses (presented between 2003 and 2006) on labor economics, history of economic thought and public economics were written by women. On the contrary, women are significantly under-represented in economic history, macroeconomics, and monetary economics. Focusing on preferences in research fields by gender , instead of gender distribution among research areas, women seem to concentrate more on international economics, while their male colleagues prefer microeconomic issues (see Tab. 2).

Tab. 2 PhD theses: Research preferences by sex: mean period frequencies (2003-2006)

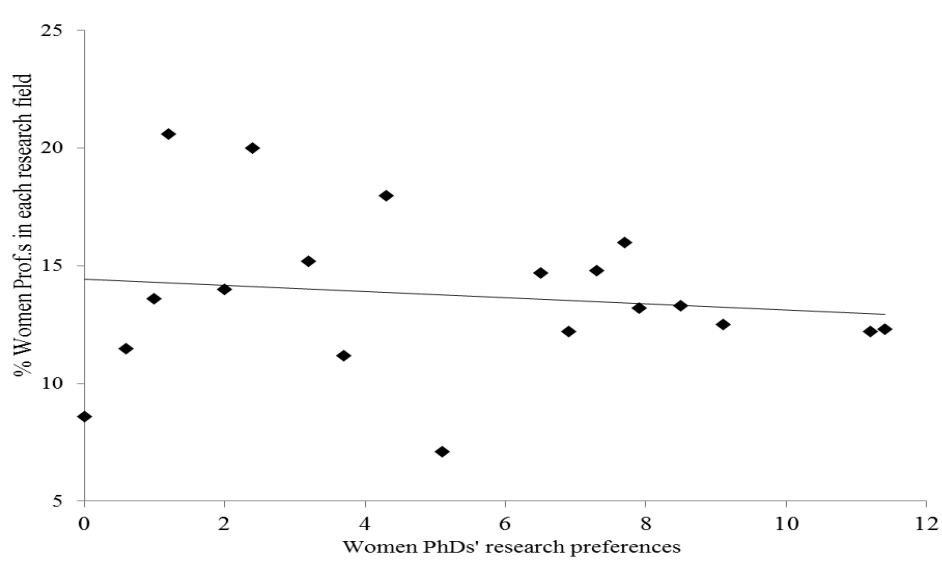
	W	**M**
A - General Economics and Teaching	0%	1%
B - History of Economic Thought	3.7%	2.5%
C - Mathematical and Quantitative	7.7%	7.8%
D – Microeconomics	7.9%	10%
E - Macroeconomics and Monetary Economics	5.1%	10%
F - International Economics	9.1%	6.9%
G - Financial Economics	6.9%	5.9%
H - Public Economics	7.3%	5%
I - Health, Education, and Welfare	3.2%	1.8%
J - Labor and Demographic Economics	6.5%	3.7%
K - Law and Economics	1%	1.8%
L - Industrial Organization	11.2%	10.6%
M - BA Marketing; Accounting	1.2%	1.5%
N - Economic History	0.6%	3%
O - Economic Development Growth	11.4%	14.3%
P - Economic Systems	2%	1.7%
Q - Agricultural and Natural Resource Economics	8.5%	5.6%
R - Urban, Rural, Regional	4.3%	5%
Z - Other Special Topics	2.4%	1.9%
Test χ^2 H_0: distribution of men = distribution of women	45.3***	

In order to identify 'generational' differences in research fields, we compare the PhD theses with the articles written by 654 full and associate professors (117 women, for details see Table B in Appendix) published in 2003-2006. Tenured women are more visible in fields like business administration, business economics, and local and regional economics, completely different areas with respect to those chosen by younger women economists. The results are similar to those reported by Forget (1995, p. 31), in that we also find that women tend to "concentrate on a smaller range of topics in the journal literature than they did in their selection dissertation topics". Once more, our findings indicate a sharp contrast with Hale and Regev (2014) since we

[27] PhD students can have up to two supervisors (in Italian *relatore* and *correlatore*).

find no evidence of a 'path dependence' effect in women's choice of research field. As is clearly visible in the scatter plot reported in Fig. 3, a higher share of women professors in a certain area of research does not seem to affect young researchers' choice of PhD theses fields.

Fig. 3 Lack of path dependence effect: women professors' presence in research fields and women PhD's preferences



There are gender differences in terms of academic careers among younger economists as well. Ten years after their thesis defence, 46% of PhDs, 52.5% of whom are women, are employed in Italian universities. For men, there is a temporal linearity: the greater the number of years since PhD graduation, the higher the share of people employed in Italian universities. For women, instead, this is an irregular trend. Those who obtained a PhD in 2003 and in 2005 have the highest rate of university employment. For younger women, geographic mobility is higher than for men: the share of those employed in the same university they obtained their PhD in is higher for men (38.3%) than for women (34.18%). By academic status, 76.9% of those employed in Italian universities work as full-time researchers, 7.5% as fixed-term researchers and 10.2% as associate professors, while only one PhD student has reached full professorship within eight years. Disaggregating the data by sex, differences in career paths are evident even in younger generations. Only 3.8% of the women are associate professors, while the share is higher for men (15%).

There are also important gender differences in productivity since the beginning of academic careers. We analyze publications by younger economists in the 5 years following PhD graduation[28] and use their h-index as a measure of impact.[29] The h-index summarizes in a single number two relevant pieces of information: the number of publications and the number of citations of each author.

[28] We prefer here to use Google Scholar rather than *Econlit* because it considers a greater number of publications in Italian.

[29] We calculate the h-index using the software Publish or Perish, from the publications in Google Scholar, in the five years following PhD thesis defence. For a detailed analysis of the strengths and weaknesses of the h-index see Rousseau and Leuven (2008).

The 2003-2006 PhDs employed by Italian universities have a median number of 9 publications in the five years following the achievement of the title. Men are more productive and visible; their median number of publications is 13 and the median h-index is 3, while for women, the median number of publications is 8 and the h-index is 2.

Looking at mentors, supervisors of the same sex as the candidate seems to have a positive effect on PhDs' productivity: the median number of publications within 5 years from PhD graduation is higher for women who have chosen women supervisors. The same occurs for men; those who have had only men PhD supervisors show a higher productivity. On the other hand, the h-index is higher, both for men and women, for those who chose only men supervisors (see Tab. 3). This means that the number of citations (and not the number of publications) is higher for the researchers who had only men supervisors.

Since citation count is one of the metrics used in the research assessment for defining hiring, tenure, and salary, it imposes a reflection on bibliometric indices and how corrective action (such as the activation of stronger citational networks) should be introduced, in which a continuous monitoring on research using a gender perspective is also provided.

Tab. 3 Mentoring effect by gender

		Younger Italian economists: PhDs					
		Women			**Men**		
		%	***Productivity***		**%**	***Productivity***	
			Median no. of publ.	Median h-index		Median no. of publ.	Median h-index
PhD Supervisors	**Only women**	9.5	10	2	3.2	2	2
	Mixed	10.8	8.5	2	10.5	5.5	1
	Only men	79.7	8	3	86.3	14	3

6. Concluding remarks

This article contributes to the analysis of diversity in the economic profession by combining two different dimensions: heterogeneity of researchers and pluralism of research interests.

Concerning the former, we find that the 'leaky pipeline' effect is evident in Italy: it is still significantly more difficult for women economists to access Italian academia and progress in it. We find evidence of gender differences among younger generations as well, both in terms of career access (progress) and production. In the latter case, effective mentoring of young women economists could help provide them with the know-how and networks that could boost their careers and reduce gender inequalities at the first stages of the path.

As far as diversity in research interests is concerned, this work is a first attempt at identifying and quantifying trends related to research interests that are connected with gender differences. In line with the recent tendency to prefer mainstream fields of research in economics, as detected in the Anglo-Saxon world by Lee et al. (2013) as well as in Italy by Corsi et al. (2010), we find a double convergence path: a

progressive reduction in diversity in research interests between women and men economists and a common conformity trend towards an international standard of perceived research 'excellence', characterised by high visibility and concentration in few research fields. Moreover, among Italian economists, we find a sharper decrease in women researchers in non-mainstream fields, in particular heterodox approaches and history of economic thought, over the last years.

Many interesting questions remain. Is there also a convergence in the quality of publications by men and women? Is the double homologation path an international trend or an Italian peculiarity? Is the choice of research fields driven by institutional characteristics such as different national research evaluation systems?

The last question is of particular interest for Italy, because a bibliometric approach is increasingly prevailing in economics, in contrast with the tendency that can be seen on an international level to redefine 'responsible' metrics for research assessments.[30] Considering the increasing popularity of bibliometric indexes in Italy, it is important to raise a debate over what is the best way to account for diversity, using a range of indicators that reflect and support plurality in research and in researchers' career paths, and trying to anticipate the systemic and researchers' potential reaction to the adoption of every indicator. In this sense, as a way to preserve diversity in economics, it would be useful to monitor future trends also from a gender perspective.

[30] See the San Francisco Declaration on Research Assessment (DORA -http://www.ascb.org/dora/) and the 2015 Independent Review of the Role of Metrics in Research Assessment and Management (http://www.hefce.ac.uk/pubs/rereports/Year/2015/metrictide/Title,104463,en.html)

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Appendix

Table A

Author(s)	Object of investigation	Research field(s)	No. of observations	Main Findings:
Bettio, Rosselli 2001	1999-2000 competitions for assistant, associate, full professor	Economics	432 candidates	(i) with the new promotion rules the number of women in the academic staff on average increased; (ii) a non-continuous recruitment mechanism is more gender equal: the probability to pass the competition for women is higher in a competition that has a higher number of opened tenure positions (the probability to win a competition is higher for 4 women on a competition for 20 positions than for 1 woman in a competition for 5 positions)
Addis, Villa 2003	Editorial boards of Italian academic economics journals	Economics	36 journals 1970-1996	(i) women are perceived as not suitable to be editorial board members, whatever their scientific accomplishments; (ii) this process of selection based on gender stereotypes keeps women at the margin of professional networks, hinders their professional development, and prevents them from achieving their full potential as scholars.
Lissoni et al. 2011	2004-2005 promotions of French and Italian academic physicists	Physics	1,816 Academic Staff	(i) checking for publications, the probability of promotion for academic physics is significantly lower for women; (ii) There is a generational effect: women at the early stage of their careers are penalized in their publication activity, but then in order to be promoted to higher ranks they publish as much as their men colleagues.
Baccini et al. 2014	2008-2011 scientific production of profs	All fields	942 Prof in U. of Siena	(i) negative gender effect in all research production indexes (no. of publications, h index); (ii) Women face ceteris paribus more difficulties than man in publishing.
Bagues et al. 2017	competition to associate and full prof Italy -ASN 2012; Spain - Habilitacion 2002 – 2006	All fields	69,020 ASN candidates	(i) no empirical support to suggest that the presence of (a few) women in evaluation committees has a statistically or economically significant positive effect on the chances of success of women candidates; (ii) on average there a small but significant negative role of women's presence in the commission in promoting the hiring of women candidates, with respect to committees composed only by men evaluators. An extra woman in a committee of five members lowers the success rate of women candidates by approximately 1.8 pp with respect to men.
Checchi et al. 2015	2009-2011 recruitment in Italian research institute (FBK)	Hard Sciences	664 candidates	Positive role of women's presence in the commission in promoting the hiring of women researchers, in particular for non-tenure-track positions
De Paola, Scoppa 2015a	competition to associate and full professorship before ASN 2012	Economics and Chemistry	1,007 candidates Economics	(i) positive role of women's presence in the commission in promoting women candidates: women are less likely to be promoted when the committee is composed exclusively of men, while the gender gap disappears when the candidates are evaluated by a mixed-sex committee; (ii) committees composed exclusively of men discriminate against women, reducing their probability of success by about 6.4 pp. However, gender discrimination disappears when a mixed-sex committee judges candidates.
De Paola et al. 2015b	competition to associate and full prof Italy -ASN 2012	All fields	8,523 candidates	(i) women have a lower probability of entering the competition of about 4 percentage points, both for competitions to associate and to full professor positions; (ii) the gender gap reduces considerably for individuals with average productivity and vanishes completely for individuals with a high level of scientific productivity; (iii) the gender gaps in competitiveness could be explained almost entirely by the fact that women are reluctant to apply because of their expectation of being discriminated against.
Pautasso 2015	competition to associate and full prof Italy -ASN 2012	All fields	59,150 candidates	(i) evidence of a generally lower success rate of women's vs. men's applications; (ii) generally no significant correlation between the number of women members of the judging commissions and women's success rates
Abramo et al. 2016	competitions to associate professor in 2008	All fields	1,300 candidates	(i) no gender-related differences occur among the candidates who benefit from positive bias, while among those candidates affected by negative bias, the incidence of women is lower than that of men; (ii) same gender as the committee president is a factor that assumes greater weight for men applicants than for women;
De Paola et al. 2016	Probability of being promoted for individuals who have obtained the ASN	All fields	13,967 candidates	(i) for associate professors differences between men and women are of about 12 p.p. ceteris paribus; (ii) for full professors gender differences are 20 p.p. When the number of available slots is un-limited they find no gender gaps; when a limited number of positions are available, women suffer a particular kind of discrimination.

Table B. Data description

1- Sample of tenured Italian economists

Associate and full professors 2003-2014
(with at least 1 *Econlit* output 1991-2014)

tot	*% women*
804	*24%*

Academic production - Econlit 1991-2014

	publications		JEL codes	
	tot	*% w*	tot	*% w*
1991-1995	1285	*14%*	2260	*16%*
1996-2000	2399	*17%*	5537	*19%*
2001-2005	3332	*19%*	9275	*23%*
2006-2010	4154	*19%*	12347	*23%*
2011-2014	1761	*20%*	5156	*21%*

Women visibility per type of publication

	Book	CVA	JA	WP
1991-1995	13%	12%	17%	3%
1996-2000	15%	15%	18%	15%
2001-2005	18%	17%	20%	15%
2006-2010	17%	19%	19%	16%
2011-2014	27%	21%	20%	19%

2- Sample of younger Italian economists

PhDs in economics 2003-2006 – Opac database

tot	*% women*
536	*43.5%*

tenured 10 years after thesis defence

tot	*% women*
191	*41.4%*

Productivity Google Scholar 5 years after PhD

	tot	*W*	M
mean	4	*3*	5
median	7.8	*6.2*	9.1

Impact - H index 5 years after thesis defence

mean	1	*1*	1
median	1.9	*1.6*	1.9

3- Full and associate prof. 2003-2006

tot	*% women*
654	*18%*

Production- Econlit 2003-2006

tot	*% women*
2040	*13%*

Table C JEL codes mean period frequencies in top journals

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Z
1991-1995	1.8	1.1	9.3	**21.8**	10.1	5.9	6.0	3.9	4.7	**10.9**	1.3	7.6	1.5	2.0	6.7	1.7	2.1	1.5	0.1
1996-2000	1.1	1.0	8.4	**18.1**	**11.4**	5.5	6.5	5.8	4.2	**12.6**	1.2	5.9	1.1	2.4	8.9	2.1	2.1	1.5	0.3
2001-2005	1.0	0.1	7.9	**19.0**	**13.0**	6.2	7.8	4.9	5.2	9.9	1.5	6.7	1.6	2.5	7.6	0.9	1.3	2.0	0.8
2006-2010	0.7	0.4	6.6	**19.7**	**14.2**	5.4	8.0	4.6	5.1	10.0	1.4	6.2	2.1	2.1	7.3	1.0	1.6	1.9	1.8
2011-2014	0.5	0.5	6.6	**20.5**	**11.3**	4.3	8.8	5.9	5.2	9.9	1.8	7.2	1.4	2.2	6.5	0.7	2.6	2.2	1.8

Note: main research fields per period in bold; we consider top journals the first 10 economic journals ranked in Kalaitzidakis et al. (2011): American Economic Review; Quarterly Journal of Economics; Journal of Political Economy; Econometrica; Review of Economic Studies; Journal of Monetary Economics; Review of Economics and Statistics; Journal of Economic Perspectives; Journal of Economic Theory; The Economic Journal.