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Pipelines or pyramids: A review of barriers for women in economics

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Work in progress.

Abstract

The persistence and the extent of barriers to women in economics make the discipline unique. To know how to reduce these imbalances, we need to understand their causes. In this paper, we review the recent literature and contribute data analysis to evidence the key barriers female economists face and policies that have proved efficient at reducing imbalances. Showing that gender differences have reduced in the last 10 years, we evidence heterogeneity in progress across several dimensions such as ranking and space, with most of the changes being observed at the top of the 'pyramid'. After framing imbalances, we highlight potential drivers of them. Initially this is by understanding differences in women's behaviours and career choices. We gather evidence of the economics field not being gender neutral: showing differences in evaluation standards, lower recognition of women's scientific contributions and abilities, and signs of a hostile environment. Building on the literature in labour economics, we show that in the job market for economists, female applicants face similar discrimination mechanisms as in other labour markets. We discuss how these findings could be used to design the job market for economists to mitigate gender differences. We then turn to the experimental literature to discuss different applications of policies aimed at promoting gender balance. By reviewing the recent literature on barriers faced by women in economics, this study aims at contributing to a better understanding of the policies to reduce imbalances while considering their distributional effects.

JEL codes: A11, A20, J16, J44, N01.

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1 Introduction

Among academic fields, economics is not unique in having barriers to women. What makes economics unique is the persistence of gender imbalances and their position compared to other disciplines. The lower presence of women in economics (26% based on RePEc data) is comparable to many male-dominated academic fields such as Science, Technology, Engineering, and Maths (STEM) than other social sciences (Bayer and Rouse, 2016). But economics progress over time has seemed to stall compared to STEM (Lundberg and Stearns, 2019). To know how to reduce these imbalances, we need to uncover their causes. In this paper, we review the recent literature and contribute data analysis to evidence the key barriers female economists face and policies that proved efficient.

Our evidence began in 1973. Carolyn Shaw Bell, the then Chair of the newly formed Committee on the Status of Women in the Economics Profession (CSWEP), invited Milton Friedman, then Professor at the University of Chicago, to present a review of CSWEP's work. For Milton Friedman, the proposed actions of CSWEP, especially the interventions in the marketplace of economists, went against his and the prevailing economic thought. He stated, in 1973 correspondence and reaffirmed in 1998, 'there is no substitute for the attempt at complete objectivity and colour-blindness' adding 'in the long run numbers do not matter, but quality does' (Friedman, 1998).

This anecdote illustrates the idea discussed by Chassonnery-Zaïgouche et al. (2019) that economists are at the same time theorists of, and subject to, their own scientific analysis: economics theory strongly influences the way economists choose to address gender imbalances. The literature on gender imbalances within economics is indicative of what the field identifies as the main barriers, prevailing equity considerations, and economists' favoured solutions. This is why we think reviewing the current literature on gender imbalances in economics from the economic field is of interest.

This literature is growing: between 1980 and 2000, Google Scholar enumerates 329 journal articles mentioning 'Women in economics', against 2440 papers between 2001 and 2023, indicating the strong interest of the discipline to reflect on its field.[1] Other literature analysed gender imbalances in the labour market in general (see Grosjean (2021) for a comprehensive review of this literature), and other sciences have analysed the consequences of gender as a social structure. We draw from these works when needed but focus mainly on economic papers in the academic field. The aim of this review is to understand what the field identifies as the main forces driving gender imbalances and the solutions discussed to address them.

We first contribute to the economic literature on women in economics by providing empirical evidence synthesising the persistence of imbalances across several dimensions of the economic field. This is achieved through gleaning and interrogating two separate data sources from 1973 to 2023. Persistent differences occur both geographically and over time, as well as in scientific hierarchies. Fewer women start studying economics, continue on to academic careers, achieve tenure and publish in high-ranking journals. Recent discussions in economics emphasised a "leaky pipeline" phenomenon (Buckles, 2019). We show the results of such leaking flows is a pyramid like structure of the stock women in economics, with a decreasing number of female scholars present as seniority or ranking increases. We also provide evidence of change occurring at the end of the pipeline—the top of the pyramid, while the rest is more stable. These barriers—glass ceilings or

[1]The bibliometric search was done on Google Scholar on the 6th of March, 2023. The search is restricted to journal articles written in English.

systemic obstacles—constitute imbalances both across gender and within gender.

We turn to mechanisms identified by the economics literature driving the lower share of women in economics. We review recent works identifying the barriers to lowering the presence of women compared to men in the field. Women differ in their choice to pursue academic careers, in the way they pursue them and in their choice of co-authors. These behavioural differences drive gender differences in career outcomes. Differences in choices should also be understood in terms of differences in conditions of choices. We discuss literature uncovering the higher costs for women researchers of pursuing an academic career due to non-gender neutral or even hostile workplaces. We then discuss research analysing how labour market structures interact with gender structures and generate imbalanced labour market outcomes. Finally, we review the policy recommendations discussed within the field. Recent work has shown that, among others, networks, mentoring, and representation can be successful tools in increasing the share of women in economics.

Other reviews of the literature on women in economics are worth noting. In particular, Lundberg and Stearns (2019) describes progress across time made by women in US economics departments and discusses barriers, Boustan and Langan (2019) provide evidence on what US economics departments characteristics make more women student succeed, and Buckles (2019) reviews solutions to fix leaky pipelines. We complement these papers by adopting a global focus on gender imbalances and discuss mechanisms playing at the individual, university, and field levels. We also believe that due to a rapidly growing literature, an updated literature review on women in economics is of general interest.

The paper proceeds as follows. Section 2 describes gender imbalances in economics over time and geographic and social dimensions in the field. Section 3 details scientific discussions on differences in choices between men and women in academic careers. Section 4 discusses evidence of a non-gender-neutral field. Section 5 presents features of the labour market for economists and how they might perpetuate imbalances between genders. Section 6 presents policy recommendations from the economic literature. A final section concludes.

2 Overview of imbalances.

To discuss the future promotion of gender equity, the current imbalances for women in economics must first be understood. Therefore, this overview begins with a brief snapshot of the state today before looking at variation across economics' custodians—looking at how this plays out in the literature; across time—here on the changing pipeline of women in academic positions; and finally, variation across space—mainly focusing on differences across countries.

2.1 General overview.

The imbalances for women in economics are visible across geography and seniority, although there is considerable variation between both. To understand where barriers occur, it is informative to look at the pipeline of talent—from those starting in school to those reaching the top.

At the end of this pipeline is arguably the Nobel Memorial Prize in Economic Sciences. Here, charting the winners—out of 89 awards—only two 'Nobel' economic prizes were awarded to women. Namely Elinor Ostrom in 2009 and Esther Duflo in 2019. It is important to note that the Nobel prize is often awarded for ideas a decade or two prior. Yet, the small number of female awardees

evidences historical barriers to women in the pipeline to the top of economics.

Slightly below the end, there is further considerable under-representation in senior academic positions. For example, far fewer women than men are in tenure positions at universities. In a survey of 238 economic departments and business schools worldwide, women held a quarter of senior-level positions—full professor or associate professor—and just over a third of those at the junior level (Auriol et al., 2022). Slightly down the pipeline still—imbalances are still high. Globally, the share of women in economics cohorts who graduated at PhD level plateaued from the 1970s to the 1990s at less than 10% but reached 26% in 2021 (RePEC 2022).[2]

This overview underscores a critical strain in the literature, the premise of a 'leaky pipeline' in economics: as we observe later stages of economics careers, women tend to disappear. The result is a pyramid structure of women in economics with comparative fewer female scholars at each stage. This can be due to choices, imbalances and barriers triggering women to leave the economics field, and we review papers exploring these mechanisms in later sections.

The leaky pipeline mechanism applies with a heterogeneous strength across institutions, depending on research productivity. In Europe, for example, universities ranked 100 places higher than others were shown to have three percentage points fewer women in senior positions. In the US, this gap is larger—it is almost five percentage points (Auriol et al., 2022).

2.2 Imbalances across custodians.

The clear institutional imbalances across space and time are also shown with the economic custodians. These custodians have influence and authority in the field. The lack of women in these positions could underline either the lack of qualified women or the barriers to access these positions. In addition to considerations on the benefits of more representation, custodians' imbalances could be worrying if the way their authority is exerted or perceived differs along their gender.

Custodian imbalances are salient in the 100 Years of the American Economic Review's The Top 20 Articles (Arrow et al., 2011). Of those articles picked, only one female-authored paper, Anne Krueger's 1974 "The Political Economy of the Rent-Seeking Society", was chosen. The other 19 papers and 26 authors were men.[3] Since 1969, only two Nobel economic prizes have been awarded to women. Focussing on recent years, the 2022 Economics Sciences Prize Committee comprised six Professors in relevant subjects from Sweden, Denmark, Finland, Iceland and Norway, who were all male. This contrasts with data from Figure 3 average where the female economists in those countries at 23%.

It is still the case that women are less likely to publish in top-ranked journals. On average, only 8% of authors per paper published in top economics journals since 1950 are women. More recently, one in particular, the Quarterly Journal of Economics between 2015 - 2017, did not publish a single exclusively female-authored paper (Hengel, 2022). Similar first-name analysis of the publicly available data from Editorial Boards of the top-ranked journals—the eminent Top 5 of Quarterly Journal of Economics (QJE), Journal of Political Economy (JPE), Econometrica, Review of Economic Studies (RES) and American Economic Review (AER)—shows an average female economist representation of less than a quarter. This is slightly less than the global share of female economists. While reflecting gender imbalances, it does not indicate leakage. Still, the following sections highlight why this might be an issue for science.

[2]The data is available at `https://ideas.repec.org/top/female.html`.

[3]The Top-20 committee was also a panel of six male authors.

Finally, more recent evidence from the promotion system of academic economists in France provides suggestive evidence of custodian imbalances. While detailed in the following section, Bosquet et al. (2019) interpret the promotion gap between men and women initially as negative unconscious discrimination, especially in the early stages when evaluating the worth of a women's research output. This is then followed by positive conscious discrimination as the competition develops.

Indeed, some prestigious institutions in Economics seem to have integrated fighting these imbalances into their mandate. Their actions contribute to locally reverting trends. A recent paper by Card et al. (2022) shows that the Econometric Society Nominating Committee created gender premiums for women on nomination and election as Fellow members.

2.3 Progress over time.

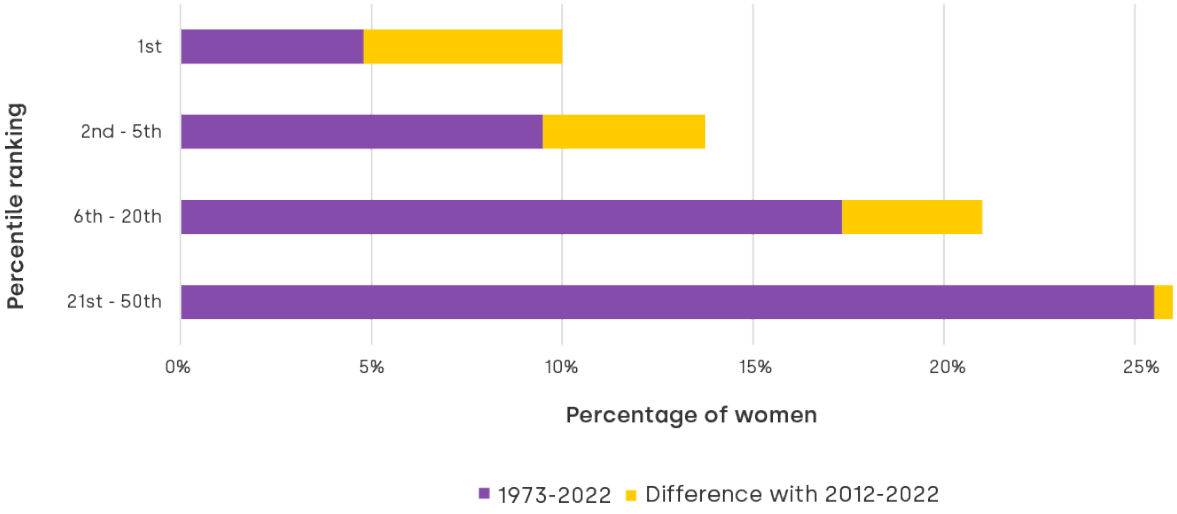
We evidence the progress made in economics over time, focusing on long-term progress (1973 to present) and on medium-term progress (the last ten years).

RePEC data can be utilised to measure women's representation in economics by publication ranking. Research Papers in Economics (RePEc) Author Service is a decentralised bibliographic database of over 3.8 million research items—working papers, journal articles, books, book chapters and software components. In total, of these published articles, gender attribution can occur through pattern matching with NamSor—a name checker for gender, origin and ethnicity.[4] Data is available both isolated and disaggregated over the last ten years as well as since records began in 1973. Rankings correspond to the combined depth of research and its breadth—measured by citations and abstract views or downloads, respectively.

Figure 1 below charts this information. Imbalances across publication ranking are large. Figure 1 shows that in the last 10 years, almost three times more female economists publishing in the 50th percentile of ranked research compared to the 1st percentile. Compared to the entire dataset from 1973, the last 10 years indicate a change with twice the amount of female economists reaching the top percentile and the distribution seemingly bolstered from those in the top 10%. This global dataset indicates both low participation of women and imbalances reducing over time, but gains heterogeneous. Why progress was made disproportionately at the top is unclear. It could be due to a catching-up effect from the bottom of the pyramid to the top: if previous progress for women in lower position with lower publication rankings in the previous time period translated into progress for higher ranks later. This would be indicative of stalling progresses at the bottom. Another explanation could be that efforts to improve gender equality are concentrated at the top of the ranking. This fact still underlines that barriers are still prevalent across all rankings: the lower percentiles display a women share of 25%, far from a balanced gender composition.

[4]See `https://ideas.repec.org/top/female.html` for detail.

Figure 1 – Proportion of women in groups by ranking in publication by RePEc



Notes: Own calculations. Data: RePEC Global data, available at `https://ideas.repec.org/top/female.html#cohort`. Bar sizes indicate the proportion of women in each percentile group taken from the rankings of economists. 'Rankings' combine the depth and breadth of research. Depth is measured by citations with analysis performed by theCitEc project. Breadth is measured by abstract views and paper downloads, which the LogEc project counts. Various rankings are then established. Parity is included for easy visual comparison.

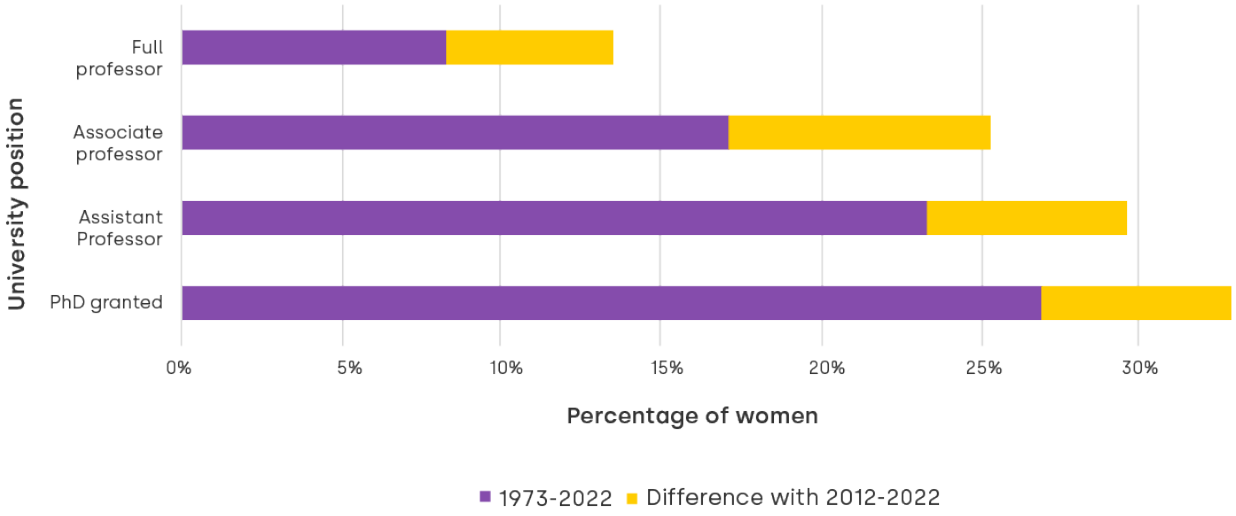
At a more geographically specific level, the Committee on the Status of Women in the Economics Profession (CSWEP) is a further source of information on imbalances over time. The committee first surveyed U.S economics departments and their gender composition of faculty in 1972, continuing this for 250 departments annually. Figure 2 diplays the results by ranking.

Although the proportion of women in each professorship position increases over time, the leaky pipeline is again apparent. This CSWEP data shows a similar picture to the RePEC data with 33% new PhDs women, plateauing at this level since approximately 2005.

A similar proportion is Assistant Professors, having steadily risen from 9% in 1973 to below 25% in 1994 and to 33% in 2022. By way of progress, the percentages at higher faculty levels have increased five times since 1973 and almost doubled in size since 1994. This rise is from almost 6% (1973) to 14% (1994) and onto 27% (2022) for Associate Professors and 3% (1973) to 7% (1994) and to 18% (2022) for Full Professors. Improvements, but again underlining the barriers to women in economics—over half of the proportion of new PhDs leave economic academia on the progress to Full Professorship. Looking at Figure 2, in the last 10 years, comparatively, most of the gains for women in economics are again at the top of the distribution.

Research shows these are not broader societal or academic issues. Rather these imbalances in women achieving tenure or full professorship shown above are not shared by other social sciences. Instead, Ginther and Kahn (2014) report that the gender gap is twice as high in economics than in its umbrella field. Furthermore, the field suffers from the largest gender gaps concerning salaries

Figure 2 – Proportion of women in groups by presence in university positions by CSWEP.



Notes: Own calculations. Data: CSWEP: Annual Reports. Bar sizes indicate the proportion of women in each professorship position. Data was gleaned manually from individual reports from 1973 - 2022. Data was unavailable for the years 1976, 1986, 1987, and 1991 due to the different focuses of the CSWEP report. The year 1980 is excluded due to different sampling.

and job satisfaction compared to maths-intensive peers (Ceci et al., 2014). Controlling for factors such as publications, citations, grant scale and size, studies find that women in economics are 15% less likely to be promoted to associate professor than men (Ginther and Kahn, 2021). Again, these differences are not found in other natural, political or mathematical sciences.

Similarly, as indicated above, while progress has been made in economics, it has stalled relative to the greater developments of women in other disciplines over the past two decades (Lundberg and Stearns, 2019). Some of the proposed reasons are gendered institutional policies and perceived implicit bias in the promotion or tenure processes—these are developed in the following sections.

Even before this stalling, scholars shared the issue. Ginther and Kahn (2004) use data from the 1990s and show that within economics, women are less likely to get tenure and take longer to achieve it compared to other academic disciplines. Some inhibiting factors are present throughout, such as gender differences in productivity and the effects of family choices on promotion. However, a large part of the explanatory factors for these differences remain unobservable.

2.4 Stalling across space.

Figure 3 below maps the published economists registered with the Research Papers in Economics Author Service harnessed previously. Of the 3.8 million research items globally, each attributed by gender, 16660 of 63833 economists are women, a proportion of 26%. This aggregation hides interesting differences across space.

Within developed countries, those with a high proportion of leading economic institutions

perform poorly—both explicitly and, in some cases, with respect to the average. The USA, for example, only has 22% female economist representation, the UK, 25% and France 32%. The story does not improve with developing countries that meet the threshold of 50 economists present and publishing. They perform similarly or worse: India and China at approximately 27% representation and Brazil at 16%. Meanwhile, in other geographies, the lack of data signals the broader problem of limited economists working and publishing in these countries. For example, in the RePEc ranking system, much of Africa does not reach the fifty economist threshold for adequate data availability. Interesting resources for why that might be are indicated above and detailed in Galiani and Panizza (2020).

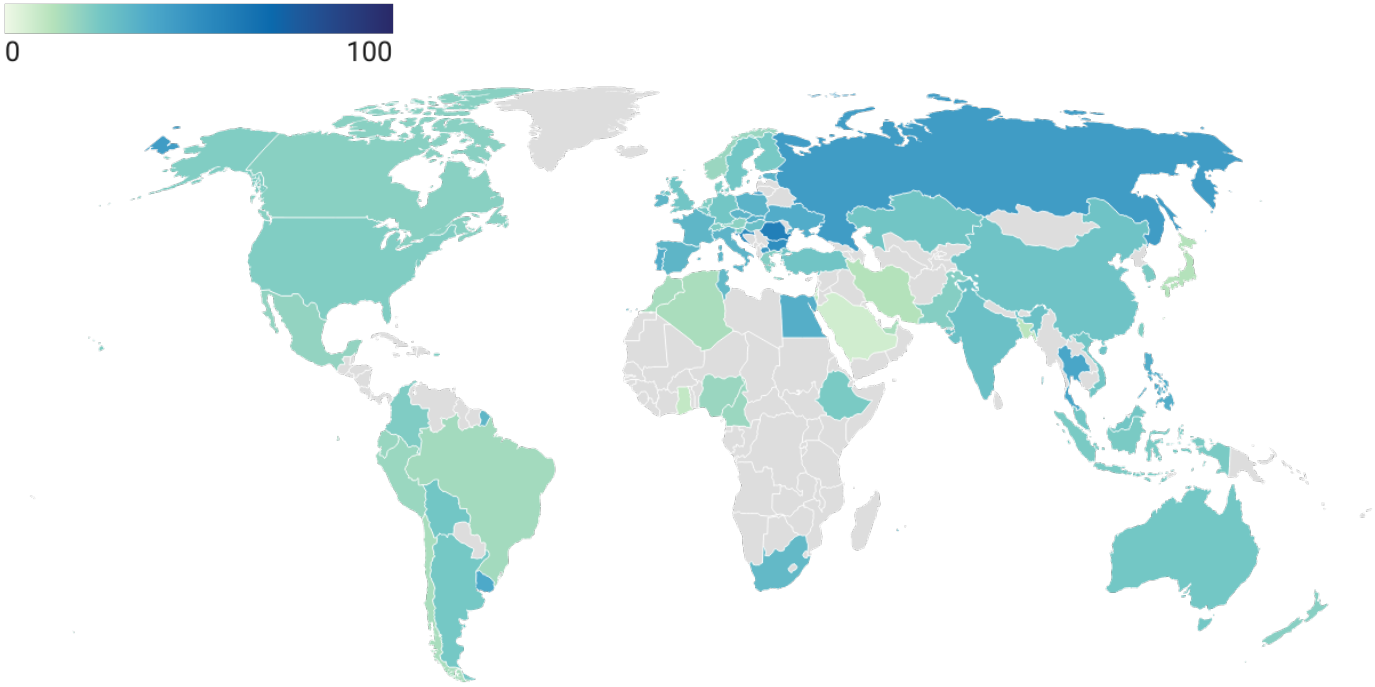
There are few countries where female economist representation is in the majority, with three worth mentioning: Romania, Croatia and Bulgaria—reaching 58%, 52% and 51%, respectively. This presence is arguably not unique to economics, as these countries often outperform their European counterparts with respect to the representation of women in technical and otherwise often male-dominated sectors. Some writers associate this with their socialist past in the 1960s, when boys and girls were encouraged to participate in Science, Technology, Engineering and Mathematics (STEM). This direction resulted from ideology and governing systems placing women's emancipation in the workplace as a core value (Vrabie, 2021).

But beyond this historical past, current policy works in women's favour. In Bulgaria, for example, recent evidence highlights policies with higher child age limits for childcare eligibility as a better-than-average and positive attribute. In Romania, Croatia, and Bulgaria, public policy for equity in mobility, work, pay, marriage, parenthood, entrepreneurship, and assets would place them with perfect equity scores—were it not for inequity in pensions with respect to benefit size, retirement age, and whether childcare is taken into account in calculations (Trumbic et al., 2021).

2.5 Imbalances of intersectionality.

It is also important to recognise the broader issues of low diversity in economics—namely, historically underrepresented individuals underpinned by their ethnicity, sexuality or gender identity. We also recognise the intersectionality of many of these underrepresented or discriminated groups. However, we will not attempt to be exhaustive and thus—for clarity of discussion—we attempt to focus on women. We point readers to other resources that address these issues. Sharma (2020) and Ahmed et al. (2021) provide overviews of disparities and discrimination of underrepresented minorities and what resources are available for change. Similarly, on sexuality, Badgett (2007) reviews discrimination based on sexual orientation, with Drydakis (2009) showing how this plays out in employer hiring decisions and Weichselbaumer (2003) accounting for variation based on gender and orientation. Finally, for a wider gender, see Aksoy et al. (2022) for negative labour market support and discomfort with transgender colleagues, Carpenter et al. (2022) for negative employment and earnings outcomes associated with non-cisgender and transgender individuals, Shannon (2022) for variation of these outcomes both based on sex assigned at birth and transitioning age, and McCloskey (2000) for a personal account.

Figure 3 – Female representation in Economics by country (in %)



Notes: Own calculations. Data: RePEc. Map created with Datawrapper. Published economists registered with the RePEc Author Service. Attribution to countries is based on affiliations. Statistics draw on the published economists registered with the RePEc Author Service. Gender attribution is performed by analysing first names and a list of exceptions. A category is listed if it has at least 50 members. Overall, 16660 of 63833 economists are women or a proportion of 26%.

3 Differences in women's behaviours and career choices.

Firstly, we focus on where women are heading when they leave academic careers and try to understand whether similar gender imbalances exist outside academics. The second area is the choices related to compliance with gender norms. Often, this self-censorship explains why women opt out of the pipeline. The leaky pipeline metaphor has sometimes been criticised as it might stigmatise women and perpetuates inadequate assumptions (Miller and Wai, 2015). The intent in its use here is not to pass judgement on active choices out of academic economics, but rather to highlight when passive barriers inhibit progression. The final area highlights differences in co-authorship choices, with women both making different choices with respect to who they undertake research with and in which subfields. These groupings of the academic literature help frame and understand persistent choices.

3.1 Leaving academia.

Contrasting with the evidence above, in some of the largest policy-orientated economics organisations, the Chief Economists have been women for many years. The World Bank Chief Economist, before the recent appointment of Indermit Gill, saw both of the fully appointed positions as women,

namely Carmen Reinhart serving from 2020 to 2022 and Penny Goldberg from 2018 - 2020. The International Monetary Fund's (IMF) first woman Chief Economist—Gita Gopinath—stepped down in 2022 after three years at the helm. Accordingly, the Chief Economist of the OECD since 2014 is a woman, with Laurence Boone holding the position since 2018, preceded by Catherine Mann between 2014 and 2017. More systematic analysis confirms this trend, showing that women hold 32% of the chief economist positions in international institutions (Formella et al., 2020).

Further research thus needs to be undertaken to explain the low share (18% in 2022) of women holding full professors positions in academic economics relative to international institutions. Chassonnery-Zaïgouche et al. (2019) suggest that feminisation proceeded more slowly in academia, particularly economics departments than in business and industry. Therefore, the imbalance might be explained by a time lag. Evidence from the previous section highlights that for women, access to tenure remains low, despite improvement in the last two decades. However, it is unclear to what extent this delay explains the imbalance.

3.2 Compliance with gender norms.

Gender norms—as detailed below—are accepted ideas of how men and women should be and thus act or behave. They reflect dispositions of individuals behaviours which depend on their gender.

What is evidenced by these behavioural choices is the self-censorship of women. Bosquet et al. (2019) study French academic economists and promotions through national competitions (during which researchers compete for a full research position) to understand at what part of the process specific barriers are seen. They could occur primarily at the decision to apply by the individual or the decision of success by promotion panels. The study finds that of the promotion gap: three-quarters is due to women being less likely to seek promotion than their male counterparts. The explanations given for this are either the requirement of entering such contests is too high, women value promotion less, or women expect discrimination.

Outside of economics, the recent shock of COVID-19 lockdown restrictions saw related self-selection of women in line with gender norms. For example, at the household level, there was early evidence showing the effects of lockdowns on many professions, with the increased childcare needs due to school closures falling most heavily on working mothers (Alon et al., 2020). Furthermore, surveys showed mothers working from home spent 1 to 2 more hours per week than fathers in the same position, homeschooling and caring for their children (Adams-Prassl et al., 2022). Similar studies highlighted that mothers spend more paid hours juggling work and childcare (Andrew et al., 2020). Those mothers who do stop working for pay contribute to more domestic work than similarly positioned fathers.

Some initial results of this self selection is apparent. For example, Gabster et al. (2020) documented the initial consequences of pandemic-related barriers to academic publishing. They showed that only 30% of the overall authorship of The Lancet's COVID-19 publications came from female academics. While this is still higher than the percentage of publishing female economists, it reflects the changes associated with publishing during the pandemic, the medium-term consequences of which are still unknown.

The pandemic reduced some imbalances for women in economics. This change of presentation mode—from in-person to digital—significantly altered seminar speakers' composition. Leading female economists did gain disproportionately as their relative travel costs decreased and could 'be' in many places in rapid succession. More generally, the share of seminars held by women increased

as well (Biermann, 2021). This exposure—increased presentation shares by women—established higher visibility and resulted in more citations. Numerically, women saw a 7% increase in the relative likelihood of being invited, which is over 34% more in terms of pre-Covid averages. Important for future policy, this probability of invitation and acceptance varies with the speaker's proximity to institutions. Being able to present digitally and thus reduce the 'distance' to travel is most important for women who would have been otherwise travelling between 1500km and 5000km (Biermann, 2021). This suggests specific barriers to women travelling for seminars at medium distances. Potentially the overnight stay—necessary with these travel distances in person—would previously be a barrier to women from accepting seminar invitations.

3.3 Co-authorship choices.

The selection of co-authors represents another difference in behaviour. Boschini and Sjögren (2007) look at the formation of teams—a voluntary feature of much economics publishing—and their gender makeup within three of the top economics journals. They find that between 1991 and 2002, such voluntary choices—by both men and women—are not gender-neutral. Instead, women are more than twice as likely as men to have a female co-author. Further, the gender difference in the likelihood of having a female co-author increases with the share of women in the subfield.

This finding suggests that some subfields of economics present better opportunities for women co-authorship selection than others. Following this, evidence from Fortin et al. (2021) show that outside of the top 50 research institutions, there are significant differences in women's presence across subfields. Moreover, subfields with a higher share of women are described as having lower employment prospects with fewer positions outside of academia (Fortin et al., 2021).

Whether these results are explained by barriers or self-selection is unclear and deserves further research, but some studies provide intuition. Following the work of Ivanova-Stenzel and Kübler (2005), who found that women perform worse in teams with mixed genders, it could be argued that this is self-selection. Ductor et al. (2021) find co-authorship and collaboration of women occur at a more clustered level: women have fewer collaborations, with those collaborations occurring more often with the same co-authors. This is the case despite an increase in the number of women in the profession.

4 Gender-biased environment: standards, recognition and hostility.

Women in economics make different career choices than men, leaving relatively more the academic track than men at each stage (Buckles, 2019). Beyond behavioural differences, these career choices could be explained by rational choices in a gender-biased work environment. Recent economic literature studies whether women face higher academic standards and receive less recognition for scientific contributions. Finally, some articles discuss the prevalence and consequences of hostile behaviours. This strand of the literature highlights how a lower share of women in economics could be in part the product of higher costs and lower rewards in academic career paths for women.

4.1 Evaluation standards.

Writing and publishing are the core of academic activity. Recent papers investigate whether women in Economics face different standards in this process. With detailed submission and referring data from Energy Economics, Alexander et al. (2021) estimates that referees spend 4.4 more days reviewing female-authored papers and female authors spend 12.3 more days revising their manuscripts, a pattern mostly driven by referees with low experience.[5] Using citations as an indicator of research quality and a pool of publications in top economic journals, Card et al. (2020) and Hengel and Moon (2022) find that female-authored submissions receive between 17% and 25% log points more citation compared to male-only authored papers. Authors interpret these results as papers authored by women that are of higher quality conditional on acceptance and that are held to higher standards. Along these lines, Hengel (2022) measures the quality of the writing of articles published in the top four economic journals (AER, ECA, JPE, QJE) from 1950-2015, using text metrics that predict readability. She finds that women's paper writing quality is higher by 1-6%, and this gap is magnified by the peer-review process.

Seminars and conferences are also a large part of academic life, at which researchers display their scientific contributions, gather comments and constructive criticisms, and meet their peers. According to Doleac et al. (2021), in economics seminars across 66 US and non-US departments, only 23% of speakers were women—2% lower than the proportion of women in senior positions in the top 250 research institutions (Auriol et al., 2022). Two papers assess women's access to research conferences. First, Hospido and Sanz (2021) estimates from submission data to European economic conferences that women are 6.8 percentage points less likely to be accepted. The authors find that this gap is larger for less-known scholars and is driven by male referees in fields with a higher share of men. On the contrary, Chari and Goldsmith-Pinkham (2017) find that acceptance rates are indistinguishable by gender, using conference programs at the NBER Summer Institute from 2001-2016, except in the finance field. The lower representation of women is driven by lower submissions from female researchers and lower invitations from male organisers to participate compared to female organisers. Conference and seminar audiences also directly assess their works to speakers. Dupas et al. (2021) collect data on all interactions between presenters and their audience for research seminars and summer conferences in the United States. They find that women receive more questions than men on average and that the types of questions differ between sexes, with questions for women more likely to be patronising or hostile.[6] Seré (2022) finds a similar result, showing that women are more interrupted in seminars than men, using YouTube recordings of seminars between 2020 and 2022. However, he provides evidence that this differential is driven by women in the audience.

Teaching often constitutes a large part of the professional activity of researchers. Boring (2017) investigates if students might evaluate male and female teachers differently, controlling how well they learn from them. She uses student evaluation of teaching from a French university for courses where the teacher's gender is randomised, and students take the same final exam. She finds that male students are more likely to give excellent grades to male instructors compared to female instructors and female students. Students also value more stereotypical gendered traits of teachers in detailed evaluations, associating male instructors with leadership and knowledgeability and female instructors with organisation skills. The author underlines that if teaching evaluations are

[5] Authors interpret it as a sign of statistical discrimination.

[6] The magnitude is 3.8 more questions in general and less than one for hostile and patronising questions.

used to evaluate the suitability of teachers for promotion, it could drive a gender bias against female instructors.

4.2 Recognition.

A potential channel for higher standards for women could come from a lack of recognition of women's scientific contributions and abilities.

The lack of recognition for women in science throughout history is a documented phenomenon, named the "Mathilda effect" by science historian Rossiter (1993). Based on observation of women's career paths in sciences, she documents how their contributions tend to be attributed to male co-authors or recognised with a long delay. The economic field is not exempt from such cases. Milton Friedman's permanent income theory was elaborated in close collaboration with the empirical economists of consumption, Dorothy Brady, Rose Friedman, and Margaret Reed (Burns, 2022). In addition to the Mathilda effect, the specificity of women's careers outside of mainstream academic paths hinders recognition. Périvier (2020) portraits three French women who contributed to economic concepts and knowledge with careers outside of academia: Clémence Royer, Julie-Victoire Daubié, and Flora Tristan.

A strand of the recent literature on gender imbalances among economists explores whether contemporaneous scientific contributions of women also tend to be acknowledged less than men's. Sarsons et al. (2021) collect positions and publications for 613 academic economists at the top 35 US schools and find that while solo-authorship or co-authorship does not matter for men's tenure prospects, tenure is less likely for women the more they co-author—exhibiting biases in credit attribution for the work. Recognition also tends to be reflected in appropriate citations of published work. Koffi (2021) finds that articles published in the top journals by women tend to be less cited in the top journals and by men, but, in contrast, are cited more outside of the discipline.[7]

Two recent working papers explore a more subjective appreciation of women's scientific abilities from reference letters. Eberhardt et al. (2022) and Baltrunaite et al. (2022) analyse the texts of letters from the application packages, which are extensive descriptions of the abilities of young researchers. Both articles argue that women tend to be depicted more by 'grindstone' terms (hardworking) and men by standout terms (brilliant), a pattern mostly driven by male writers and referents supporting a lower share of women. This pattern is similar to results from other disciplines (Schmader et al., 2007). Baltrunaite et al. (2022) estimate that it can substantially impact later career paths: gender differences in letters could explain 5 to 8% of the future career success gap for women with a PhD.

This lack of recognition of women's outstanding scientific abilities can be put into perspective with a more general stereotype of women lacking talent or brilliance: academic fields in which beliefs that raw innate talent is more required for success than hard work and cooperation display a lower share of women (Leslie et al., 2015). Napp and Breda (2022) conduct the first worldwide study of this stereotype's prevalence among students, using the PISA 2018 survey. Authors find that 15 years old girls tend to attribute their failures to a lack of talent more than boys of the same age, and a lack of outstanding qualities, controlling students' abilities in all countries. The prevalence of this gap is higher in developed rich countries and among high-achieving students,

[7]She also finds signs that the citation premium for women found by Card et al. (2020) and Hengel and Moon (2022) could be driven by citations from women publishing in lower-tier journals. In contrast, men and high-publishing women tend to cite fewer female-authored papers.

and in countries with strong individualistic values, which could point to the amplification of this gap with strong beliefs in rewards for individual merits.

Card et al. (2022) provide evidence that this lack of recognition could be compensated for in some parts of the academic field. They collect data on active researchers in economics, their publications, CVs, gender, and other career variables, and probabilities of becoming Econometric Society Fellows selection from 1933 to 2019, using detailed data on nominations and elections. Conditional on career outcomes, the authors document a large negative effect of being a woman on nomination and election probabilities from 1933 to 1980, which reverts and becomes positive from 2000 to 2019. A large part of this gender premium in the latest decade seems to correlate with the Nominating Committee's active mandate to improve the share of underrepresented minorities among Fellows and change of election modes. The authors suggest that voting economists could seek to correct the past representation of women, internalise higher evaluation standards discussed in the previous subsection, or improve the representation of women.

4.3 Hostile environment.

A supplementary cost in academic careers that could drive women out of the profession is a hostile work environment for women. The analysis of hostile behaviours is challenging, as these actions often occur in a more informal context and are hidden to avoid social and legal sanctions.

The preliminary findings of Wu (2018) launched the discussion within the discipline on hostile behaviours, using data from an online forum on which young economists can express their true beliefs thanks to anonymity. She provides evidence that women tend to be depicted by more sexual and discriminating terms on an online forum used by PhD students to discuss the Academic Job Market informally. Following up, Wu (2020) collects 2.2 million posts from the same forum and finds that posts discussing a women researcher contain 196% more non-professional terms. Threads discussing women also tend to deviate more from professional to personal topics and transition less back to professional matters than men. The author argues that deviation from professional topics on posts discussing women's profiles could come from men's desire to boost the positive perception of their own social group in the profession, compared to more marginalised social groups.

Surveys are alternative tools to evaluate hostility when there is no mechanism that reveals the true beliefs of the individuals. The AEA Professional Climate Survey (American Economic Association, 2019) highlights gender differences in perception of the work environment, particularly regarding valuation from peers within the field, social inclusion and discrimination. Overall, women declare to be half as satisfied as men. An interesting variation is also provided by subfield: the ones with the lower prevalence of unwarranted advances are also the fields in which the share of women increased the most.

In 2018, the AEA the Committee on the Status of Women in the Economics Profession dedicated its first newsletter to sexual harassment, sharing accounts from members of the profession and solutions and best practices (CSWEP, 2018). The prevalence of sexual harassment contributes to differentiating the experiences of men and women in the workplace, potentially driving women out of the field. Not limited to the academic context, Batut et al. (2022) provide empirical evidence that the most hostile workplaces in France saw the largest increase in women's quitting their jobs after the 2017 Metoo movement. Using Swedish administrative data and vignette experiments, Folke and Rickne (2022) show that sexual harassment contributes to gender segregation of the labour market and to the gender gap by driving women out of high-pay masculine sectors and men

out of lower-pay sectors with a large share of women employees. In the academic context, Deruelle (2022) conducts lengthy interviews on the role of sexuality in conferences with 24 researchers from the French National Centre for Scientific Research (CNRS). Heterosexual men interviewed tend to describe conferences as spaces of freedom, with a combination of personal and scientific opportunities. Contrasting, their female colleagues find this permeability between work and non-work detrimental, having to implement vigilant strategies to avoid the risk of sexual harassment, and potentially missing career opportunities taking place on informal conference times.

Finally, a recent working paper by Gertsberg (2022) underlines that exposing hostile behaviours, particularly sexual harassment, can have unintended consequences. The author collects data for 83 junior female scholars from 58 US universities on collaborations before and after the 2017 me-too movement. She observes that women in her sample start 0.73 fewer new projects annually after 2017. This effect is mostly driven by collaboration with tenured male co-authors in universities with more ambiguous policies regarding sexual harassment. Gertsberg (2022) does not observe the same pattern for comparable junior male economists.

5 The labour market for economists, a market like any other?

In the job market for economists, applicants who are women face similar discrimination mechanisms as in any other labour market. Economists' findings in labour economics could be used to design the job market for economists to mitigate gender differences.

5.1 Gender gaps in the labour market.

Until the 1980s, the gender gap in labour force participation and earnings was mainly explained by women's limited access to education and their relative lack of professional experience. The following 20 years witnessed many changes, and, subsequently, in the 2000s, these two factors only explained a small share of the gender gap (Blau and Kahn, 2017). The observed gender gap in presence, measured as the share of women in certain occupations, and earnings tend to widen along the earnings distribution (Guvenen et al., 2022). The gender gap is now largely explained by differential job sorting -sectoral as well as occupational- 51% relative to 20% in 1980 (Blau and Kahn, 2017). Bertrand (2018) reviews the job market dynamics in the US context between 1970 and 2010. Women's participation in the labour force has been increasing since the 1970s and appears to have plateaued since the late 1990s, the same trend holds for the evolution of earnings, leaving women underrepresented at the top of the earnings distribution (Atkinson et al., 2018). This persisting glass ceiling in earnings is observed across and within occupations. The glass ceiling also exists in academia, regardless of rank, as highlighted in Figure 4.

In line with the recent literature, Bertrand (2018) presents three key factors explaining these gender imbalances in the labour market. Firstly, *educational differences* appears to be an important factor in explaining earnings differences. In the US since the 1960s, with respect to years in education—men and women are converging. But despite this, women sort into educational tracks that bring lower labour market outcomes (measured in terms of earnings) than men do. This discrepancy is partly explained by a gender bias in teachers' assessments which affects students' choice

of field of study, with the early stage (dis)encouragement of students into mathematics courses inhibiting further science—and economics—study (Lavy and Sand, 2018). Another rationale is the differential response to pressure. Several studies show that, on average female students perform worse on highly competitive maths tests than their male counterparts (Niederle and Vesterlund, 2010). Studying the case of college entrance exams in China, Cai et al. (2019) show that women underperform on the day of the test relative to their scores on the mock test. These studies underscore the importance of social norms in shaping educational choices. Going back to the case of economics, social norms likely contribute to explaining the leaky pipeline (women leaving academia after obtaining their PhD degree) and to sorting into subfields (Chari and Goldsmith-Pinkham, 2017, Sierminska and Oaxaca, 2022).

Second, *psychological factors*. As discussed above, numerous works in the behavioural literature highlight gender differences in attitudes towards risk and competition. Following these results, women's relatively higher risk aversion could partially explain occupational sorting into lower-paying jobs. In line with this intuition, several studies show that wage bargaining often results in women receiving lower salaries than men with similar credentials (Card et al., 2016; Biasi and Sarsons, 2022).

Third, unequal *time allocation*. Historically, there exists a gender gap in time allocation in both paid and unpaid work-and while this has narrowed over the last four decades—the phenomenon persists in most countries (Gimenez-Nadal and Molina, 2020). In the French context, in 2010, women still did most of the domestic work (64%) and parental work (71%). The sharp decrease (27%) in the time women allocate to domestic tasks observed between 1985 and 2010 is mainly explained by the delegation of these tasks to housekeepers and the use of domestic appliances rather than a change in time allocation between genders.[8] In the academic context, as detailed in section 3, the Covid-19 shock reveals differences in time allocation: Amano-Patiño et al., 2020 highlight its unequal effects researchers' productivity. Women, as well as mid-career researchers, have produced less new research (measured in terms of Covid-related working papers) relative to male and more senior researchers.

Finally, Bertrand (2018) mentions the likely frequent gender bias in how employers treat their employees, and during the hiring process, and reaffirms the need to better measure the role of sexism in explaining the glass ceiling. After controlling for education and professional experience, the residual difference in gender outcomes is likely explained by gender discrimination, as discussed by Grosjean (2021) who reviews experiments evidencing gender discrimination, in male and female-dominated sectors, against the gender minority. Another explanation for this "unexplained gap" is discussed in Amano-Patiño et al. (2021): profit-maximising firms form expectations regarding career interruptions of women and incorporate these in the wage-setting process. Therefore, the expected cost of turnover, which is expected to be higher for high-skilled employees, would explain part of the gender pay gap.

Babcock et al. (2017) highlight another barrier to career advancement for women is the inequity in the distribution of the promotability of tasks. The authors call for distinguishing tasks that matter for performance evaluations from tasks that matter for the organisation, hereafter low promotability tasks. In the context of a large public university in the UK, there is evidence that women were 2.7 times more likely than men to volunteer to do low-promotability tasks, such as serving on a faculty senate committee. This is reaffirmed in experimental settings. Questioning

[8]French Institute of Statistics and Economic Studies, Time use survey (2010).

whether this discrepancy is a matter of preferences—if women are, for instance, more agreeable and concerned for the welfare of others—they find that women are also seen as more likely to accept low promotability tasks than men. In reaction, the authors have created the 'No-Club' through which they encourage women to systematically decline all requests pulling them away from the work that matters most to their careers. Gender quotas which initially aim to reduce gender discrimination likely contribute to the unequal distribution of low-promotability tasks. Bagues et al. (2017) study the impact of introducing gender quotas in committees at Spanish universities, a policy aimed at increasing female scholars' career advancement. Due to the under-representation of women in top academic positions, women have to participate in these committees more frequently than men, reducing the time they can allocate to research. The authors only observe the positive effects of the policy for female applicants to professor positions, suggesting that quotas can be detrimental to young female associate professors as they might over-commit them.

Wage differences, task assignments and social norms also apply to the job market for economists. Nevertheless, there are specific features to it, which represent obstacles for women pursuing a career in economics.

5.2 Specificities of the job market for economists.

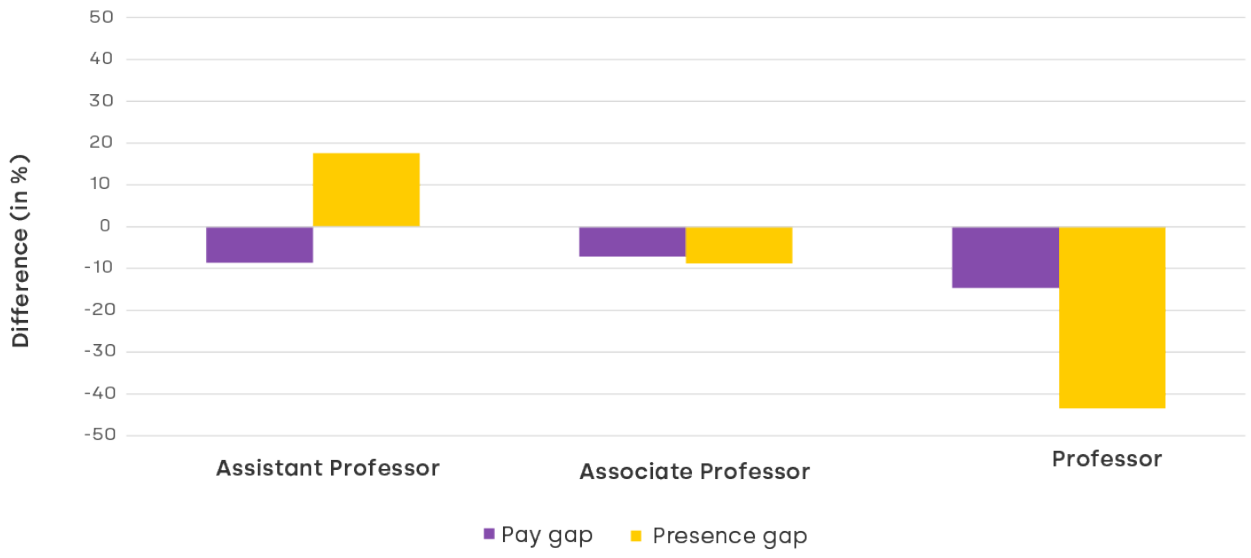
As explained by Chassonnery-Zaïgouche et al. (2019), economists are both experiencing and studying the job market, leading them to interpret discrimination mainly through the economic lens. Since the 1970s, the lower status of women in economics was mostly discussed as an allocation problem—attempting to optimise the limited number of collective female economists rather than what is a challenging individual experience. In this context, the proposed solutions to fight discrimination were centred on reducing market imperfections, such as increasing transparency during the hiring process by clearly stating job requirements and publicly circulating job openings. Fourcade et al. (2015) invoke a strong consensus on quality criteria (e.g. clear hierarchy between journals and institutions, ranking of students who will 'do' the job market), which allows the market to take place and exists to a lesser extent in other social sciences. Deeming that information about candidates, revealed through reference letters from top scholars or publications, is "homogeneous and therefore inherently reliable" might disadvantage female candidates. Indeed, as discussed above, gender bias in the economics field hinders female scholars' recognition.

The described leaky pipeline is largely explained by women leaving academia at early career stages after obtaining their PhD degrees. The aforementioned study by Eberhardt et al. (2022) provides evidence of differential treatment between genders—women being described as 'hardworking' while men are said to be 'brilliant'. Such adjectives will likely lead to differential placement in the job market, especially when little is known about the candidate yet and networks can shape a candidate's career.

Women in academics are also under-represented in high-skilled and top earners positions, as shown in Figure 4. A plausible reason for this leaky pipeline, in the US context, is the tenure track: a fixed probationary period at the end of which assistant professors are evaluated for tenure. Tenure tracks often coincide with the start of a family, a decision that has strong and long-lasting effects on worker productivity, mainly because the first years of a researcher's career are usually characterised by a steep increase in productivity and a large accumulation of human capital. Most US universities implemented family-friendly policies such as the tenure clock stop. Nevertheless, they do not always prove effective and might even disadvantage mothers. Antecol et al. (2018) use

data from 50 top economics departments in the US between 1980 and 2005. They find that the gender-neutral tenure clock stop—a policy where parents are allowed to extend the tenure probation period for one year per newborn, for up to two kids—markedly increased tenure rates for men, while they decreased those for women. Their results highlight that gender-neutral tenure clock-stop policies allow fathers to improve their productivity disproportionately, measured in terms of top journal publications. This case study calls attention to a better understanding of the impact of such policies, which are likely to exclude women from top positions. Furthermore, it highlights the need to carefully design gender-neutral policies ensuring that they do not reinforce exclusion mechanisms, for instance, by accounting for differential time allocation inside the household, as discussed in the first section.

Figure 4 – Gender gaps in US Academics by Rank



Notes: Own calculations. Data: US Department of Education's Integrated Postsecondary Education Data System (Ipeds). The faculty data refer to full-time, nonmedical instructional staff. The gender gap is the difference between women's and men's earnings or presence, expressed in percentage points.

6 Promoting gender balance: policy recommendations.

6.1 Networks.

In the 21st century, women's networks have emerged in various sectors. We focus on networks for women in economics and discuss how these organisations, in general, can be a powerful tool to promote gender equality.

The CSWEP was founded in 1971 in the US to survey women's progress and promote their careers. As shared in the introduction, the early days of the network witnessed a controversy between Carolyn Bell, the inaugural chairperson of the Committee, and Milton Friedman after

the latter refused an invitation to participate in a panel to comment on the first CSWEP report findings. Friedman said he worried the committee's actions would result in preferential treatment and distort the market. This dispute highlights the strength of the debate on the existence of discrimination against minority groups and its measures. The Bell-Friedman controversy over the creation of a women's network also reflected their broader different views on how the market works (Chassonnery-Zaïgouche et al., 2019). Despite reluctance, the CSWEP thrived. It surveys every year the economic profession to increase the visibility of women in economics and issues recommendations to change practices and foster gender balance in the discipline.[9] Its success has encouraged professionals to create other women in economics networks, inside and outside the US, in academics and public institutions. These organisations have emerged at the institutional and regional levels and are becoming increasingly numerous and visible. We now count at least 30 of these networks.

Highlighting gender differences in representation and treatment can contribute to changing perspectives of both men and women, an important matter in a gender-biased environment such as economics. Surveying high school students in Australia, Livermore et al. (2021) found that more men than women agree with the statement that "economics is a career option for men more than women". This suggests that a change in men's perceptions is needed to improve women's condition in economics. The finding echoes the one from Eberhardt et al. (2022) showing that male professors who wrote more reference letters for female candidates exhibited a lower gender bias.

Networks can also be a tool to increase professional opportunities. Burt (1998) shows that women with tighter networks are promoted more quickly because they borrow social capital from their connections.

In an experimental setting, Mengel (2020) finds that when building networks, men are more prone to homophily—the tendency to associate with similar others—than women. The former are also more likely to favour their networks' neighbours, leading them to benefit more from networks relative to women. Regarding geographical ties over distance, Kwiek and Roszka (2021) study the co-authorship patterns of 25,000 Polish scientists. They find substantial differences between genders, as males exhibit a higher rate of international collaboration. Economics has the largest gender gap across all co-authoring types—men collaborate more than women. However, the international collaboration gap decreases as economists age. Despite the specific context (the sample contains as many female and male economists and, as indicated in Figure 3, Poland seems more gender-equal than other countries), this last result suggests that early-career networks might be of crucial help in reducing the gender gap in professional outcomes. The *Australian Women in Economics Network* in 2017 is a striking example of the positive impact networks can have on women's careers. After its creation in 2017, Cassells et al. (2022) observed two substantial changes. First, there appears to be a steady increase in the inclusion of women in economics—as measured in the number of women who subscribe to the *Economic Society of Australia* every year. Second, there is a sharp improvement in women's representation—as measured by the share of women being award nominees, recipients and keynote speakers. To the best of our knowledge, the impact of academic networks for women on research collaborations has not yet been evaluated.

[9]See: https://www.aeaweb.org/resources/best-practices.

6.2 Mentoring, role models and representation.

Mentoring is often suggested as a tool to incentivise young female scholars to stay in gender-imbalanced fields and help them in their career paths. Increasingly recent work evaluates its success. The CSWEP CeMENT program, consisting of mentoring workshops held along AEA annual meetings, was designed as a randomised treatment. Blau et al. (2010) and follow-up study Ginther et al. (2020) estimate that the program increased by 11 percentage points the probability of having a tenure-stream job and by 9 percentage points in the top 50 institutions. Pre-tenure grants and publications have also increased by 0.150 and 1.594, respectively. The results are interesting as these workshops consisted of short-term treatments. Long-term mentoring also seems to matter for orientation and career choice. Canaan and Mouganie (2021) find that having a science advisor that is a woman increases the likelihood of majoring in Science for undergraduate students. Yet, as noted by Buckles (2019), it is difficult to differentiate whether what makes the difference comes from reduced information asymmetry, support for younger professionals, or the provision of role models. Suppose we believe mentoring provides young female scholars with crucial knowledge and training. In that case, we need to understand why those women lack this knowledge compared to their male counterparts in the first place, and what specific knowledge are female advisors providing.

Providing role models does seem to provide positive results on courses and career choices. Porter and Serra (2020) show that short-time exposure to female role models who majored in Economics from the same university increases the share of women choosing to major in that discipline. In other disciplines, Breda et al. (2023) shows that a one-hour intervention of women working in STEM incentivises high-achieving girls to specialise in science fields. The authors also provide results on what makes a successful intervention: the one that changes a student's perception of science fields without emphasising too much the gender imbalances existing within it.

Role model provision has the advantage of being relatively low-cost policies when the supply of qualified women is big enough. One can expect that improving the presence of women in top positions will increase the willingness of young women to engage in such fields. However, relying on a few successful women to fill these roles in a male-dominated environment might also present drawbacks if women perpetuate gender hierarchies. In the influential social psychology paper Ellemers et al. (2004) and follow-up study Faniko et al. (2021), authors measure how successful women in a male-dominated academic environment tend to conform to and encourage masculinity of the environment, the "Queen Bee phenomenon".[10] Using surveys among senior academics on their views regarding their young colleagues, authors show that senior women undervalue the career commitment of female PhD candidates, even though the latter declare themselves as ambitious as male PhD candidates. This pattern is not observed among senior male academics.

More generally, according to Derks et al. (2016), successful women adopting "queen bee" strategies are found in masculine environments. They tend to present themselves in a masculine fashion, distance themselves from junior women, and legitimise gender hierarchies, making them less efficient mentors and role models. Derks et al. (2016) explain that women adopt this type of individual strategies for success due to coping with threats to social identity in male-dominated work environments. They recommend reducing social identity threats (through positive individual feedback, for example) and reducing belief in gender hierarchies' legitimacy to incentivise senior women to

[10]The authors note that this term bears in itself stereotypes on competing women and prefer to adopt the more neutral term "self-group distancing" in their second study.

improve equal opportunities for younger female colleagues.

6.3 Other solutions.

Other solutions can be grouped into four main categories: first affecting infrastructures, then changing institutions, and finally implementing incentives and providing information.

Information - Starting with information, evidence shows that statements simply telling people not to discriminate do not invoke much change (Boring and Philippe, 2021). Rather, precise information about how others typically discriminate and have done so in the past changes future actions and has proven effective. In the context of a French university, Boring and Philippe, 2021 find that the evaluation gap between male and female teachers is 0.19 (out of satisfaction score up to 4). They then run a trial in which they provide information to some students about how students typically discriminate. Looking at the next evaluation, they show that providing detailed information reduced the gender gap in evaluations by half.

This use of precise information, in addition to stopping discriminatory action, can also encourage affirmatory action. For example, Bedard et al. (2021) show that positive feedback, specifically personalised letters praising high-achieving undergraduate female students have affirming consequences. These letters increase the probability of students seeking more information and entering or continuing the study of economics by between 5 and 6%.

Infrastructures - The infrastructures upon which the economics profession is built are also critical. Throughout this paper, evidence repeatedly shows the systemic barriers women face—but there are indications that by putting in place different infrastructures, this can be mitigated. For example, The AEA now provides clearer guidelines to the job market hiring process—with one recent discussion being the campaign against interviews occurring in hotel rooms (Chassonnery-Zaïgouche et al., 2019). They also identify ways in which candidates can explicitly or implicitly indicate that they are a member of a historically underrepresented group (Cawley, 2019). A wider part of this is AEA's Professional Code of Conduct—adopted in 2018, highlighting individual and collective responsibility to create a professional environment with equal opportunity and fair treatment. This treatment is regardless of many past and present potential biases, including sex, gender identity and expression.

Further to general codes and guidelines around the job market or professional conduct, more explicit soft infrastructure to aid participants when important barriers often occur could reduce imbalances. For example, verbal or codified agreements between audience members and speakers to minimise participants' gender-related interruptions might create a more balanced seminar atmosphere. Similarly, evidence shows that, while having a female chair does not reduce the interruptions from women in seminars, it does reduce the number of interruptions made by men (Seré, 2022).

Institutions - The institutions underpinning the academic economics professional are also important when applying recommendations for promoting gender balance in the current state of gender equality. Returning to geographical differences, countries with lower current gender balance are shown to underestimate support for equalisation. Contrastingly high-gender equality countries overestimate support for affirmative action—such as prioritising women when hiring for

leadership (Bursztyn et al., 2022). Using newly collected national datasets covering 80% of the global population and across 60 countries, perceived support for gender equality and how best to act depends on progress already achieved. This should be accounted for when making decisions.

In some contexts, properly implemented quota systems have shown some positive outcomes—although they are not wanted or can be implemented in all situations. Evidence from Chess, a similarly male-dominated area with 10% of female players at the top (compared to 15% of female full professors in economics), shows a quota to have one woman on each team had two positive effects. It increased the number and quality of female chess players. This was driven by individual gains of women over time, while men did not similarly improve performance. De Sousa and Niederle, 2022 show this skill enhancement of female players was only seen in France, where the quota was implemented, with no difference in nearby countries. In this case, the quota did not affect men or male performance. Although other studies such as Besley et al., 2017 look at quotas—explicitly the zipper system of alternation of gender on political party candidate lists in Sweden—it is shown there were consequences for men. Overall, the quota raised the competence of male politicians. Still, it is argued this effect is due to 'mediocre' men being displaced—or resigned—as a result of affirmative action—, notably where it raised the representation of women the most.

This contrast highlights the need for quotas to be carefully designed and studied. In another context: the gender composition of scientific committees deciding on professorships, the presence of women does not increase the number or the quality of women hired. While female evaluators rate female applicants more highly, the difference is small, insignificant and counterbalanced by male evaluators who, in gender-mixed committees, tend to give lower evaluations to female candidates (Bagues et al., 2017). Furthermore, as discussed in the previous section, quotas may increase disproportionately the time women researchers spend doing low-promotability tasks—overcommitting young female-associated professors. As Vernos (2013) argues, quotas can have mixed effects on gender imbalances. Still, they might foster improvements if combined with incentives as below.

Incentives - De Sousa and Niederle (2022) outline how quotas could be combined with incentive systems. They centre the discussion on output-based incentives rather than pure representation quota. For example, rewarding departments on the research output of female faculty measured on publications, citations and prizes achieved rather than numbers of female faculty. This would incentivise departments to ensure women are not assigned a disproportionate share of non-promotable tasks as outlined in (Babcock et al., 2017). It also addresses some of the issues outlined with quotas as above. Ranking departments based on female faculty and rewarding those that reach certain thresholds with reduced conference fees or library subscription fees are additional recommendations (De Sousa and Niederle (2022)).

Economics department Human Resource policies could also alter the incentives around women's choices to diminish gender gaps. For example, evidence from Sweden shows that take-up of temporary parental leave to care for a sick child during working hours—thus changing different genders' marginal tax rates—can affect the labour participation of men and women (Ichino et al., 2019).

Additionally, as discussed above, travel distances between home and host institution seem to matter as when invited to speak at seminars, women travel at a lower frequency than men. Identifying what barriers restrict these opportunities—whether it is childcare costs or household norms—is essential. Similarly, considering the distance travelled and whether this necessitates

overnight stays and how this interacts with the gender of the speaker is a recommendation.

Finally, it seems the way incentives are in place with competitions, and the nature of competition has gender consequences. Gneezy et al. (2003) show, in an experimental context, that while the performance of men increases under a system of peer-to-peer competition, the performance of women remains unchanged. Contrastingly, when competition is only on individual merit—notwithstanding the performance of others—men and women perform the same. Thus, the way competitions are set up matters. For example, if the winner takes all, then existing gender biases may be amplified if the effort for the competition is costly. Similarly, gender dynamics change in team environments—in this case, the gender gap increases when under competition—and, therefore, must be carefully considered.

Some studies show that it is the type of task competed upon that matters. Günther et al. (2010) replicate the experiment of Gneezy et al. (2003), but rather than the 'male' maze-solving task, they use a 'gender neutral' task—making words with one specific letter and 'female' tasks—a combination of pattern matching and memory. They find that for 'gender-neutral' tasks, both parties respond to incentives equally and in the case of 'female' tasks: women react stronger to competition.

Beyond the competition setup, the competition rewards are also important. Different incentive types, whether monetary or prizes, change women's motivation to compete. This could explain the aforementioned results: in Cassar and Zhang, 2022's work, switching from cash prizes—to child-benefiting or gender-stereotypical goods— significantly lowered the gender gap in competitiveness. Aligning incentives more closely with women's preferences might have implications for women's competitiveness and gender equality more broadly. There is an important application of these findings in how the economics profession structures its rewards system.

7 Conclusion

This review and outline of progress highlight persisting gender imbalances in economics. Despite a decrease over time, differences are observed along several dimensions, such as space, status, and recognition. We show that over the past 10 years, the reduction in imbalances has concentrated among top scholars, with gains in publication ranking most proportionally increasing for scholars in the top 10%. This suggests that the current pyramid structure visible across women in economics is shifting slowly towards a more balanced structure. Progress at the top could be indicative of a concentration of policy efforts in part of the field with the most prevalent imbalances. This reduction in loss from the leaky pipeline may also indicate some catch-up effect for women at the end of the pipeline after progresses at lower stages while barriers to women in economics persist overall. These systemic barriers could correspond with the limited reduction of imbalances at the bottom of the pyramid, with less than one-third of new PhDs granted to female economists and fewer still reaching the top half of the publication ranking. It indicates that the base of the pipeline is still to be consolidated.

Reviewing the recent literature, we detail barriers and gender differences the discipline has identified as sources of imbalances. We show that women in economics—through self-selection or gender norms—make different choices and demonstrate different behaviours when it comes to career development. These choices put women on specific trajectories or result in them leaving academia at different rates and levels than their male counterparts. We then discuss papers

exploring whether the economic academic field treats women and men differently. Women face lower rewards and higher costs of pursuing careers because of differences in evaluation standards, lower recognition, and hostility in the workplace. Turning to the labour market in economics, we highlight that women face similar discrimination mechanisms as in other labour markets. We show that these mechanisms combine with norms that are specific to economics, resulting in gender differential placement on the job market. Finally, we review policies promoting gender balance, highlighting the crucial role of organisations and infrastructures.

This review provides a framework to understand gender imbalances within economics better. Whilst recent research begins to chart this space, more evidence is required for a better understanding of the obstacles women researchers face in this field. In particular, understanding how behavioural differences and gender-biased environments interact would be of interest: what share of behavioural differences between men and women is explained by women who adapt to hostility or higher standards? Following Card et al. (2022), understanding whether imbalances are due to more women leaving (leaky pipeline) or more women being stuck at the bottom of the pyramid (glass ceiling) could point to different policy tools. Finally, we think that exploring what networks and mentoring brings to junior women in economics could be valuable. Especially if this allows women to access skills beneficial to pursue a career in economics.

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