BSE Barcelona School of Economics

WORKING PAPERS

Gender Choice at Work

BSE Working Paper 1460| September 2024

Enriqueta Aragonès

Gender Choice at work*

Enriqueta Aragones[†]
IAE-CSIC and BSE

September 2024

Abstract

This paper analyzes the demand based causes of gender discrimination in the labor market and it aims to explain the currently existing gender gaps in terms of labor market participation and labor income. I propose a formal model to analyze the gender discrimination that individuals face at work due to statistical discrimination and taste-based discrimination. I study the effects of discrimination on the labor market participation, income, and utility distributions and compare these effects between the female and male sectors of the society. I show that the conditions that dissipate the gender gaps are also good to improve efficiency. However, in order to reach a first best it is necessary to eliminate all kinds of gender related idiosyncratic preferences that are based on stereotypes and conscious and unconscious biases.

Keywords: statistical discrimination, taste-based discrimination, labor market.

JEL classification: J7, J31

It is easier to break an atom than a prejudice.
Albert Einstein

1 Introduction

The under-representation of women with respect to men in many professions at all levels and in all professions at some levels is a fact. Given that women represent about 50 per cent of the population it is reasonable to describe this situation as gender unbalanced. The demand for a balanced proportion of women in all professions and at all levels has been raised and its support has been increasing over time. This demand can be based on the claim that a world in

*The author gratefully acknowledges financial support from the Generalitat de Catalunya grant number 2021-SGR-00416; from the Severo Ochoa Programme for Centres of Excellence in R&D (Barcelona School of Economics CEX2019-000915-S), funded by MCIN/AEI/10.13039/501100011033; and from grant PID2021-126200NB-I00 funded by MCIN/AEI/10.13039/501100011033 and by ERDF A way of making Europe.

[†]Institut d'Anàlisi Econòmica, CSIC, Campus UAB, 08193 Bellaterra (Spain). Email: enriqueta.aragones@iae.csic.es

which males and females are found in equal shares in all professions and at all levels would be optimal. But it also can be based on an equity claim: female and male should have the same professional opportunities.

The current gender unbalanced situation can be explained by causes that are related to specific gender conditions of the supply and demand in the labor market. This paper analyzes the causes of the current gender unbalanced situation that are related to the labor market demand and it aims at finding mechanisms that may induce a change from the current unbalanced situation to a world in which males and females are found in more equal shares in all professions and at all levels.

Across the EU, the gender employment gap (the difference between the employment rates of men and women of working age: 20-64 years) was 10.8 percentage points in 2021, meaning that the proportion of men of working age in employment exceeded that of women by 10.8 percentage points. Women tend to work less hours, they are more likely to engage in low paid and informal work, and in partial time jobs. Maternity leaves have a long run negative effect on the participation of women in the labor force (Bertrand 2020 and Isen *et al.* 2017).

The disproportionate representation of women in low paid and informal work also contributes to the observed gender earnings gap. The gender earnings gap measures the impact of the three combined factors (the average hourly earnings, the monthly average number of hours paid, and the employment rate) on the average earnings of all women of working age compared with men. In 2018, the gender overall earnings gap was 36.2 % in the EU. Across Member States, the gender overall earnings gap varied significantly (from 20.4 % in Lithuania and Portugal to 44.2 % in Austria).

Regarding the causes that produce a low labor demand for women in some professions it is important to refer to different kinds of discrimination originated in the decisions made by the employer that are biased in favor of men relative to women. In particular I will focus on *statistical discrimination* and *taste-based discrimination*.

The theory of statistical discrimination was pioneered by Arrow (1973), Spence (1973), and Phelps (1972). Statistical discrimination relates to the way in which employers make employment decisions. Since their information on the applicants' productivity is imperfect, they use statistical information, both current and historical, in order to infer their productivity. If a given group or workers is perceived as less productive, each individual in this group will be assumed to be less productive and discrimination arises. This type of discrimination can result in a self-reinforcing vicious circle over time, and the individuals from the discriminated group are discouraged from participating in the market. According to this theory, inequality may exist and persist between demographic groups even when economic agents are rational. For instance, Arrow (1973) shows that discrimination can be a result of self-fulfilling expectations even if all agents are identical ex ante. Extensions of the statistical discrimination theory include: Coate and Loury (1993), Rosen (1997), Mailath *et al.* (2000), Moro and Norman (2004), and Lang *et al.* (2005).

Given that in the past the female labor force has been disproportionately lower than the male's one, employers have had more experience with male employees and thus have more information about the characteristics of male labor force which in turn implies more uncertainty about the characteristics of the female labor force. The higher uncertainty associated to the female candidates with respect to men induces employers to be more likely to hire men than women. First moment statistical discrimination occurs when, for example, female workers are offered lower wages because females are perceived to be less productive, on average, than male workers. Second moment discrimination occurs when risk averse employers offer female workers lower wages based on a higher variance in their productivity. Statistical discrimination has been highlighted as a potential source of the gender wage gaps that are a prevailing feature of the current labour market (Lesner 2017 and Keng 2020). The theoretical models that analyze gender gaps in the labor market assume specific strategies for the firms such as incentive contracts (Albanesi and Olivetti 2009) or different types of jobs (Francois 1998 and Dolado *et al.* 2013) and they display multiple self-fulfilling equilibria, some of which exhibit gender gaps.

Taste-based discrimination is an economic model of labor market discrimination which argues that employers' prejudice or dislikes can have an influence in hiring workers. The model posits that employers discriminate against some applicants to avoid interacting with them, regardless of the applicant's productivity, and that employers are willing to pay a financial penalty to do so. The taste-based model further supposes that employers' preference for employees of certain groups is unrelated to their preference for more productive employees. According to this model, employees that are members of a group that is discriminated against may have a lower probability of being hired, and if they are hired, they have to work harder for the same wage or accept a lower wage for the same work. The taste-based discrimination model was first proposed by Becker (1957 and 1971) and Schelling (1971). Becker argued that the reasons for such discrimination should be determined by psychologists and sociologists. These approaches explain racial discrimination by assuming that individuals derive disutility from interacting with members of a different race. Alternatively a taste for discrimination might develop as an outcome of group formation processes: similar people might facilitate collective decision making (Baccara and Yariv 2008 and Alesina and La Ferrara 2005). Some kinds of discrimination are based on the fact that most employers are men and thus it is possible that men are more likely to like men as employees or coworkers. Therefore, since men are a preferable choice for employers, women end up suffering this kind of discrimination.

The two types of discrimination just described, statistical and taste-based, can be found in a combined way in the labor market. Neilson and Ying (2016) consider hiring managers who care not just about productivity but also about some other unrelated characteristic. For instance, if they value beauty more in women than in men, then the hired women will be better looking but less productive. They find that this taste-based discrimination can lead to productivity-based statistical discrimination by the firm's subsequent hiring managers who observe from their workforce that women tend to produce less. Gneezy, List and Price (2012) find that when the object of discrimination is perceived to be controllable, the discrimination is taste-based and if the object of discrimination is exogenous, discrimination is of statistical nature. In this paper I assume that there is an exogenous gender difference which is in part controllable, at an individual cost. Thus the type of discrimination analyzed here is considered to be due to a combination of both: statistical and taste-based.

This paper describes a formal model of individual choice about the labor market participation which includes discrimination factors that are originated in the demand side of the labor market independently of whether they are due to statistical discrimination or taste-based discrimination. I assume that the employer has a preference for a particular type of individual. The type of an individual represents a measure of the individual features that are valuable for the point of view of the hiring process that may not be necessarily linked to her or his productivity. Employers are more likely to hire individuals that exhibit features that correspond to their most preferred type, and they are also willing to pay higher wages to individuals that are more like their preferred type. Since I am interested in explaining the different gender gaps observed in the labor market, I interpret that these features that are relevant for the employers are related to the gender of the individuals.

Each individual is assumed to have a natural type that is determined by her or his personal characteristics and therefore it is exogenous. However all individuals may invest in changing some features of their type in order to appear as more acceptable to the employer. This investment can only be made by paying a cost that is to be interpreted as the burden that implies having to adopt skills or attitudes that are not naturally associated to the individual's type. I assume that the choice variable of an individual corresponds to the *chosen type* that he or she presents to the employer.

The results offer a specific characterization of the employment gender gap as a function of the discrimination parameters and it also explains the gender wage gap that is observed in the labor market. Most importantly, I determine the reduction in overall welfare suffered by the female sector of the society due to the lower income levels obtained and also due to the higher costs that women have to pay from adapting their chosen types to the employer's preferences. I also investigate some measures that could reduce the effects of the discrimination on the labor market. I find that a change in the preferences of the employers with respect to their most preferred type may reduce the gender gaps. However the inefficiency will persist as long as the employers decision is driven by stereotypes.

The next section introduces the formal model. Section 3 describes the optimal individual choices. Section 4 analyzes the effects of discrimination in the society. Section 5 compares the effects of discrimination between two sections of the society: female and male. Finally section 6 contains some concluding remarks.

2 The model

This model considers the choice of an individual about her or his participation in the labor market. Individuals are characterized by their type. Let $t \in [0,1]$ denote an individual's type. The type of an individual represents a measure of the individual features that are valuable from the point of view of the hiring process. Since I am interested in explaining the different gender gaps observed in the labor market, I interpret that these features are related to the gender of the individuals.

I assume that there is a particular type that is the most preferred by employers, that is, they are more willing to hire individuals whose type is close to it and they are also more willing to pay higher salaries to individuals with a type that is close to their most preferred one. Let $\tau \in [0,1]$ denote the optimal type of the employers.

The type of each individual depends on her or his personal characteristics and therefore it is exogenous. However all individuals may invest in changing the features of their type in order to appear as more acceptable to the employer. This investment can only be made by paying a cost that is to be interpreted as the burden that implies having to adopt skills or attitudes that are not naturally associated to the individual type. I assume that the choice variable of an individual corresponds to the *chosen type* that he or she offers to the employer. Let $s \in [0,1]$ denote the corresponding choice variable and it is to be interpreted as follows: the choice of a value of s that is close to the natural type of the individual implies that he or she does not have to adopt any important changes in her or his skills or attitudes, while the choice of a value of s that is far away from the natural type of the individual implies that he or she has to adopt important changes in her or his skills or attitudes.

The value of t can also be interpreted as a measure of the features that an individual of type t can offer to the labor market at zero cost. For an individual of type t offering different features than t to the labor market represents a reduction of welfare. In particular, if an individual of type t decides to offer a type $s = t$ to the labor market, he or she does not suffer any additional cost. However, if an individual of type t decides to offer a type $s \neq t$ to the labor market, he or she will suffer a cost. This cost is supposed to be larger when the type that the individual decides to offer to the labor market is further away from her or his natural type. I assume that this cost is represented by a convex function of the distance between the individual's natural type and the individual's chosen type. Let $C(s) = \gamma(t-s)^2$ with $\gamma > 0$ denote the cost corresponding to the labor market participation of an individual of type t that decides to offer a type s in the labor market.

Individuals obtain their income from their participation in the labor market and employers are willing to pay higher salaries to individuals that offer values of s that are closer to τ. I assume that the income obtained by an individual that offers a type s is decreasing with the distance between the type that the individual offers to the labor market s and the preferred type of the employer τ.

The individual income is represented by $W(s) = \omega\left(1 - \delta\,(s-\tau)^2\right)$ where $\omega > 0$ denotes the maximal income that an individual may obtain. This maximal income is realized when the choice of type that is offered to the labor market s coincides with the most preferred type of the employer τ. The income obtained by an individual that offers a type s to the labor market is proportional to ω and it decreases with the distance of the chosen type to the one most preferred by the employer. The parameter $\delta > 0$ in the income function denotes the importance of hiring good types from the employer's point of view, that is, the discrimination imposed to types that differ from the one preferred by the employer.

The overall welfare of an individual of type t is measured by a utility function that combines the individual's income and the cost that he or she bears from the choice of the type that he or she decides to offer to the labor market and it is represented by

$$U(s) = W(s) - C(s) = \omega\left(1 - \delta\,(s-\tau)^2\right) - \gamma(t-s)^2$$

Larger values of the cost parameter γ relative to the income parameter ω imply larger reductions of welfare. Thus $\frac{\gamma}{\omega}$ can be interpreted as a measure of the level of discrimination that an individual suffers due to the discrepancy between her or his type natural and the most preferred type of the employer. Without loss of generality I normalize this maximal wage to be $\omega = 1$. This implies that the interpretation of the parameter γ is the weight of the cost relative to the maximal wage.

Assumption 1: $\omega = 1$

First, I analyze the individual's optimal choice of labor market participation as a function of its type and of the parameters of the model τ, δ, and γ. Then I analyze the effects of the discrimination on the overall society by considering the aggregate levels of labor market participation, income, and welfare for a society, and the aggregate level of cost that a society has to bear. Finally, I analyze these effects on two segregated sections of the society: female and male. This distinction is important according to the data since it is the female section the one that bears most of the costs derived from the discrimination implemented by the employers. I thus compare the effects of discrimination between the female and male sections of society.

3 The optimal individual choice

In order to find the optimal type to be offered to the labor market for an individual of type $t \in [0,1]$ I solve the maximization problem of her or his utility function with respect to the choice variable $s \in [0,1]$. This result is stated in the next proposition.

Proposition 1: *Only individuals with types* $|t-\tau| < \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$ *participate in the labor market and their optimal chosen type is*

$$s^*(t,\tau,\delta,\gamma) = \frac{\delta\tau+\gamma t}{\delta+\gamma}$$

All proofs are relegated to the appendix.

First of all I find that not all individuals decide to participate in the labor market. In fact, only individuals with a natural type that is close enough to the type that is most preferred by the employer are able to obtain a non negative utility from their labor market participation. Thus, for individuals with a natural type far from τ it is optimal not to participate in the labor market. Notice that the set of individuals that decide to participate in the job market contains those individuals that would obtain a non negative income (and utility) if they were to propose their natural type, and it is a subset of those individuals that obtain a non negative income with their optimal type choice.

For those individuals that decide to participate in the labor market the optimal type is always in $[0,1]$. It is smaller than τ whenever the natural individual type is also smaller than τ; and it is smaller than the natural individual type whenever τ is also smaller than it. This implies that the value of the optimal type always lies between the individual's natural type and the type most preferred by the employer. Thus, as expected, all individuals choose a type that resembles more the most preferred type of the employer than their own natural types. In addition, the optimal type is closer to the most preferred type by the employer than to the natural type whenever $\delta > \gamma$, thus individuals make a more intense effort to resemble the most preferred type of the employer when they perceive that the discrimination implemented by the employer is more important the the cost they have to bear to adapt to the employers' preferences.

The optimal type increases with τ and with the individual's natural type t. This implies that when τ moves away from the natural type, the optimal type approaches τ; and when τ moves towards the natural type the optimal type moves away from τ. Similarly, when t moves away from the type most preferred by the employer the optimal type also moves away from τ; and when t moves towards the type most preferred by the employer the optimal type also moves towards τ.

When the investment cost γ goes to zero the optimal type converges to the type most preferred by the employer and when the investment cost γ becomes very large the optimal type converges to the individual's natural type. Finally, as the income discrimination δ goes to zero the chosen type converges to the individual's natural type, and if the income discrimination δ approaches infinity the optimal type converges to the type most preferred by the employer. The comparative statics results discussed here are included in the proof of proposition 1.

Given the individual's optimal choice of type to be offered to the labor market I compute her or his income, cost, and utility evaluated at the optimal type.

Proposition 2: *For an individual of type t such that* $|t-\tau| < \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$, *the optimal income is*

$$W^{*}(t,\tau,\delta,\gamma) = 1 - \frac{\delta\gamma^{2}}{(\delta+\gamma)^{2}}(t-\tau)^{2}$$

the optimal cost is

$$C^{*}(t,\tau,\delta,\gamma) = \frac{\delta^{2}\gamma}{(\delta+\gamma)^{2}}(t-\tau)^{2}$$

and the optimal utility is

$$U^{*}(t,\tau,\delta,\gamma) = 1 - \frac{\delta\gamma}{\delta+\gamma}(t-\tau)^{2}$$

Observe that the optimal income and the optimal utility for all types that decide to participate in the labor market is positive. The optimal income and the optimal utility received by all types increase as the individual's natural type approaches the most preferred type of the employer, and they decrease otherwise. The optimal cost supported by all types is non negative (it is positive except for $\tau = \frac{1}{2}$); it decreases as the individual's natural type approaches the most preferred type of the employer and it increases otherwise. The comparative statics for these economic variables are included in the proof of proposition 2 and the representation of the optimal choice and its implications on income, cost, and utility for all types are illustrated in figure 1.

FIGURE 1 ABOUT HERE

Increases in the cost parameter γ produce decreases in the optimal income and optimal utility for all types, and it also produces increases in the optimal cost for all types whenever $\delta > \gamma$. That is, an increase in γ induces all individuals to choose a type closer to the most preferred one of the employer when the cost is small enough relative to the discrimination parameter. Otherwise, when $\delta < \gamma$ increases in the cost parameter induce all individuals to choose a type closer to their natural type and thus produce reductions in the optimal cost for all types. Notice that the condition $\delta \lesseqgtr \gamma$ relates a measure of the personal cost paid by an individual with a measure of the reduction in wage that he or she obtains derived from the employer discrimination: $\delta > \gamma$ implies that it is relatively cheap for an individual to satisfy the employer's preferences, and $\delta < \gamma$ implies that it is very costly for the worker to satisfy the employer's preferences.

Finally, an increase in the discrimination parameter δ produces an increase in the optimal cost for all types and it produces a decrease in the optimal utility for all types. The optimal income of all types increases with δ whenever $\delta > \gamma$. Thus for small values of the cost parameter relative to the reduction in wage derived from the discrimination I find that increases in δ imply larger values of the optimal income and optimal cost. However the increase in the optimal cost more than compensates the increase in the optimal income, which implies a reduction in the individual's optimal utility. For large values of the cost parameter relative to the reduction in wage derived from the discrimination $\delta < \gamma$, the optimal income decreases with δ and since the optimal cost always increases, obviously the individual's optimal utility decreases. Recall that the optimal type is closer to the natural type than to the most preferred type by the employer whenever $\delta < \gamma$, and it is closer to the most preferred type of the employer than to his or her natural type whenever $\delta > \gamma$.

4 Discrimination in the society

Suppose that the types in the society are distributed according to a uniform probability distribution function over the support $[0,1]$. I compute the total labor market participation, the total income, the total cost, and the total utility of the society evaluated at the individuals' optimal choices. I also analyze how each of these economic variables changes with the type most preferred by the employer and with the parameters of the model δ and γ. Without loss of generality I assume that $\frac{1}{2} \leq \tau \leq 1$. The results for the case $0 \leq \tau < \frac{1}{2}$ would be analogous and they are not included. The following analysis considers different cases depending on the magnitude of the parameter values. I start with the case of low discrimination, that is for relatively small values for δ and γ such that they imply full labor market participation.

Proposition 3.1: *If $\frac{1}{2} \leq \tau \leq \sqrt{\frac{1}{\gamma} + \frac{1}{\delta}}$ the labor market participation is $TL^*(\tau, \delta, \gamma) = 1$ and the total income, total cost, and total utility for the society evaluated at the individuals' optimal choices are:*

$$TW^*(\tau, \delta, \gamma) = 1 - \frac{\delta\gamma^2}{3(\delta+\gamma)^2}[1 - 3\tau(1-\tau)]$$

$$TC^*(\tau, \delta, \gamma) = \frac{\delta^2\gamma}{3(\delta+\gamma)^2}[1 - 3\tau(1-\tau)]$$

$$TU^*(\tau, \delta, \gamma) = 1 - \frac{\delta\gamma}{3(\delta+\gamma)}[1 - 3\tau(1-\tau)]$$

The restriction imposed on the parameter values by $\frac{1}{2} \leq \tau \leq \sqrt{\frac{1}{\gamma} + \frac{1}{\delta}}$ implies that we must have either $\gamma < \frac{1}{\tau^2}$ or $\gamma > \frac{1}{\tau^2}$ and $\delta < \frac{\gamma}{\gamma\tau^2 - 1}$. In this case, the total income and total utility decrease with τ and the total cost increases with it. This indicates that when the most preferred type of the employer is large, increasing it produces a clear harm to the society. Similarly, for $\tau < \frac{1}{2}$ the total income and total utility increase with it and the total cost decreases with it, which implies that when the most preferred type of the employer is small, increasing it produces a clear benefit to the society. And therefore we have a clear implication stated in the next corollary.

Corollary 1: $\tau^* = \frac{1}{2} = \arg\max_\tau TU^*(\tau, \delta, \gamma)$.

Thus the type that employers seek to hire that is optimal for the society is $\tau = \frac{1}{2}$.

Since in this case I have full labor market participation the comparative statics for the total income, total cost and total utility with respect to the parameters of the model related to gender discrimination δ and γ are identical to those found for the individual's optimal income, optimal cost, and optimal utility: total utility decreases with both δ and γ; total income decreases with γ and total cost increases with δ; if $\delta > \gamma$ total income increases with δ and total cost increases with γ and if $\delta < \gamma$ total income decreases with δ and total cost decreases with γ.

Next, I compute the total labor market participation, the total income, the total cost, and the total utility of the society evaluated at the individuals' optimal choices for the case of intermediate values of the discrimination parameters.

Proposition 3.2: *If $\tau \geq \frac{1}{2}$ and $1 - \tau \leq \sqrt{\frac{1}{\gamma} + \frac{1}{\delta}} \leq \tau$ the labor market participation is $TL^*(\tau, \delta, \gamma) = 1 - \tau + \sqrt{\frac{1}{\gamma} + \frac{1}{\delta}} < 1$ and the total income, total cost, and total utility for the society evaluated at the individuals' optimal choices are:*

$$TW^*(\tau, \delta, \gamma) = 1 - \tau - \frac{\delta\gamma^2}{3(\delta + \gamma)^2}(1 - \tau)^3 + \frac{3\delta + 2\gamma}{3(\delta + \gamma)}\sqrt{\frac{1}{\gamma} + \frac{1}{\delta}}$$

$$TC^*(\tau, \delta, \gamma) = \frac{\delta^2\gamma}{3(\delta + \gamma)^2}(1 - \tau)^3 + \frac{\delta}{3(\delta + \gamma)}\sqrt{\frac{1}{\gamma} + \frac{1}{\delta}}$$

$$TU^*(\tau, \delta, \gamma) = 1 - \tau - \frac{\delta\gamma}{3(\delta + \gamma)}(1 - \tau)^3 + \frac{2}{3}\sqrt{\frac{1}{\gamma} + \frac{1}{\delta}}$$

The restriction imposed on the parameter values by $\tau \geq \frac{1}{2}$ and $1 - \tau \leq \sqrt{\frac{1}{\gamma} + \frac{1}{\delta}} \leq \tau$ implies that we must have $\frac{\gamma}{\gamma\tau^2 - 1} < \delta < \frac{\gamma}{\gamma(1-\tau)^2 - 1}$. In this case the total labor market participation is less than 1 and it decreases with τ, δ and γ. The total income, total cost and total utility of the society decrease with τ because the reduction in the labor market participation that affects the types $t < \tau$ more than compensates the increases in income and utility and decreases in cost enjoyed by the types $t > \tau$.

The comparative statics for the total income, total cost and total utility with respect to the parameters of the model related to gender discrimination δ and γ are similar to those found for the individual's optimal income, optimal cost, and optimal utility. As before total utility decreases with both δ and γ; total income decreases with γ and total cost increases with δ. In this case there is a bound $\overline{\delta}(\tau, \gamma)$ such that for $\delta > \overline{\delta}(\tau, \gamma)$ total income increases with δ and total cost increases with γ; and if $\delta < \overline{\delta}(\tau, \gamma)$ total income decreases with δ and total cost decreases with γ. This bound is much larger than the one that applies to the comparative statics for the case of full labor market participation since $\overline{\delta}(\tau,\gamma) > 4\gamma$ and its value approaches 0 when τ tends to 1.

Finally, I compute the total labor market participation, the total income, the total cost, and the total utility of the society evaluated at the individuals' optimal choices for the case of high discrimination, that is for relatively large values for δ and γ.

Proposition 3.3: *If* $\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} \leq 1-\tau \leq \frac{1}{2}$ *the labor market participation is* $TL^{*}(\tau,\delta,\gamma) = 2\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < 1$ *and the total income, total cost, and total utility for the society are:*

$$TW^{*}(\tau,\delta,\gamma) = \frac{2}{3}\frac{3\delta+2\gamma}{\delta+\gamma}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$$

$$TC^{*}(\tau,\delta,\gamma) = \frac{2}{3}\frac{\delta}{\delta+\gamma}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$$

$$TU^{*}(\tau,\delta,\gamma) = \frac{4}{3}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$$

The restriction imposed on the parameter values by $\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} \leq 1-\tau \leq \frac{1}{2}$ implies that we must have $\gamma > \frac{1}{(1-\tau)^2}$ and $\delta > \frac{\gamma}{\gamma(1-\tau)^2-1}$. In this case the most preferred type of the employer does not have any effect on the aggregated variables. It only affects which types are going to participate in the labor market: a set of types that are close enough to the most preferred type of the employer. This set determines the labor market participation which is less than 1 and it decreases with the two discrimination parameters. Total income and total utility also decrease with the two discrimination parameters. Total cost increases with δ and decreases with γ.

The results obtained in the last three propositions are illustrated in figure 2. Notice that for $\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} = \tau$ the results from proposition 3.1 and 3.2 coincide, and similarly for $\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} = 1-\tau$ the results from propositions 3.2 and 3.3 coincide. Full labor market participation obtains for all values of τ if $\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} > 1$, and otherwise it is less likely to obtain for smaller values of $\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$. In particular, for values of $\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$ that are close to $\frac{1}{2}$ full labor market participation only obtains if τ is also very close to $\frac{1}{2}$. For a fixed value of τ, labor market participation decreases as discrimination increases $\left(\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} \text{ decreases}\right)$. Finally, for fixed values of the discrimination parameters the labor market participation increases as the value of τ approaches $\frac{1}{2}$. We can conclude that for a fixed value of τ maximal efficiency is reached when both δ and γ are zero, because total utility increases when these values decrease: total income is maximized and total cost is minimized. For fixed values of δ and γ maximal efficiency is reached when τ equals $\frac{1}{2}$, because total utility increases when τ approaches $\frac{1}{2}$.

FIGURE 2 ABOUT HERE

5 Female and male types

In this section I analyze equity in terms of gender. Suppose that as before, the types in the society are distributed according to a uniform probability distribution function over the support $[0,1]$. I assume that increasing values of t represent those types that include more male features and less female features. Accordingly I represent the female types by those t such that $0 \leq t \leq \frac{1}{2}$ and the male types are represented by those t such that $\frac{1}{2} \leq t \leq 1$.

Recall that Corollary 1 stated that the most preferred type of the employer that maximizes the total utility of the society is $\tau = \frac{1}{2}$. According to my interpretation this implies that the optimal type for the employers should include both female and male characteristics in a balanced manner. Given the observed gender gaps in the participation in the labor market and in the salaries, I can speculate that the current most preferred type for the employer is not the optimal one for the society. Instead it is one that includes very few female features and many male features. Thus the type that is currently the most preferred by the employers corresponds to values of τ larger than $\frac{1}{2}$.

In order to illustrate the discrimination suffered by female types I compare the aggregated economic variables for each section of the society: female and male. First, I compute the labor market participation, total income, total cost, and total utility for female types ($TL^{F*}(\delta,\gamma)$, $TW^{F*}(\delta,\gamma)$, $TC^{F*}(\delta,\gamma)$, $TU^{F*}(\delta,\gamma)$) and for male types ($TL^{M*}(\delta,\gamma), TW^{M*}(\delta,\gamma), TC^{M*}(\delta,\gamma), TU^{M*}(\delta,\gamma)$) separately evaluated at the individuals' optimal choice. I analyze how these variables are affected by changes in the parameter values of τ, δ and γ. Then I compare the aggregated economic variables obtained for each group type in order to analyze the extend of the effect of the discrimination. The following analysis considers different cases depending on the magnitude of the parameter values. As in the previous section, I start with the case of low discrimination, that is for relatively small values for δ and γ such that they imply full labor market participation.

Proposition 4: *If* $\frac{1}{2} \leq \tau \leq \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$ *the labor market participation is* $TL^{*}(\tau,\delta,\gamma)=1$ with $TL^{F*}(\tau,\delta,\gamma)=TL^{M*}(\tau,\delta,\gamma)=\frac{1}{2}$ *and*

$$\frac{TW^{F*}(\tau,\delta,\gamma)}{TW^{M*}(\tau,\delta,\gamma)} = \frac{4-\frac{\delta\gamma^2}{3(\delta+\gamma)^2}\left[1-\tau\left(6-12\tau\right)\right]}{4-\frac{\delta\gamma^2}{3(\delta+\gamma)^2}\left[7-\tau\left(18-12\tau\right)\right]} < 1$$

$$\frac{TC^{F*}(\tau,\delta,\gamma)}{TC^{M*}(\tau,\delta,\gamma)} = \frac{1-\tau\left(6-12\tau\right)}{7-\tau\left(18-12\tau\right)} > 1$$

$$\frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)} = \frac{4 - \frac{\delta\gamma}{3(\delta+\gamma)}\left[1-\tau\left(6-12\tau\right)\right]}{4 - \frac{\delta\gamma}{3(\delta+\gamma)}\left[7-\tau\left(18-12\tau\right)\right]} < 1$$

$$\frac{TW^{F*}(\tau,\delta,\gamma)}{TW^{M*}(\tau,\delta,\gamma)} > \frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)}$$

The proof of Proposition 4 describes the values of the aggregated economic variables for the female and male sections of the society and its proof includes de computation of the corresponding comparative statics. This proposition assumes values of δ and γ that are small enough relative to τ in order to guarantee full labor market participation and it shows that for values of τ that are larger than $\frac{1}{2}$ the female types suffer more from discrimination relative to the male types: the female section of society obtains lower total utility, lower total income, and higher total costs which imply that the effects of discrimination are higher in terms of utility than in terms of income. The comparative statics with respect to τ show that the ratios of total income and total utility decrease with τ which implies that female types become relatively worse off with increases of τ. And the ratio of total cost decreases with τ for values of τ that are very large ($\tau > \frac{1}{2} + \frac{1}{\sqrt{12}}$) and it increases otherwise. See figure 3. The comparative statics with respect to τ imply that the optimal value of τ for males is $\tau = \frac{3}{4}$, and the optimal value of τ for females would be $\tau = \frac{1}{4}$, however if we assume that $\tau \geq \frac{1}{2}$ the best value of τ for females is $\tau = \frac{1}{2}$. Notice that when τ approaches $\frac{1}{2}$ all ratios converge to 1. And when τ approaches 1 we have that

$\lim_{\tau\to 1} \frac{TW^{F*}(\tau,\delta,\gamma)}{TW^{M*}(\tau,\delta,\gamma)} = \frac{4-\frac{7\delta\gamma^2}{3(\delta+\gamma)^2}}{4-\frac{\delta\gamma^2}{3(\delta+\gamma)^2}} < 1$

$\lim_{\tau\to 1} \frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)} = \frac{4-\frac{7\delta\gamma}{3(\delta+\gamma)}}{4-\frac{\delta\gamma}{3(\delta+\gamma)}} < 1$

and $\lim_{\tau\to 1} \frac{TC^{F*}(\tau,\delta,\gamma)}{TC^{M*}(\tau,\delta,\gamma)} = 7$

FIGURE 3 ABOUT HERE

The comparative statics with respect to γ show that the ratios of total income and total utility decrease with γ which implies that female types become relatively worse off with increases of γ. The comparative statics with respect to δ show that the ratios of total income and total utility decrease with δ only if $\gamma < \delta$. The ratio of total cost is not affected by the parameters δ and γ. Notice that when either δ or γ approach 0 all ratios converge to 1. And when $\tau = 1$ the ratio of total utility decrease with δ and γ, and the ratio of income decreases with γ, and it also decreases with δ whenever $\gamma > \delta$.

Proposition 4 implies that in order to eliminate the gender gaps the type that employers should use as reference when hiring is $\tau = \frac{1}{2}$ which is also the value of τ that maximizes total utility given fixed values of δ and γ. In this case there is no trade-off between efficiency and gender equity. Given that full labor market participation is the best that society can hope for, if in addition we had that $\tau = \frac{1}{2}$ we would have reached the optimal labor market configuration which would also imply that

$$\frac{TL^{F*}\left(\frac{1}{2},\delta,\gamma\right)}{TL^{M*}\left(\frac{1}{2},\delta,\gamma\right)} = \frac{TW^{F*}\left(\frac{1}{2},\delta,\gamma\right)}{TW^{M*}\left(\frac{1}{2},\delta,\gamma\right)} = \frac{TC^{F*}\left(\frac{1}{2},\delta,\gamma\right)}{TC^{M*}\left(\frac{1}{2},\delta,\gamma\right)} = \frac{TU^{F*}\left(\frac{1}{2},\delta,\gamma\right)}{TU^{M*}\left(\frac{1}{2},\delta,\gamma\right)} = 1$$

which on top of the efficiency levels just mentioned it would reach the desirable goal of equity for the two sections of the society considered here: female and male types. Thus according to this model we would be in the best of all possible worlds with $\tau = \frac{1}{2}$. However, we also observe that even if $\tau = \frac{1}{2}$ for any value of δ and γ such that $\delta, \gamma > 0$ we would always have individuals that are paying a cost in order to comply with the preferences of the employer, and thus the aggregated economic variables for the society will never be able to reach a first best because inefficiency would always persist.

So far we have analyzed the case of full labor market participation which can only hold for low values of the discrimination parameters ($\tau \leq \sqrt{\frac{1}{\gamma} + \frac{1}{\delta}}$). Since the empirical studies of the current gender gaps show that unemployment levels are higher for female types than for male types, in the real world we might have higher discrimination levels. If we consider intermediate discrimination levels such as $1 - \tau \leq \sqrt{\frac{1}{\gamma} + \frac{1}{\delta}} \leq \tau$ only high enough types decide to participate in the labor market. In particular for $\tau - \frac{1}{2} \leq \sqrt{\frac{1}{\gamma} + \frac{1}{\delta}}$ all male types participate $TL^{M*}(\tau, \delta, \gamma) = \frac{1}{2}$ and only a fraction of the female types do $TL^{F*}(\tau, \delta, \gamma) = \frac{1}{2} - \tau + \sqrt{\frac{1}{\gamma} + \frac{1}{\delta}} < \frac{1}{2}$. And for $\sqrt{\frac{1}{\gamma} + \frac{1}{\delta}} \leq \tau - \frac{1}{2}$ we have that only a fraction of the male types participate $TL^{M*}(\tau, \delta, \gamma) = 1 - \tau + \sqrt{\frac{1}{\gamma} + \frac{1}{\delta}} < \frac{1}{2}$ and $TL^{F*}(\tau, \delta, \gamma) = 0$.

Finally, for higher discrimination levels such as $\sqrt{\frac{1}{\gamma} + \frac{1}{\delta}} \leq 1 - \tau$ only those types that are close enough to τ decide to participate in the labor market. In particular for $\tau - \frac{1}{2} \leq \sqrt{\frac{1}{\gamma} + \frac{1}{\delta}}$ we have that some male and some female types participate with $0 < TL^{F*}(\tau, \delta, \gamma) = \frac{1}{2} - \tau + \sqrt{\frac{1}{\gamma} + \frac{1}{\delta}} < TL^{M*}(\tau, \delta, \gamma) = \tau + \sqrt{\frac{1}{\gamma} + \frac{1}{\delta}} - \frac{1}{2} < \frac{1}{2}$.

And for $\sqrt{\frac{1}{\gamma} + \frac{1}{\delta}} \leq \tau - \frac{1}{2}$ we have that only a fraction of the male types participate $TL^{M*}(\tau, \delta, \gamma) = 2\sqrt{\frac{1}{\gamma} + \frac{1}{\delta}} < \frac{1}{2}$ and $TL^{F*}(\tau, \delta, \gamma) = 0$. See figure 4.

FIGURE 4 ABOUT HERE

Notice that in all cases the female section of the society is worse off than the male section in terms of labor market participation which implies lower values of income and utility for females with respect to males. As before this is due to the fact that increasing values of the discrimination parameters imply a worse situation for all individuals but it is much harder on types that are far away from the most preferred type of the employer. In the cases of partial labor market participation it also implies lower labor market participation for types that are far away from the most preferred type of the employer. Thus very large values of the discrimination parameters drives all the female types out of the labor market. These are the features that one can observe in the labor market in some professions at all levels and in most professions at top levels where women are almost non existent.

Therefore, higher discrimination implies lower ratios of total income and total utility for the female types. At the same time the ratio of total cost borne by the female types decreases with the values of the discrimination parameters, because as these values increase discrimination becomes generalized and affects increasingly male types. Finally, the total cost borne by female and male are equal (and equal to zero) when the discrimination index reaches its maximum. However at this point the inequality in terms of total utility is maximal. This is due to the fact that maximal discrimination implies maximal inequality in terms of income and utility because when the cost of is so high relative to the wage no one has any incentive in investing into changing its type.

However, if instead of trying to explain the observed gender variation of the labor market participation in the real world I want to characterize the most desirable situation for the society both in terms of efficiency and also of gender equity I have to focus on how much of salary distortion and gender gaps can be reduced through a reduction in the discrimination factors.

The derivation of possible policies that may induce an alleviation of the effects of the labor market discrimination in this model has to be done through changes in the parameters τ, δ, and γ. Changes in γ may be very difficult or even impossible to implement, because they refer to the way individuals perceive themselves. A reduction in the value of the parameter γ implies a relaxation of the individual gender considerations which is a very personal endeavor and it may take several generations to obtain perceivable results. However, since at the beginning of the paper I have assumed a normalization of the parameter corresponding to the maximal wage ($\omega = 1$) I have to interpret γ as the weight of the cost relative to the maximal wage. With this interpretation increasing values of the maximal wage imply a reduction of γ and thus they will reduce the overall total cost paid by the society relative to the total income obtained, and the effects of the discrimination may be reduced. But the effects of discrimination will not disappear, in fact, they will persist as long as $\gamma > 0$.

Changes in τ or δ involve a change in the preferences of the employers with respect to the labor market candidates. Changes in individual preferences are also difficult to implement, and their effects also take a long time to be perceived. However they can be produced by an education that is inclusive enough regarding gender issues. Smaller values of δ would imply a smaller punishment in terms of income reductions for all individuals, and less extreme values of τ would reduce the total cost that the society has to pay.

6 Concluding remarks

This paper has analyzed gender discrimination for an individual choice model about labor market participation that includes a specific choice that individuals make about which personal gender features they want to offer to their potential employers. The model includes specific preferences of the employers that represent the observed gender discrimination (statistical and/or taste-based). And it has shown that its effects not only produce a gender unbalanced labor market but also an inefficient one. Gender discrimination will persist as long as employers have a preference to hire men over women. If employers could be convinced to prefer to hire a gender balanced type that include as many female features as male ones, gender discrimination would disappear however inefficiency will remain, since in this case we would still have individuals investing on their chosen types in order to become attractive enough to employers.

The analysis proposed in this paper contributes to the theoretical literature on discrimination in the labor market that includes some papers devoted to explain racial discrimination such us Peski and Szentes (2013) who analyze how racial stereotypes may affect the labor market outcomes. The existing theoretical models that focus on the gender gaps in the labor market assume specific strategies for the firms such as incentive contracts (Albanesi and Olivetti 2009) or different types of jobs (Francois 1998 and Dolado *et al.* 2013) and they display multiple self-fulfilling equilibria, some of which exhibit gender gaps.

The lower labor demand for women that is generated due to the discrimination that may be implemented by the employer produces a gender unbalanced distribution of successful workers: women are less likely to obtain a job than male in similar situations. This distribution may be taken as reference by potential candidates when searching for a job. The fact that it is unbalanced implies that it will have a different effect on male and female potential candidates: females will consistently estimate lower probabilities of success in their job search than males. Since the expected success for women in the labor market is lower, the relative benefits of pursuing the job search are smaller for women and in turn it affects negatively the female labor supply.

It is important to highlight the contribution of firms' pay policies to the observed gender wage gap in earnings on average, at different quantiles of the earnings distribution, and over time to shed light on the role of firm pay policies in hindering or reinforcing the gender wage. Casarico and Lattanzio (2024) show that the gap in firm pay policies explains on average 30% of the gender pay gap in the period 1995-2015. Sorting of women in low pay firms explains a large fraction of the gender pay gap and they also find that women have a lower probability of moving towards firms with higher pay rates. Campa *et al.* (2011) find that firms' beliefs, which express their set of ideas, values and norms, are as important as individuals' attitudes to explain female labor market outcomes.

Social norms may be considered as an additional cause of lower demand of females in the labor market. The fact that it is more naturally and more generally accepted that males participate in the labor market than females is one such social norm that affects negatively women's participation in the labor market because it induces employers (mostly men) to be more reluctant to hire women (Farré and Vella 2013, Bertrand 2019, and Fernandez *et al.* 2004). In addition, the possibility of maternity leaves increases the risk and the expected costs associated with hiring women relative to those of hiring men. These larger costs also induce employers to hire men rather than women (Bertrand and Mullainathan 2014, Goldin 2014, and Bertrand and Duflo 2017).

The existence of gender differences has also been found in preferences: women have lower preferences for risk and competition and are more sensitive to social cues (Azmat and Petrongolo 2014). Gender differences also appear in personality traits, social cooperation and verbal and nonverbal communication (Del Giudice 2015). Lindenlaub and Prummer (2021) analyze gender traits in network structures and find that men establish more connections while women create denser networks. A key open question remains as to the source of gender preferences and performances—nature versus nurture, or their interaction—and their role, if any, in the workplace.

While these observable gender differences may be able to explain productivity gaps, Lundberg and Stearns (2019) find that the productivity gaps cannot explain the gender disparity in promotion rates and they argue that they may be due to gendered institutional policies. Thus we should consider the possibility that at the origin of the observed gender gaps in the labor market there may be less observable gender differences, for instance gender stereotypes and unconscious gender biases.

There exist gender stereotypes (assessing what women and men are like) that create biased judgements and biased decisions that are the causes of the gender discrimination analyzed in this paper. Heilman (2012) argues that gender stereotypes promote gender bias because they produce the perception that female features are not adequate for a successful professional performance (previously determined according to male attributes). For instance, Baltrunaite *et al.* (2022) find that men are described more often as brilliant and women as hardworking and diligent. Eberhardt *et al.* (2022) show that women are more likely to be described using 'grindstone' terms and less likely to be praised for their ability. And Mengel *et al.* (2019) explains that the lower teaching evaluations that women receive systematically are driven by male students' evaluations.

When these stereotypes are at work we find that women possibilities of improving professionally are affected. Mengel (2020.a) shows that earnings and promotion gender gaps appear because male decision makers are more likely to reward their (predominantly male) network neighbors with increased earnings as well as promotions. Witterman *et al.* (2019) find that gender gaps in grant funding are attributable to less favorable assessments of women as principal investigators, not to the quality of their proposed research. And Cullen *et al.* (2020) report that male employees assigned to male managers were promoted faster than male employees assigned to female managers.

In order to alleviate the discrimination suffered by women due to the existence of gender stereotypes there are some proposals that have been shown to be effective. Mengel (2020.b) proposes an information intervention where the existence of gender stereotypes and its effects are made explicit and common knowledge. This experiment has been able to reduce the gender bias in the lab. Hospido *et al.* (2022) shows that gender wage and promotions gaps disappear in the European Central Bank after they issue a public commitment to diversity. And Bertrand *et al.* (2019) report that gender gap in earnings fell substantially in the boards of public limited liability companies after Norway passed a law mandating 40 percent representation of each gender.

Finally, but not less important, we have the effects of the existing implicit bias or unconscious bias (Pritlove *et al.* 2019). The concept of implicit bias is based on the belief that people act on the basis of internalized schemes of which they are unaware and thus can engage in discriminatory behaviors without a conscious intent. Thus, opinions that we hold about different social groups that operate outside of our conscious awareness end up having an effect on our assessments and decisions. In fact, unconscious gender bias occurs when a person rejects gender stereotypes but still unconsciously makes evaluations based on stereotypes. During the past few decades, social scientists have discovered that unconscious bias can strongly influence the way we evaluate and treat other people. In particular, unconscious gender bias may be thought of as one of the causes of the observed gender gaps in the labor market where men's competencies, skills, productivity, leadership potential, and quality of work are consistently judged to be superior on the basis of gender identification alone.

In order to eliminate the discriminatory consequences of the unconscious gender bias Girod *et al.* (2016) propose an implicit bias training that should make individuals aware of their unintentional involvement in the perpetuation of discrimination and inequity as well as the unrecognized advantages they enjoy based on group membership. Such training encourages individuals to confront their own biases and unearned privileges and to learn strategies aimed at reducing discriminatory thoughts and practices. Grewal *et al.* (2013) outline several specific strategies that individuals can take in order to prevent unconscious bias from negatively influencing their own careers. These strategies include promoting awareness in self and others and building and maintaining strong professional networks. In addition, several recommendations are given to institutions on how to combat the influence of unconscious bias in the context of hiring. For example, institutions and firms can educate search committees and make sure job descriptions are neutral. And Grada *et al.* (2015) show that involving women in the development and redesign of organizational policies and programs helped to promote more inclusive measures of success. Overall, we have argued that in order to overcome the current gender gaps in the labor market, due to discriminatory idiosyncrasies or unconscious biases, it is essential to promote awareness of gender inequities.

7 References

Albanesi, Stefania and Claudia Olivetti (2009) "Home production,market production and the gender wage gap: Incentives and expectations" *Review of Economic Dynamics* 12(1):80-107.

Alesina, Alberto and Eliana La Ferrara (2005) "Ethnic Diversity and Economic Performance" *Journal of Economic Literature* 43(3):762-800.

Arrow, Kenneth (1973) "The Theory of Discrimination" in *Discrimination in Labor Markets* edited by Orley C. Ashenfelter and Albert Everett Rees, 3-33. Princeton, NJ: Princeton University Press.

Azmat, Ghazala and Barbara Petrongolo (2014) "Gender and the labor market: What have we learned from field and lab experiments?" *Labour Economics* 30:32-40.

Baccara, Mariagiovanna and Leeat Yariv (2008) "Similarity and Polarization in Groups" Unpublished.

Baltrunaite, Audinga, Alessandra Casarico, and Lucia Rizzica (2022) "Women in Economics: the role of gendered references at entry in the profession" CEPR discussion paper 17474.

Becker, Gary S. (1957) *The Economics of Discrimination* Chicago: University of Chicago Press.

Becker, Gary S. (1971) *The Economics of Discrimination*, second edition, Chicago: University of Chicago Press.

Bertrand, Marianne (2020) "Gender in the Twenty-First Century" *American Economic Association: Papers and Proceedings* 110:1-24.

Bertrand, Marianne (2019) The Gender Socialization of Children Growing up in Non-Traditional Families. *American Economic Association: Papers and Proceedings* 109: 115-21.

Bertrand, Marianne, Sandra E. Black, Sissel Jensen, and Adriana Lleras-Muney (2019) "Breaking the Glass Ceiling? The Effect of Board Quotas on Female Labor Market Outcomes in Norway" *The Review of Economic Studies* 86(1):191-239.

Bertrand, Marianne and Esther Duflo (2017) "Field Experiments on Discrimination" in Abhijit Banerjee and Esther Duflo eds., *Handbook of Field Experiments*, North Holland.

Bertrand, Marianne and Sendhil Mullainathan (2014) "Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination" *American Economic Review* 94(4):991-1013.

Campa, Pamela, Alessandra Casarico, and Paola Profeta (2011) "Gender Culture and Gender Gap in Employment" CESifo Economic Studies, 2011, 57(1):156-182.

Casarico, Alessandra and Salvatore Lattanzio (2024) "What Firms do: Gender Inequality in Linked Employer-Employee Data" *Journal of Labor Economics*, forthcoming.

Coate, Stephen and Glenn C. Loury (1993) "Will Affirmative-Action Policies Eliminate Negative Stereotypes?" *American Economic Review* 83(5):1220-1240.

Cullen, Zoe and Ricardo Perez-Truglia (2020) "The Old Boys' Club" working paper.

Del Giudice (2015) "Gender Differences in Personality and Social Behavior" *International Encyclopedia of the Social Behavioral Sciences*, second edition, 750-756.

Dolado, Juan J., Cecilia García-Peñalosa, and Sara De La Rica (2013) "On Gender Gaps and Self-Fulfilling Expectations:Alternative Implications of Paid-For Training" *Economic Inquiry* 51.3:1829-1848.

Eberhardt, Markus, Giovanni Facchini, and Valeria Rueda (2022) "Gender differences in reference letters: Evidence from the economics job market" CEPR discussion paper 16960.

Farré, Lídia and Francis Vella (2013) The Intergenerational Transmission of Gender Role Attitudes and its Implications for Female Labour Force Participation. *Economica* 80(318): 219-247.

Fernandez, Raquel, Alessandra Fogli, and Claudia Olivetti (2004) Mothers and Sons: Preference Formation and Female Labor Force Dynamics. *Quarterly Journal of Economics* 119(4): 1249-1299.

Francois, Patrick (1998) "Gender discrimination without gender difference: theory and policy responses" *Journal of Public Economics* 68(1):1-32.

Girod, Sabine, Magali Fassiotto, Daisy Grewal, and Manwai Candy Ku (2016) "Reducing Implicit Gender Leadership Bias in Academic Medicine with an Educational Intervention" *Academic Medicine* 91(8):1143-1150.

Gneezy, Uri, John List, and Michael K. Price (2012) "Toward an understanding of Why People Discriminate: Evidence from a Series of Natural Field Experiments" NBER working paper 17855.

Goldin, Claudia (2014) A Grand Gender Convergence: Its Last Chapter. *American Economic Review* 104(4): 1091-1119.

Grada, Aifric O., Caitriona Ni Laoire, Carol Linehan, Geraldine Boylan, and Lindan Connolly (2015) "Naming the parts: A case-study of a gender equality initiative with academic women" *Gender in Management. An International Journal* 30(5):358-378.

Grewal, Daisy, Manwai Candy Ku, Sabine Girod, and Hannah Valantine (2013) "How to Recognize and Address Unconscious Bias" in L. Weiss Roberts (Ed.) *The Academic Medicine Handbook: A guide to achievement and fulfillment for academic faculty* 405-412. Springer Science and Business Media.

Heilman, Madeline E. (2012) "Gender Stereotypes and Workplace Bias" *Research in Organizational Behavior* 32:113-135.

Hospido, Laura, Luc Laeven, and Ana Lamo (2022) "The Gender Promotion Gap: Evidence from Central Banking" *The Review of Economics and Statistics* 104(5):981-996.

Isen, Adam, Maya Rossin-Slater, and Reed Walker (2017) "Relationship Between Season of Birth, Temperature Exposure, and Later Life Well-Being" *Proceedings of the National Academy of Sciences* 114(51):13447-13452.

Keng, Shao-Hsun (2020) "Gender Bias and Statistical Discrimination Against Female Instructors in Student Evaluations of Teaching" *Labour Economics* 66(2):101889.

Lang, Kevin, Michael Manove, and William T. Dickens (2005) "Racial Discrimination in Labor Markets with Posted Wage Offers" *American Economic Review* 95(4):1327-1340.

Lesner, Rune V. (2017) "Testing for Statistical Discrimination Based on Gender" *Labour* 32(2):141-181.

Lindenlaub, Ilse and Anja Prummer (2021) "Network structure and performance" *The Economic Journal* 131(634):851-898.

Lundberg, Shelly and Jenna Stearns (2019) "Women in economics: Stalled progress" *Journal of Economic Perspectives* 33(1):3-22.

Mailath, George J., Larry Samuelson, and Avner Shaked (2000) "Endogenous Inequality in Integrated Labor Markets with Two-sided search" *American Economic Review* 90(1):46-72.

Mengel, Friederike (2020.a) "Gender Differences in Networking" *The Economic Journal* 130:1842-1873.

Mengel, Friederike (2020.b) "Gender Biases in Opinion Aggregation" working paper.

Mengel, Friederike, Jan Sauermann, and Ulf Zolitz (2019) "Gender Bias in Teaching Evaluations" *Journal of the European Economic Association* 17(2):535-566.

Moro, Andrea and Peter Norman (2004) "A General Equilibrium Model of Statistical Discrimination" *Journal of Economic Theory* 114(1):1-30.

Neilson, William and Shanshan Ying (2016) "From Taste-Based to Statistical Discrimination" *Journal of Economic Behavior & Organization* 129:116-128

Peski, Marcin and Balazs Szentes (2013) "Spontaneous Discrimination" *American Economic Review* 103(6):2412-2436.

Phelps, Edmund (1972) "The Statistical Theory of Racism and Sexism" *American Economic Review* 62(4):659-661.

Pritlove,Cheryl, Clara Juando-Prats, Kari Ala-leppilampi, and Janet A Parsons (2019) "The Good, the Bad, and the Ugly of Implicit Bias" *The Lancet* 393:502-504.

Rosen, Asa (1997) "An Equilibrium Search-Matching Model of Discrimination" *European Economic Review* 62(4):1589-1613.

Schelling, Thomas C. (1971) "Dynamic Models of Segregation" *Journal of Mathematical Sociology* 1(2):143-186.

Spence, Michael (1973) "Job Market Signalling" *Quarterly Journal of Economics* 87(3):355-364.

Witterman, Holly O., Michael Hendricks, Sharon Straus, and Cara Tannenbaum (2019) "Are Gender Gaps due to Evaluations of the Applicant or the Science? A Natural Experiment at a National Funding Agency" *The Lancet* 393:531-40.

8 Appendix

Proof of Proposition 1:

The optimization of $U(s) = 1 - \delta\left(s - \tau\right)^2 - \gamma(t-s)^2$ with respect to $s \in [0,1]$ produces a first order condition given by $\frac{\partial U(s)}{\partial s} = -\delta 2\left(s - \tau\right) + \gamma 2(t - s) = 0$ which implies that the optimal value of s is given by $s^*\left(t, \tau, \delta, \gamma\right) = \frac{\delta\tau + \gamma t}{\delta + \gamma}$. Notice that the second order condition $\frac{\partial^2 U(s)}{\partial s^2} = -2\left(\delta + \gamma\right) < 0$ is always satisfied.

$s^*(t,\tau,\delta,\gamma) = \frac{\delta\tau+\gamma t}{\delta+\gamma}$ implies $U(s^*(t,\tau,\delta,\gamma)) > 0$ iff
$1 > \delta\left(\frac{\delta\tau+\gamma t}{\delta+\gamma} - \tau\right)^2 + \gamma\left(t - \frac{\delta\tau+\gamma t}{\delta+\gamma}\right)^2$ iff $|t-\tau| < \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$.

Notice that for $|t-\tau| \le \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$ either $\gamma|t-\tau|^2 < 1$ holds or $\gamma|t-\tau|^2 > 1$ and $\delta < \frac{\gamma}{\gamma|t-\tau|^2-1}$ hold.

Thus only the types that satisfy $|t-\tau| < \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$ decide to participate in the labor market and they do so choosing the type $s^*(t,\tau,\delta,\gamma) = \frac{\delta\tau+\gamma t}{\delta+\gamma}$ and $\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} > 1$ iff $\delta < \frac{\gamma}{\gamma-1}$ and $\gamma > 1$.

And $s^*(t,\tau,\delta,\gamma) \le t$ if and only if $t \ge \tau$ and $s^*(t,\tau,\delta,\gamma) \le \tau$ if and only if $t \le \tau$, therefore $\tau \le s^*(t,\tau,\delta,\gamma) \le t$ for $\tau \le t$ and $t \le s^*(t,\tau,\delta,\gamma) \le \tau$ for $\tau \ge t$.

Finally, $s^*(t,\tau,0,\gamma) = t, s^*(t,\tau,\delta,0) = \tau$,
$|s^*(t,\tau,\delta,\gamma) - t| > |s^*(t,\tau,\delta,\gamma) - \tau|$ if and only if $\delta > \gamma$,
and $\lim_{\delta\to\infty} s^*(t,\tau,\delta,\gamma) = \tau$, and $\lim_{\gamma\to\infty} s^*(t,\tau,\delta,\gamma) = t$.

Comparative statics:
$\frac{\partial s^*(t,\tau,\delta,\gamma)}{\partial t} = \frac{\gamma}{\delta+\gamma} > 0$
$\frac{\partial s^*(t,\tau,\delta,\gamma)}{\partial \tau} = \frac{\delta}{\delta+\gamma} > 0$
$\frac{\partial s^*(t,\tau,\delta,\gamma)}{\partial \delta} = \frac{\gamma(\tau-t)}{(\delta+\gamma)^2} > 0$ iff $\tau > t$
$\frac{\partial s^*(t,\tau,\delta,\gamma)}{\partial \gamma} = \frac{\delta(t-\tau)}{(\delta+\gamma)^2} > 0$ iff $\tau < t$.▼

Proof of Proposition 2:

For $|t-\tau| \le \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$I have

$W^*(t,\tau,\delta,\gamma) = 1 - \delta(s^*-\tau)^2 = 1 - \delta\left(\frac{\delta\tau+\gamma t}{\delta+\gamma} - \tau\right)^2 = 1 - \delta\left(\frac{\gamma(t-\tau)}{\delta+\gamma}\right)^2 = 1 - \frac{\delta\gamma^2}{(\delta+\gamma)^2}(t-\tau)^2$

$C^*(t,\tau,\delta,\gamma) = \gamma(t-s^*)^2 = \gamma\left(t - \frac{\delta\tau+\gamma t}{\delta+\gamma}\right)^2 = \gamma\left(\frac{\delta(t-\tau)}{\delta+\gamma}\right)^2 = \frac{\delta^2\gamma}{(\delta+\gamma)^2}(t-\tau)^2$

$U^*(t,\tau,\delta,\gamma) = 1 - \delta\left(\frac{\gamma(t-\tau)}{\delta+\gamma}\right)^2 - \gamma\left(\frac{\delta(t-\tau)}{\delta+\gamma}\right)^2 = 1 - \frac{\delta\gamma}{\delta+\gamma}(t-\tau)^2 = 1 - \frac{(t-\tau)^2}{\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}} > 0$

Recall that for $|t-\tau| \le \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$ either $\gamma|t-\tau|^2 < 1$ holds or $\gamma|t-\tau|^2 > 1$ and $\delta < \frac{\gamma}{\gamma|t-\tau|^2-1}$ hold.

Comparative statics:
$\frac{\partial W^*(t,\tau,\delta,\gamma)}{\partial t} = -\frac{2\delta\gamma^2}{(\delta+\gamma)^2}(t-\tau) > 0$ iff $t < \tau$
$\frac{\partial W^*(t,\tau,\delta,\gamma)}{\partial \tau} = \frac{2\delta\gamma^2}{(\delta+\gamma)^2}(t-\tau) < 0$ iff $t < \tau$
$\frac{\partial C^*(t,\tau,\delta,\gamma)}{\partial t} = \frac{2\delta^2\gamma}{(\delta+\gamma)^2}(t-\tau) < 0$ iff $t < \tau$
$\frac{\partial C^*(t,\tau,\delta,\gamma)}{\partial \tau} = -\frac{2\delta^2\gamma}{(\delta+\gamma)^2}(t-\tau) > 0$ iff $t < \tau$
$\frac{\partial U^*(t,\tau,\delta,\gamma)}{\partial t} = -\frac{2\delta\gamma(t-\tau)}{\delta+\gamma} > 0$ iff $t < \tau$

$\frac{\partial U^*(t,\tau,\delta,\gamma)}{\partial \tau} = \frac{2\delta\gamma(t-\tau)}{\delta+\gamma} < 0$ iff $t < \tau$
and
$\frac{\partial W^*(t,\tau,\delta,\gamma)}{\partial \delta} = \frac{\gamma^2(\delta-\gamma)}{(\delta+\gamma)^3}(t-\tau)^2 < 0$ iff $\delta < \gamma$
$\frac{\partial W^*(t,\tau,\delta,\gamma)}{\partial \gamma} = -\frac{2\delta^2\gamma}{(\delta+\gamma)^3}(t-\tau)^2 < 0$
$\frac{\partial C^*(t,\tau,\delta,\gamma)}{\partial \delta} = \frac{2\delta\gamma^2}{(\delta+\gamma)^3}(t-\tau)^2 > 0$
$\frac{\partial C^*(t,\tau,\delta,\gamma)}{\partial \gamma} = \frac{\delta^2(\delta-\gamma)}{(\delta+\gamma)^3}(t-\tau)^2 < 0$ iff $\delta < \gamma$
$\frac{\partial U^*(t,\tau,\delta,\gamma)}{\partial \delta} = -\frac{\gamma}{(\delta+\gamma)^2}(t-\tau)^2 < 0$
$\frac{\partial U^*(t,\tau,\delta,\gamma)}{\partial \gamma} = -\frac{\delta^2}{(\delta+\gamma)^2}(t-\tau)^2 < 0.$▼

Proof of Proposition 3.1:

For $\frac{1}{2} \le \tau \le \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$ I find full labor market participation for all parameter values $TL^*(\tau,\delta,\gamma) = 1$ and:

$TW^*(\tau,\delta,\gamma) = \int_0^1 W^*(t,\tau,\delta,\gamma)dt = 1 - \frac{\delta\gamma^2}{3(\delta+\gamma)^2}[1-3\tau(1-\tau)]$

$TC^*(\tau,\delta,\gamma) = \int_0^1 C^*(t,\tau,\delta,\gamma)dt = \frac{\delta^2\gamma}{3(\delta+\gamma)^2}[1-3\tau(1-\tau)]$

$TU^*(\tau,\delta,\gamma) = TW^*(\tau,\delta,\gamma) - TC^*(\tau,\delta,\gamma) = -\frac{\delta\gamma^2}{(\delta+\gamma)^2}[2\tau-1] < 0$

$\frac{\partial TC^*(\tau,\delta,\gamma)}{\partial \tau} = \frac{\delta^2\gamma}{(\delta+\gamma)^2}[2\tau-1] > 0$
$\frac{\partial TU^*(\tau,\delta,\gamma)}{\partial \tau} = -\frac{\delta\gamma}{(\delta+\gamma)}[2\tau-1] < 0$
Comparative statics:
$\frac{\partial TW^*(\tau,\delta,\gamma)}{\partial \delta} = \frac{\gamma^2(\delta-\gamma)}{3(\delta+\gamma)^3}[1-3\tau(1-\tau)] > 0$ iff $\delta > \gamma$
$\frac{\partial TW^*(\tau,\delta,\gamma)}{\partial \gamma} = -\frac{2\delta^2\gamma}{3(\delta+\gamma)^3}[1-3\tau(1-\tau)] < 0$
$\frac{\partial TC^*(\tau,\delta,\gamma)}{\partial \delta} = \frac{2\delta\gamma^2}{3(\delta+\gamma)^3}[1-3\tau(1-\tau)] > 0$
$\frac{\partial TC^*(\tau,\delta,\gamma)}{\partial \gamma} = \frac{\delta^2(\delta-\gamma)}{3(\delta+\gamma)^3}[1-3\tau(1-\tau)] > 0$ iff $\delta > \gamma$
$\frac{\partial TU^*(\tau,\delta,\gamma)}{\partial \delta} = -\frac{\gamma^2}{3(\delta+\gamma)^2}[1-3\tau(1-\tau)] < 0$
$\frac{\partial TU^*(\tau,\delta,\gamma)}{\partial \gamma} = -\frac{\delta^2}{3(\delta+\gamma)^2}[1-3\tau(1-\tau)] < 0.$▼

Proof of Proposition 3.2:

For $\frac{1}{2} \le \tau \le 1$ and $1-\tau < \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < \tau$ I have partial labor market participation for all parameter values. In particular I have labor market participation for all t such that $0 < \tau - \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < t < 1$. Thus the labor market participation is equal to $TL^*(\tau,\delta,\gamma) = 1 - \tau + \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$ and it decreases with τ, δ and γ.

$TW^*(\tau,\delta,\gamma) = \int_{\tau-\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}}^1 W^*(t,\tau,\delta,\gamma)dt = 1-\tau-\frac{\delta\gamma^2}{3(\delta+\gamma)^2}(1-\tau)^3+\frac{3\delta+2\gamma}{3(\delta+\gamma)}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$

$TC^*(\tau,\delta,\gamma) = \int_{\tau-\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}}^1 C^*(t,\tau,\delta,\gamma)dt = \frac{\delta^2\gamma}{3(\delta+\gamma)^2}(1-\tau)^3 + \frac{\delta}{3(\delta+\gamma)}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$

$TU^*(\tau,\delta,\gamma) = TW^*(\tau,\delta,\gamma) - TC^*(\tau,\delta,\gamma) = 1 - \tau - \frac{\delta\gamma}{3(\delta+\gamma)}(1-\tau)^3 + \frac{2}{3}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$

$\frac{\partial TW^*(\tau,\delta,\gamma)}{\partial \tau} = \frac{\delta\gamma^2}{(\delta+\gamma)^2}(1-\tau)^2 - 1 < 0$ iff $1-\tau < \sqrt{\frac{\delta+\gamma}{\gamma}}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$

which holds in this case since $1-\tau \leq \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < \sqrt{\frac{\delta+\gamma}{\gamma}}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$

$\frac{\partial TC^*(\tau,\delta,\gamma)}{\partial \tau} = -\frac{\delta^2\gamma}{(\delta+\gamma)^2}(1-\tau)^2 < 0$

$\frac{\partial TU^*(\tau,\delta,\gamma)}{\partial \tau} = \frac{\delta\gamma}{(\delta+\gamma)}(1-\tau)^2 - 1 < 0$ iff $1-\tau < \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$ which holds in this case

Comparative statics:

$\frac{\partial TW^*(\tau,\delta,\gamma)}{\partial \delta} = \frac{\gamma^2(\delta-\gamma)}{3(\delta+\gamma)^3}(1-\tau)^3 - \frac{\gamma(\delta+2\gamma)}{6\delta(\delta+\gamma)^2}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < 0$ iff $(\delta-\gamma)(1-\tau)^3 < \frac{\delta+2\gamma}{2}\left(\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}\right)^3$

which holds for $\delta < \gamma$, and otherwise, if $\delta > \gamma$ it holds iff $\left(\frac{1-\tau}{\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}}\right)^3 < \frac{\delta+2\gamma}{2(\delta-\gamma)}$

Since $\left(\frac{1-\tau}{\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}}\right)^3 < 1$, and $\frac{\delta+2\gamma}{2(\delta-\gamma)} > 1$ iff $4\gamma > \delta$, $\frac{\partial TW^*(\tau,\delta,\gamma)}{\partial \delta} < 0$ also holds for $4\gamma > \delta > \gamma$.

Thus $\frac{\partial TW^*(\tau,\delta,\gamma)}{\partial \delta} < 0$ iff $\delta < \overline{\delta}(\tau,\gamma)$ for some $\overline{\delta}(\tau,\gamma) > 4\gamma$.

$\frac{\partial TW^*(\tau,\delta,\gamma)}{\partial \gamma} = -\frac{2\delta^2\gamma}{3(\delta+\gamma)^3}(1-\tau)^3 - \frac{\delta}{2\gamma(\delta+\gamma)}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < 0$

$\frac{\partial TC^*(\tau,\delta,\gamma)}{\partial \delta} = \frac{2\delta\gamma^2}{3(\delta+\gamma)^2}(1-\tau)^3 + \frac{\gamma}{6(\delta+\gamma)^2}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} > 0$

$\frac{\partial TC^*(\tau,\delta,\gamma)}{\partial \gamma} = \frac{\delta^2(\delta-\gamma)}{3(\delta+\gamma)^3}(1-\tau)^3 - \frac{\delta(\delta+2\gamma)}{6\gamma(\delta+\gamma)^2}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < 0$ iff $(\delta-\gamma)(1-\tau)^3 < \frac{\delta+2\gamma}{2}\left(\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}\right)^3$

as before $\frac{\partial TC^*(\tau,\delta,\gamma)}{\partial \delta} < 0$ iff $\delta < \overline{\delta}(\tau,\gamma)$ for some $\overline{\delta}(\tau,\gamma) > 4\gamma$

$\frac{\partial TU^*(\tau,\delta,\gamma)}{\partial \delta} = -\frac{\gamma^2}{3(\delta+\gamma)^2}(1-\tau)^3 - \frac{1}{3\delta^2}\left(\frac{1}{\gamma}+\frac{1}{\delta}\right)^{-\frac{1}{2}} < 0$

$\frac{\partial TU^*(\tau,\delta,\gamma)}{\partial \gamma} = -\frac{\delta^2}{3(\delta+\gamma)}(1-\tau)^3 - \frac{1}{3\gamma^2}\left(\frac{1}{\gamma}+\frac{1}{\delta}\right)^{-\frac{1}{2}} < 0.$▼

Proof of Proposition 3.3:

For $\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} \leq 1-\tau \leq \frac{1}{2}$ I find labor market participation only for $0 < \tau - \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < t < \tau + \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < 1$. Thus labor market participation is equal to $TL^*(\tau,\delta,\gamma) = 2\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < 1$ (because $\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < \frac{1}{2}$) and it decreases with δ and with γ.

$TW^*(\tau,\delta,\gamma) = \int_{\tau-\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}}^{\tau+\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}} W^*(t,\tau,\delta,\gamma)dt = \frac{2}{3}\frac{3\delta+2\gamma}{\delta+\gamma}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$

$TC^*(\tau,\delta,\gamma) = \int_{\tau-\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}}^{\tau+\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}} C^*(t,\tau,\delta,\gamma)dt = \frac{2}{3}\frac{\delta}{\delta+\gamma}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$

$TU^*(\tau,\delta,\gamma) = TW^*(\tau,\delta,\gamma) - TC^*(\tau,\delta,\gamma) = \frac{4}{3}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$

$\frac{\partial TW^*(\tau,\delta,\gamma)}{\partial \tau} = \frac{\partial TC^*(\tau,\delta,\gamma)}{\partial \tau} = \frac{\partial TU^*(\tau,\delta,\gamma)}{\partial \tau} = 0$

Comparative statics:

$\frac{\partial TW^*(\tau,\delta,\gamma)}{\partial\delta} = -\frac{2}{3}\frac{\gamma(\delta+2\gamma)}{2\delta(\delta+\gamma)^2}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < 0$

$\frac{\partial TW^*(\tau,\delta,\gamma)}{\partial\gamma} = -\frac{1}{3}\frac{\delta(3\delta+4\gamma)}{\gamma(\delta+\gamma)^2}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < 0$

$\frac{\partial TC^*(\tau,\delta,\gamma)}{\partial\delta} = \frac{2}{3}\frac{\gamma}{2(\delta+\gamma)^2}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} > 0$

$\frac{\partial TC^*(\tau,\delta,\gamma)}{\partial\gamma} = -\frac{2}{3}\frac{\delta}{\gamma(\delta+\gamma)}\sqrt{\frac{1}{\gamma}+\frac{1}{\delta}} < 0$

$\frac{\partial TU^*(\tau,\delta,\gamma)}{\partial\delta} < 0$

$\frac{\partial TU^*(\tau,\delta,\gamma)}{\partial\gamma} < 0.$▼

Proof of Proposition 4:

For $\frac{1}{2} \leq \tau \leq \sqrt{\frac{1}{\gamma}+\frac{1}{\delta}}$ I have $TL^*(\tau,\delta,\gamma) = 1$ as in proposition 3.1 and therefore $TL^{F*}(\tau,\delta,\gamma) = TL^{M*}(\tau,\delta,\gamma) = \frac{1}{2}$.

For female types:

$TW^{F*}(\tau,\delta,\gamma) = \int_0^{\frac{1}{2}} W^*(t,\tau,\delta,\gamma)dt = \frac{1}{2} - \frac{\delta\gamma^2}{3(\delta+\gamma)^2}\left[\frac{1}{8} - \frac{3}{2}\tau\left(\frac{1}{2}-\tau\right)\right]$

$TC^{F*}(\tau,\delta,\gamma) = \int_0^{\frac{1}{2}} C^*(t,\tau,\delta,\gamma)dt = \frac{\delta^2\gamma}{3(\delta+\gamma)^2}{}^2\left[\frac{1}{8} - \frac{3}{2}\tau\left(\frac{1}{2}-\tau\right)\right]$

$TU^{F*}(\tau,\delta,\gamma) = TW^{F*}(\tau,\delta,\gamma) - TC^{F*}(\tau,\delta,\gamma) = \frac{1}{2} - \frac{\delta\gamma}{3(\delta+\gamma)}\left[\frac{1}{8} - \frac{3}{2}\tau\left(\frac{1}{2}-\tau\right)\right]$

and

$\frac{\partial TW^{F*}(\tau,\delta,\gamma)}{\partial\tau} = -\frac{\delta\gamma^2}{(\delta+\gamma)^2}\left[\tau - \frac{1}{4}\right] < 0$

$\frac{\partial^2 TW^{F*}(\tau,\delta,\gamma)}{\partial\tau^2} = -\frac{\delta\gamma^2}{(\delta+\gamma)^2} < 0$

$\frac{\partial TC^{F*}(\tau,\delta,\gamma)}{\partial\tau} = \frac{\delta^2\gamma}{(\delta+\gamma)^2}\left[\tau - \frac{1}{4}\right] > 0$

$\frac{\partial^2 TC^{F*}(\tau,\delta,\gamma)}{\partial\tau^2} = \frac{\delta^2\gamma}{(\delta+\gamma)^2} > 0$

$\frac{\partial TU^{F*}(\tau,\delta,\gamma)}{\partial\tau} = -\frac{\delta\gamma}{\delta+\gamma}\left[\tau - \frac{1}{4}\right] < 0$

$\frac{\partial^2 TU^{F*}(\tau,\delta,\gamma)}{\partial\tau^2} = -\frac{\delta\gamma}{\delta+\gamma} < 0$

Therefore, the optimal employer's most preferred type for females is $\tau = \frac{1}{4}$. For $\tau > \frac{1}{2}$ the optimal employer's most preferred type for females is $\tau = \frac{1}{2}$.

From proposition 2 we know that for all types individual utility decreases with δ and γ; individual income decreases with γ and individual cost increases with δ; individual income increases with δ and individual cost increases with γ if and only if $\delta > \gamma$. Since full market participation holds the same comparative statics apply.

For male types:

$TW^{M*}(\tau,\delta,\gamma) = \int_{\frac{1}{2}}^{1} W^*(t,\tau,\delta,\gamma)dt = \frac{1}{2} - \frac{\delta\gamma^2}{3(\delta+\gamma)^2}\left[\frac{7}{8} - \frac{3}{2}\tau\left(\frac{3}{2}-\tau\right)\right]$

$TC^{M*}(\tau,\delta,\gamma) = \int_{\frac{1}{2}}^{1} C^*(t,\tau,\delta,\gamma)dt = \frac{\delta^2\gamma}{3(\delta+\gamma)^2}\left[\frac{7}{8} - \frac{3}{2}\tau\left(\frac{3}{2}-\tau\right)\right]$

$TU^{M*}(\tau,\delta,\gamma) = TW^{M*}(\tau,\delta,\gamma) - TC^{M*}(\tau,\delta,\gamma) = \frac{1}{2} - \frac{\delta\gamma}{3(\delta+\gamma)}\left[\frac{7}{8} - \frac{3}{2}\tau\left(\frac{3}{2}-\tau\right)\right]$

and

$\frac{\partial TW^{M*}(\tau,\delta,\gamma)}{\partial\tau} = -\frac{\delta\gamma^2}{(\delta+\gamma)^2}\left[\tau - \frac{3}{4}\right] > 0 \text{ iff } \tau < \frac{3}{4}$

$\frac{\partial^2 TW^{M*}(\tau,\delta,\gamma)}{\partial\tau^2} = -\frac{\delta\gamma^2}{(\delta+\gamma)^2} < 0$

$\frac{\partial TC^{M*}(\tau,\delta,\gamma)}{\partial\tau} = \frac{\delta^2\gamma}{(\delta+\gamma)^2}\left[\tau - \frac{3}{4}\right] < 0$ iff $\tau < \frac{3}{4}$

$\frac{\partial^2 TC^{M*}(\tau,\delta,\gamma)}{\partial\tau^2} = \frac{\delta^2\gamma}{(\delta+\gamma)^2} > 0$

$\frac{\partial TU^{M*}(\tau,\delta,\gamma)}{\partial\tau} = -\frac{\delta\gamma}{\delta+\gamma}\left[\tau - \frac{3}{4}\right] > 0$ iff $\tau < \frac{3}{4}$

$\frac{\partial^2 TU^{M*}(\tau,\delta,\gamma)}{\partial\tau^2} = -\frac{\delta\gamma}{\delta+\gamma} < 0$

Therefore the optimal most preferred type by the employer for males is $\tau = \frac{3}{4}$.

From proposition 2 we know that for all types individual utility decreases with δ and γ; individual income decreases with γ and individual cost increases with δ; individual income increases with δ and individual cost increases with γ if and only if $\delta > \gamma$. Since full market participation holds the same comparative statics apply.

Female/Male ratios:

$\frac{TW^{F*}(\tau,\delta,\gamma)}{TW^{M*}(\tau,\delta,\gamma)} = \frac{4-\frac{\delta\gamma^2}{3(\delta+\gamma)^2}[1-\tau(6-12\tau)]}{4-\frac{\delta\gamma^2}{3(\delta+\gamma)^2}[7-\tau(18-12\tau)]} < 1$

$\frac{TC^{F*}(\tau,\delta,\gamma)}{TC^{M*}(\tau,\delta,\gamma)} = \frac{1-\tau(6-12\tau)}{7-\tau(18-12\tau)} > 1$

$\frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)} = \frac{4-\frac{\delta\gamma}{3(\delta+\gamma)}[1-\tau(6-12\tau)]}{4-\frac{\delta\gamma}{3(\delta+\gamma)}[7-\tau(18-12\tau)]} < 1$

$\frac{TW^{F*}(\tau,\delta,\gamma)}{TW^{M*}(\tau,\delta,\gamma)} > \frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)}$ iff $\frac{4-\frac{\delta\gamma^2}{3(\delta+\gamma)^2}[1-\tau(6-12\tau)]}{4-\frac{\delta\gamma^2}{3(\delta+\gamma)^2}[7-\tau(18-12\tau)]} > \frac{4-\frac{\delta\gamma}{3(\delta+\gamma)}[1-\tau(6-12\tau)]}{4-\frac{\delta\gamma}{3(\delta+\gamma)}[7-\tau(18-12\tau)]}$ iff $\frac{TC^{F*}(\tau,\delta,\gamma)}{TC^{M*}(\tau,\delta,\gamma)} > 1$

Comparative statics for $\frac{TW^{F*}(\tau,\delta,\gamma)}{TW^{M*}(\tau,\delta,\gamma)} = \frac{4-\frac{\delta\gamma^2}{3(\delta+\gamma)^2}[1-\tau(6-12\tau)]}{4-\frac{\delta\gamma^2}{3(\delta+\gamma)^2}[7-\tau(18-12\tau)]}$:

$\frac{\partial\frac{TW^{F*}(\tau,\delta,\gamma)}{TW^{M*}(\tau,\delta,\gamma)}}{\partial\tau} = \frac{\delta\gamma^2}{3(\delta+\gamma)^2}\frac{\left[6\tau-6\tau^2-1\right]\frac{8\delta\gamma^2}{(\delta+\gamma)^2}-48}{\left[4-\frac{\delta\gamma}{3(\delta+\gamma)}[7-\tau(18-12\tau)]\right]^2} < 0$ iff

$\tau - \tau^2 - \frac{1}{6} < \frac{(\delta+\gamma)^2}{\delta\gamma^2} = \frac{\delta+\gamma}{\gamma}\left(\sqrt{\frac{1}{\delta}+\frac{1}{\gamma}}\right)^2$

and since $\tau - \tau^2 - \frac{1}{6} < \frac{1}{12}$ and here $\frac{\delta+\gamma}{\gamma}\left(\sqrt{\frac{1}{\delta}+\frac{1}{\gamma}}\right)^2 > \frac{\delta+\gamma}{\gamma}\tau^2 > \frac{1}{4}$ then $\frac{\partial\frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)}}{\partial\tau} < 0$.

$\frac{\partial\frac{TW^{F*}(\tau,\delta,\gamma)}{TW^{M*}(\tau,\delta,\gamma)}}{\partial\delta} = \frac{1-2\tau}{\left[4-\frac{\delta\gamma}{3(\delta+\gamma)}[7-\tau(18-12\tau)]\right]^2}\frac{8(\gamma-\delta)\gamma^2}{(\delta+\gamma)^3} < 0$ iff $\gamma > \delta$

$\frac{\partial\frac{TW^{F*}(\tau,\delta,\gamma)}{TW^{M*}(\tau,\delta,\gamma)}}{\partial\gamma} = \frac{1-2\tau}{\left[4-\frac{\delta\gamma}{3(\delta+\gamma)}[7-\tau(18-12\tau)]\right]^2}\frac{16\delta^2\gamma}{(\delta+\gamma)^3} < 0$

$\lim_{\delta\to 0}\frac{TW^{F*}(\tau,\delta,\gamma)}{TW^{M*}(\tau,\delta,\gamma)} = \lim_{\gamma\to 0}\frac{TW^{F*}(\tau,\delta,\gamma)}{TW^{M*}(\tau,\delta,\gamma)} = 1$

$\lim_{\tau\to 1}\frac{TW^{F*}(\tau,\delta,\gamma)}{TW^{M*}(\tau,\delta,\gamma)} = \frac{4-\frac{7\delta\gamma^2}{3(\delta+\gamma)^2}}{4-\frac{\delta\gamma^2}{3(\delta+\gamma)^2}} < 1$

$\lim_{\tau\to\frac{1}{2}}\frac{TW^{F*}(\tau,\delta,\gamma)}{TW^{M*}(\tau,\delta,\gamma)} = 1$

Comparative statics for $\frac{TC^{F*}(\tau,\delta,\gamma)}{TC^{M*}(\tau,\delta,\gamma)} = \frac{1-\tau(6-12\tau)}{7-\tau(18-12\tau)}$:

$\frac{\partial \frac{TC^{F*}(\tau,\delta,\gamma)}{TC^{M*}(\tau,\delta,\gamma)}}{\partial \tau} = \frac{\tau-\tau^2-\frac{1}{6}}{[7-\tau(18-12\tau)]^2}144 > 0$ iff $\frac{1}{2}-\frac{1}{\sqrt{12}} < \tau < \frac{1}{2}+\frac{1}{\sqrt{12}}$.

Thus here we have $\frac{\partial \frac{TC^{F*}(\tau,\delta,\gamma)}{TC^{M*}(\tau,\delta,\gamma)}}{\partial \tau} > 0$ only if $\tau < \frac{1}{2}+\frac{1}{\sqrt{12}}$

with $\frac{TC^{F*}\left(\frac{1}{2}+\frac{1}{\sqrt{12}},\delta,\gamma\right)}{TC^{M*}\left(\frac{1}{2}+\frac{1}{\sqrt{12}},\delta,\gamma\right)} = \frac{2+\frac{\sqrt{12}}{2}}{2-\frac{\sqrt{12}}{2}} > 7$.

And $\frac{\partial \frac{TC^{F*}(\tau,\delta,\gamma)}{TC^{M*}(\tau,\delta,\gamma)}}{\partial \delta} = \frac{\partial \frac{TC^{F*}(\tau,\delta,\gamma)}{TC^{M*}(\tau,\delta,\gamma)}}{\partial \delta} = 0$

$\lim_{\tau\to 1} \frac{TC^{F*}(\tau,\delta,\gamma)}{TC^{M*}(\tau,\delta,\gamma)} = 7$

$\lim_{\tau\to \frac{1}{2}} \frac{TC^{F*}(\tau,\delta,\gamma)}{TC^{M*}(\tau,\delta,\gamma)} = 1$

Comparative statics for $\frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)} = \frac{4-\frac{\delta\gamma}{3(\delta+\gamma)}[1-\tau(6-12\tau)]}{4-\frac{\delta\gamma}{3(\delta+\gamma)}[7-\tau(18-12\tau)]}$:

$\frac{\partial \frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)}}{\partial \tau} = \frac{\delta\gamma}{3(\delta+\gamma)} \frac{\left[6\tau-6\tau^2-1\right]\frac{8\delta\gamma}{\delta+\gamma}-48}{\left[4-\frac{\delta\gamma}{3(\delta+\gamma)}[7-\tau(18-12\tau)]\right]^2} < 0$ iff

$\tau-\tau^2-\frac{1}{6} < \frac{\delta+\gamma}{\delta\gamma} = \left(\sqrt{\frac{1}{\delta}+\frac{1}{\gamma}}\right)^2$

and since $\tau-\tau^2-\frac{1}{6} < \frac{1}{12}$ and here $\left(\sqrt{\frac{1}{\delta}+\frac{1}{\gamma}}\right)^2 > \tau^2 > \frac{1}{4}$ then $\frac{\partial \frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)}}{\partial \tau} <$ 0.

$\frac{\partial \frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)}}{\partial \delta} = \frac{1-2\tau}{\left[4-\frac{\delta\gamma}{3(\delta+\gamma)}[7-\tau(18-12\tau)]\right]^2}\frac{8\gamma^2}{(\delta+\gamma)^2} < 0$

$\frac{\partial \frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)}}{\partial \gamma} = \frac{1-2\tau}{\left[4-\frac{\delta\gamma}{3(\delta+\gamma)}[7-\tau(18-12\tau)]\right]^2}\frac{8\delta^2}{(\delta+\gamma)^2} < 0$.

$\lim_{\delta\to 0} \frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)} = \lim_{\gamma\to 0} \frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)} = 1$

$\lim_{\tau\to 1} \frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)} = \frac{4-\frac{7\delta\gamma}{3(\delta+\gamma)}}{4-\frac{\delta\gamma}{3(\delta+\gamma)}}$

$\lim_{\tau\to \frac{1}{2}} \frac{TU^{F*}(\tau,\delta,\gamma)}{TU^{M*}(\tau,\delta,\gamma)} = 1$. ▼

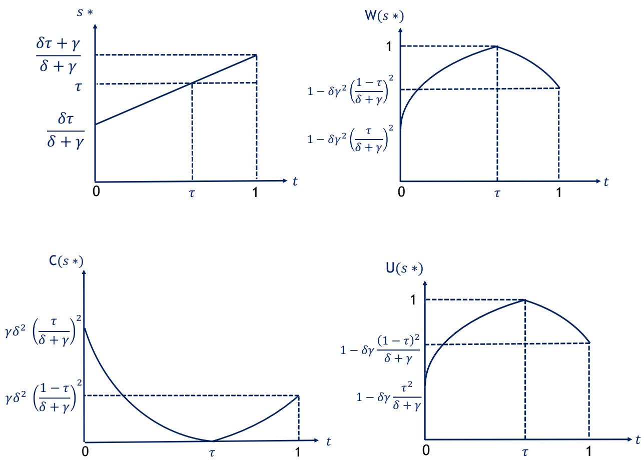

Figure 1: Optimal individual outputs.

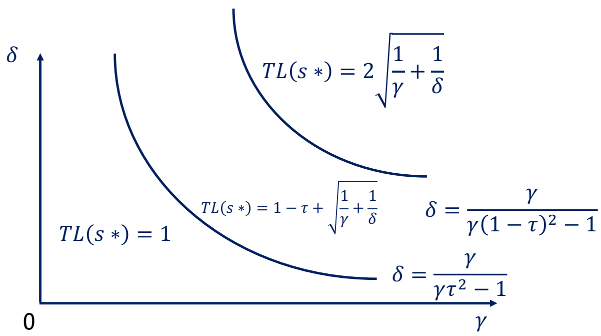

Figure 2: Total labor market participation.

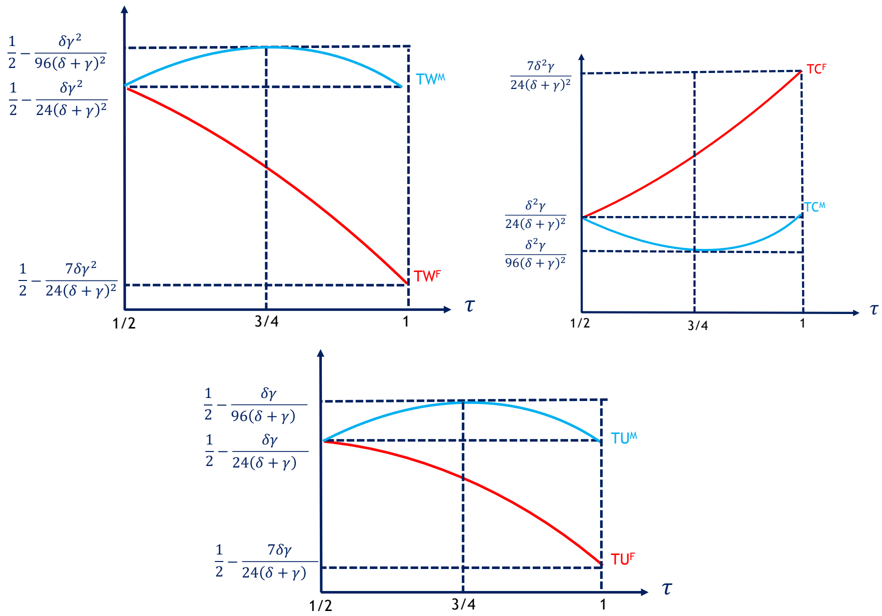

Figure 3: Aggregated economic variables for female and male types.

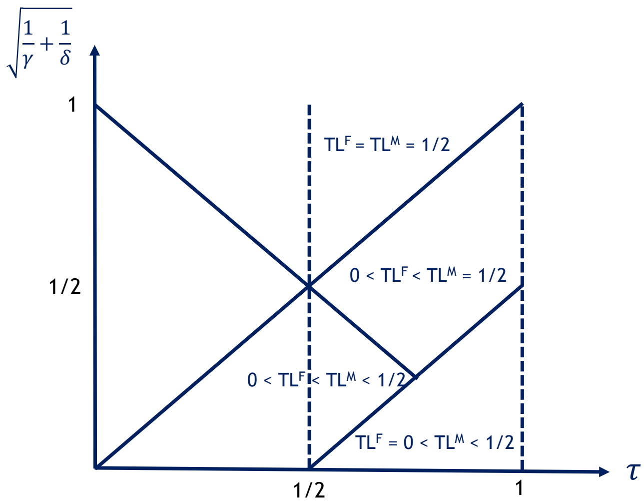

Figure 4: Labor market participation by gender.