DISCUSSION PAPER SERIES

No. 7917

**THE GOOD, THE BAD,
AND THE DIFFERENT:
CAN GENDER QUOTAS RAISE THE
QUALITY OF POLITICIANS?**

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***DEVELOPMENT ECONOMICS and
PUBLIC POLICY***

Centre for Economic Policy Research

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Available online at: **www.cepr.org/pubs/dps/DP7917.asp**

ISSN 0265-8003

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Discussion Paper No. 7917
July 2010

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CEPR Discussion Paper No. 7917

July 2010

ABSTRACT

The Good, the Bad, and the Different: Can Gender Quotas Raise the Quality of Politicians?*

This paper models, for the first time, the relationship between gender quotas and the quality of elected public officials. In our economy, females and males can be either high or low-skill. The number of high-skill individuals elected for public office determines the overall quality of politicians. Women suffer from gender discrimination in the labor market and in the political market, and are underrepresented in elected political bodies in the status quo. Introducing a quota increases the probability of election for women and decreases it for men. The impact of the quota on quality depends on the skills of those individuals from the discriminated (over-represented) group that are encouraged (discouraged) to run for office. We demonstrate that a higher gender quota only decreases the overall quality of those elected when the rewards from public office are low, or when the rewards from pubic office are high but women are significantly discriminated against in the political market versus the labor market. In other cases, a quota either decreases quality only initially, but for sufficiently high values there is a positive effect on quality, or leads to immediate increases in quality. Our model also formalizes the role that policies fighting discrimination may have on the number and type of women elected.

JEL Classification: E0, J1 and J7
Keywords: citizen-candidate games, gender discrimination, political quotas and quality of politicians

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*We thank Francesco Caselli, Francesco Franco, Pedro Lains, Marina Costa Lobo, Andrés Malamud, Massimo Morelli, Susana Peralta, Luís Santos Pinto and all the participants in the seminar on Institutions at FEUNL (Lisbon, May 2008), in the Brown Bag Seminar at *Instituto de Ciências Sociais* (Lisbon, June 2008), and in the seminar at *Fundação Getúlio Vargas* (São Paulo, April 2010) for useful comments. The authors also thank NOVA-Forum and *Fundação para a Ciência e Tecnologia* for financial support, and Tiago Vieira for excellent research assistance.

Submitted 21 June 2010

1 Gender quotas

Quotas are mechanisms to ascribe to a specific group preferential access to a resource. The resource can vary, from entry to higher education institutions to a position in political lists or parliament. The group benefitting from preferential access can be defined on the basis of ethnicity, gender, or other observable characteristic. While ethnically-based quotas in the access to higher education have been common in the United States for decades, affirmative action programs are increasingly under scrutiny.[1] In contrast, gender based quotas in politics are increasingly popular. Between 1997 and 2007 the number of countries applying gender quotas in the political arena has increased from 10 to 49, a five-fold increase in just a decade.[2] In addition, countries are moving from less stringent to more stringent quota systems and some have implemented or are seriously considering introducing gender quotas in private company board rooms.[3] Though the share of female elected officials is well below 50 percent for most countries, Figure 1 below makes evident that countries that apply gender quotas in politics present larger shares, about 5 percentage points higher than no-quota countries.[4] Figure 2 plots the share of female members in parliament for subsamples of the available countries, defined according to the presence or absence of quotas in the years 1997 and 2007.[5] The share of elected women politicians rises by about 6 percent in the whole sample, by 8.5 percent for countries using quotas in both years, and by almost 10.5 percent for countries that adopted quotas in the intervening period. In sum, the presence of women in elected political bodies has increased everywhere, but more so where quotas are in place or were introduced.

In spite of the facts documented above, gender quotas remain a hotly debated and understudied issue, as recognized in Holzer and Neumark (2000). One of the most

[1] As Holzer and Neumark (2000) puts it, "the future of affirmative action in the United States is uncertain," and several states have passed propositions prohibiting government institutions from "discriminating against or giving preferential treatment to groups or individuals on the basis of race, sex, color, ethnicity, or national origin."

[2] Quotas can be legally mandated or voluntary, and imposed on aspirants, candidates or those elected. The figures discussed in this section refer to all types of quotas. See Dahlerup (2006) for a discussion of quota types.

[3] Norway mandated that 40 percent of directorships are ascribed to women, and other governments, such as France and Spain, are considering similar moves – see Cromley (2010).

[4] The data we use, available from IDEA (2010), are for the Lower House only, the most relevant parliamentary body as far as current policy-making is concerned. The percentage of elected females rose from 10.20 in 1997 to 15.98 in 2007. According to Larserud and Taphorn (2007), the average percentage of women members of parliament stands at 17.2 percent in 2007, with only 19 countries displaying a share larger than 30 percent.

[5] See Appendix A for the underlying table.

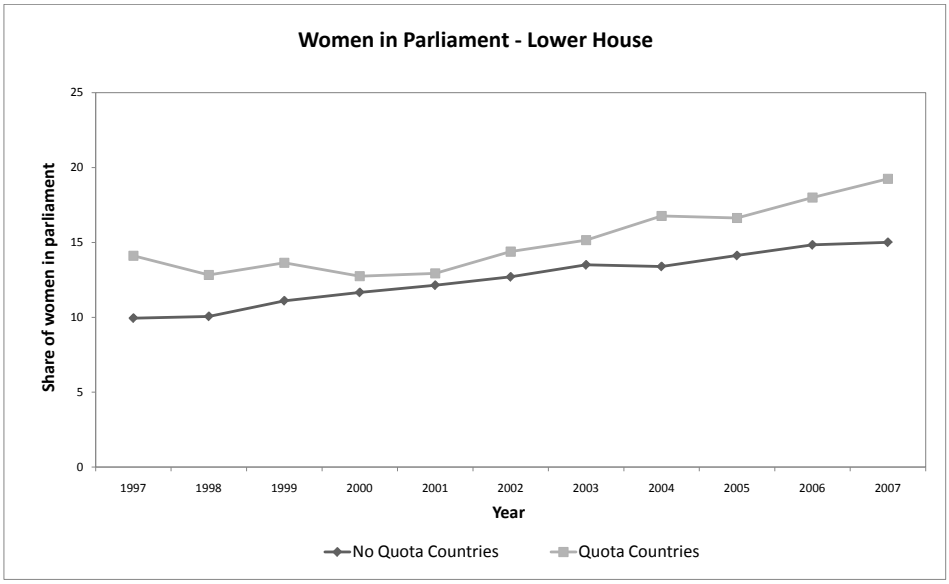

Figure 1: Women in parliament, Lower House.

important controversies revolves around the idea of a potential sacrifice in overall "quality" of politicians in exchange for greater female representativeness. The basic intuition is that gender preferences necessarily sacrifice average "quality" since the exogenous quota restriction alters the initial political equilibrium and "artificially" increases the presence of women in politics, independent of merit. This paper models the self-selection and election of public officials and demonstrates that quotas may not involve a cost in terms of the quality of public officials; in fact, quite the opposite is often the case.[6] The theoretical analysis is conducted in the presence of "political market" and "private labor market" gender discrimination.[7] Depending on the type and intensity of gender discrimination, the imposition of gender quotas may decrease, increase, or have no effect on the quality of elected officials.[8] While recognizing the

[6]Murray (2010) compares new women parliamentarians in France, elected after the parity law, with their male counterparts and to women elected prior to the parity law. The author does not find evidence that parity produced weaker politicians. Once elected, the volume of parliamentary activity across genders is not significantly different. Supporting our conclusions, the different profiles of male and female politicians seem to reflect wider social barriers to women's political careers, which would be hard to overcome without the parity law.

[7]The paper applies to any situation where "candidates" go through a "selection process," such as the selection of minorities for higher education or the selection of job candidates by a firm. Our choice of the political market and women as the discriminated group is merely instrumental.

[8]Andrade (2003) models the effect of ethnic quotas in public universities on the efficiency of expenditures in higher education. The author finds that the impact of quotas on average student merit depends on the degree of liquidity-constraints and the relative quality of public and private universities. There is an initial misallocation in that some highly-qualified students attend public universities for cost reasons only. In Andrade (2003) quotas decrease the initial misallocation by attracting students to higher priced – and higher quality – private universities. This setup is similar

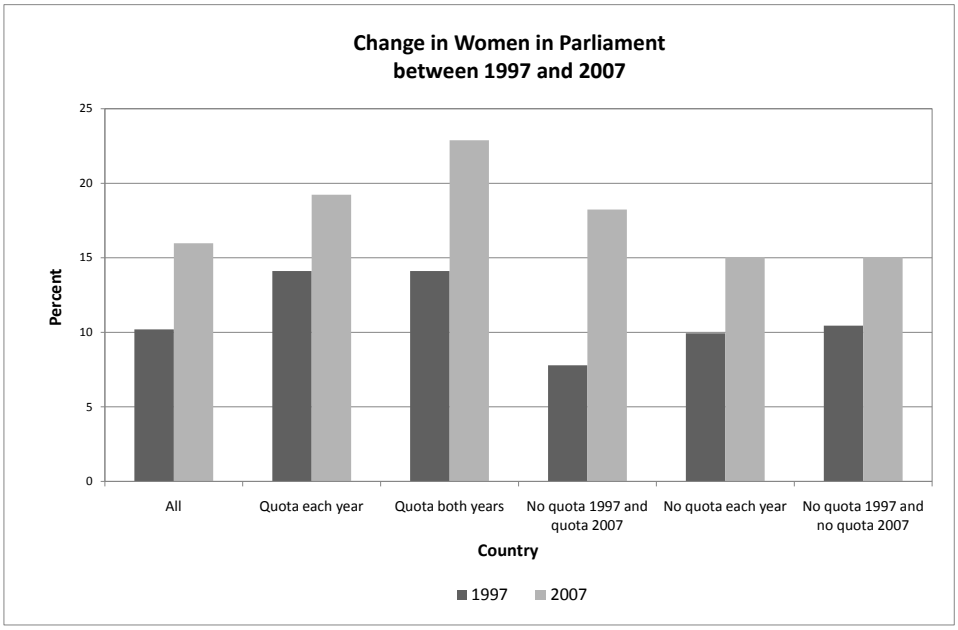

Figure 2: Change in women in parliament (Lower House) between 1997 and 2007.

centrality of the "quality" issue in the public discussion of the merits of quotas, our paper exposes the fragility of the common sense argument in a parsimonious model of political competition in the wake of Caselli and Morelli (2004).[9]

We model political choice as the selection of candidates from four different pools of politicians, divided according to an identifiable characteristic – which we take to be gender but could equally be ethnicity or other –, and an imperfectly observed characteristic – in our case individual ability. The benchmark model features an equal share of high-skill among female and male populations. In the *status quo* females are under-represented in the pool of the elected. We hypothesize that women, as the under-represented group, suffer from two types of discrimination. Discrimination in the private labor market results in less pay for women relative to men with similar skills. *Ceteris paribus*, this would endogenously encourage women to participate relatively more in the political market. However, in accordance with the almost universal under-representation of women in politics, we consider that a second type of discrimination – political discrimination – makes women face a higher personal cost to gain access to the same odds of election.[10] Both high- and low-skill females suffer

to our citizen-candidate game with gender discrimination in the labor market and in the political market.

[9]Reservation of elected seats versus reservation of places in electoral lists have quite different effects, and here we care only about the former.

[10]This can be due to a negative voter perception directed at women or their involvement in additional private activities that increase the cost of campaigning, such as child rearing and child care, for the same objective candidate characteristics. An immediate consequence of a high degree

private labor market and political market discrimination, and the former has different quantitative implications in terms of wages earned. After characterizing the *status quo*, with the number of female candidates endogenously determined, we introduce a gender quota that ascribes to females a percentage of the elected seats.[11] We then compute how the quality of elected women, elected men, and the overall quality of the elected, changes with quota values.

Our main result is that quotas may have contrasting effects on the quality of the elected: they can raise it, decrease it, or have no impact whatsoever. Interestingly, quotas may have a non-linear effect on quality, first decreasing it and, at higher quota values, increasing it. The mechanism is simple: a higher quota increases the probability of election for the discriminated group – females – regardless of skill, and decreases the probability of election for the other group; the impact of quotas on quality depends on the type of candidates from the discriminated group that are encouraged to run for office – either high- or low-skill – and the type of candidates from the other group that are discouraged – also high- or low-skill. As one might infer, the change in the overall quality of the elected pool depends on the mix of those entering and those abandoning the political arena. A quota may have non-linear effects on quality since it may at first reduce the probability of election for high-skill men without encouraging high-skill women to enter politics and, at higher quota values, encourage more high-skill women than discouraging high-skill men.[12] Crucially, the effect of gender quotas on the average quality of the elected depends on the rewards of political office, the relative strengths of private labor market versus political market discrimination, and the size of the quota. We are able to explicitly derive the effect of quotas on the quality of politicians, showing how it depends on parameters that sum up the gender wage gap in the labor market, the different cost of access to political

of political discrimination is that female candidates, in equilibrium, have lower expected ability than male candidates. Chattopadhyay and Duflo (2004) find evidence in this direction for "reserved" councils in India. They show that women elected to reserved seats are poorer than their male counterparts, less experienced, less educated, and less likely to be literate. These authors suggest that voters may use these characteristics for making inferences on the quality of their leaders, regardless of the actual quality.

[11] In this paper we do not endogenize the choice over quotas or quota levels. Maniquet et al. (2005) examine the adoption of gender quotas in electoral lists and argue that they can be fully rationalized on the basis of the self interest of male incumbent politicians. The existence of a voters' bias in favor of male candidates is sufficient to convince the incumbents to advocate for equal gender representation in party lists, because it raises the incumbents' chances of being reelected.

[12] In our model, we consider that the two groups are of the same size, have the same "propensity" to be candidates, and the same percentage of high- and low-quality members. All hypotheses can be altered easily, but at the cost of more complex algebra and of losing illustrative power for the central issue we care about here, that is, the role of discrimination and quotas on the quality of the elected.

life, and the quota. In general we find that active policies decreasing discrimination in the political market may have a direct impact on female representation, compounding the effect of quotas alone.

In our model the quality of politicians is related solely to individual skills – whether the elected individuals are high- or low-skill – and independent of gender. There is a wider conceptual debate on the benefits of more equitable gender-based representation. For instance, Dahlerup (2003) cites three arguments in favor of gender quotas, which have been present in most debates since the initial fight for women's suffrage:

1. The justice argument: women represent half of the population and hence have the right to half of the seats;
2. The experience argument: women have different experiences – biological or socially constructed – that ought to be represented;
3. The interest group argument: women and men have partly conflicting interests and thus men cannot represent women.

The experience and interest group arguments may be relevant for extensions of our model, as they might affect the average quality of the pool of elected politicians. In these cases, in contrast to our model, the quality of the elected politicians depends on the distribution of individual characteristics among the elected, and not solely on the sum of those individual characteristics. The model also does not consider the effect of quotas on three dimensions of quality referred to in the literature. First, the presence of a diversified elected body can increase the average quality of the elected themselves, through the imparting of diverse experience. Second, quotas can create role models for groups that lack them dearly, thus influencing the effort and the choices of the next generation. Third, the average quality of a group may affect the quality of each individual. These may be important issues to be examined in future research.

This article is organized as follows. In Section 2 we present the benchmark model and in Section 3 the *status quo* with under-representation. In Section 4 we analyze two important cases where quotas affect the average quality of elected politicians. Section 5 concludes. The Appendices provide additional data and complete characterizations of the equilibria.

2 The benchmark model

In our model we consider four groups of citizens that decide whether to compete for political office. Each citizen is characterized by two sets of individual traits: gender, which is observable and thus easily subject to discrimination, and skills, which are

only imperfectly monitored. Thus, each individual is either female or male, high- or low-skill. The information on skills is imperfectly monitored via a signal that can be more or less informative. The share of high-skill citizens elected for public office determines the average quality of the political body, regardless of whether the elected official is female or male. Females face discrimination in the private labor market – they are paid lower wages than their male equivalent – and in the political market – they incur higher political campaign costs to attain the same probability of election as males with the same objective qualities and objective evaluation by voters.[13]

A novelty in our model is the introduction of political market discrimination, for instance due to higher entry barriers into a party machine faced by women, a negative prejudice against female candidates or female office-holders, or higher opportunity costs of time in the case of women due, say, to an unequal distribution of tasks performed at home. Several papers in the literature address the issue of whether under-represented groups suffer from prejudice: there is evidence that women are indeed discriminated against as political candidates and that this is due to differential perceptions on the part of voters.[14] Women are also discriminated against as elected officials.[15] A similar type of political market discrimination also applies in the case of race.[16] In our model, the existence of two types of discrimination is a necessary

[13]The persistence and pervasiveness of gender discrimination in wages is well documented, for example in Blau and Kahn (1992, 1996), who report a female/male earnings ratio of 65.4 percent for the United States, 70.5 percent in Norway and 73.3 percent in Australia. Female workers tend to receive less pay for the same job, when compared to males with similar skills. Though the extent of gender discrimination can differ between high- and low-skill individuals, a consensus has not emerged over where it is likely to be most acute. See Cavalcanti and Tavares (2007) for an evaluation of the aggregate economic cost of discrimination.

[14]For instance, Milyo and Schosberg (2000) show that female incumbents are more likely to be opposed by high-quality challengers. The authors estimate that the gender-based quality difference leads to an electoral advantage for female incumbents of close to 6 percentage points. However, the bias against female incumbents on the part of voters lowers the net effect to about 4 percentage points.

[15]Duflo and Topalova (2004) combine individual level data on satisfaction with public services with independent assessments on the quality of public policy – including objective measures of the quantity and quality of public goods, for India. Despite the fact that women leaders provide more public goods of higher quality, residents of villages headed by women report a lower level of satisfaction with those public goods, when compared to male political leaders.

[16]The literature on perceptions and race is important. For a recent example, see Camargo et al. (2007), who use a wide individual-based survey from a U.S. college that randomly and irrevocably assigns roommates in the freshman year. The authors analyze whether students perceive that other students of her race have higher "compatibility" as friends, and conclude that very substantial racial segregation exists in friendships at the start of classes: 66.8 percent of "all" friends of black students are black, compared to only 9.8 percent of "all" friends of white students. The authors find that about half of the best friends of a different race arose because of the random assignment as roommates,

condition to characterize the benchmark situation as an instance where females are under-represented in the elected body. Thus, in accordance with empirical facts, discrimination in the political market overcomes discrimination in the private labor market, so that the fraction of women elected in the no-quotas situation is below 50 percent. We can then add a quota that reserves a fraction of the elected seats to women, and examine how the average quality of office-holders changes.

Our population is composed of a continuum of citizens, of measure $1 + p$, where p is the share of the population elected for public office. Two distinct groups, "males," denoted by the superscript M, and "females," denoted by the superscript F, are present in the population in equal proportions. Citizens differ in their skills: a fraction s^h is of type $\overline{s}$, or high-ability, while the complement, $1 - s^h$, is of type $\underline{s}$, or low-ability. For simplicity, the incidence of high-ability individuals is the same for males and females, *i.e.*, $s^M = s^F = s$.

2.1 Individual payoffs

In our economy individual utility depends on the citizen status: employed in the private sector, candidate for public office and, finally, whether he or she has actually been elected. Citizens derive utility from consumption, which equals individual income earned – either in the private sector or as elected officials – minus taxes paid, minus, when applicable, campaign costs. Campaign costs are incurred by all candidates, whether elected or not. Office holders collect tax revenues to provide an indispensable public good, without which the society could not function.[17] The key assumption here is that, once in office, high-ability citizens are more competent than low-ability citizens in that they are able to provide the public good at a lower tax cost. If $p_{\overline{s}}$ is the fraction of high-ability office holders, the provision of the public good requires a lump-sum tax burden of $t = t(p_{\overline{s}})$, where $\mathrm{d}t/\mathrm{d}p_{\overline{s}} < 0$ – a higher average quality of the elected politicians always leads to a lower cost of provision. This benefits all citizens alike so that, all else equal, voters prefer high-quality candidates. Table 1 below summarizes individual payoffs.

Income in the private sector for high-ability individuals is given by λ^M and λ^F for males and females, respectively. Low-skill males and females earn incomes in the

but there is no evidence that a roommate of a different race increases the number of other friends from that same race.

[17] This assumption implies that the benefits of the public good are uniform across individuals, so that citizens have no incentive to become candidates to change the composition of public expenditures. In addition, the political process is not "wasteful," that is, the society would not be better off by eliminating the elected seats.

Table 1: Payoffs for citizens, candidates, and office-holders.

	Males		Females	
	type-$\overline{s}$	type-$\underline{s}$	type-$\overline{s}$	type-$\underline{s}$
Does not run	$\lambda^M - t(p_{\overline{s}})$	$\omega^M - t(p_{\overline{s}})$	$\lambda^F - t(p_{\overline{s}})$	$\omega^F - t(p_{\underline{s}})$
Runs but loses	$\lambda^M - t(p_{\overline{s}}) - \phi^M$	$\omega^M - t(p_{\overline{s}}) - \phi^M$	$\lambda^F - t(p_{\overline{s}}) - \phi^F$	$\omega^F - t(p_{\overline{s}}) - \phi^F$
Runs and wins	$\pi - t(p_{\overline{s}}) - \phi^M$		$\pi - t(p_{\overline{s}}) - \phi^F$	

private sector equal to ω^M and ω^F, respectively. We normalize $\omega^M = 1$. Due to gender discrimination in the private sector, we consider $\lambda^M > \lambda^F$ and $\omega^M > \omega^F$, that is, females receive lower wages than males with equivalent skills. Furthermore, we assume that $\lambda^F > \omega^M$, so that high-skill females are paid higher wages than low-skill men. From the above it follows that $\lambda^M > \lambda^F > \omega^M = 1 > \omega^F$. The private sector wage is paid to voters who do not run for office as well as to losing candidates who return to the private sector.

Successful candidates derive a positive benefit from holding office, π. This benefit is independent of gender and includes both the direct utility from holding office as well as the net present monetary rewards obtained during the period in office, or expected in future income rewarding the accumulated political experience as office-holder.[18] All candidates, whether elected or not, incur a cost of campaigning, ϕ^M for males and ϕ^F for females, with $\phi^F > \phi^M$. Hence, females suffer wage discrimination in the private market and political discrimination in the electoral market.

In sum, the payoffs for all population groups are as follows. If a group-h, type-i candidate wins the election, her utility is $\pi - t(p_{\overline{s}}) - \phi^h$, while if she looses, she gets $y_i^h - t(p_{\overline{s}}) - \phi^h,\ i = \overline{s}, \underline{s},\ h = M, F$, where y_i^h is the private market income of a type-i,

[18] Diermeier et al. (2002) estimate that experience in elected politics significantly increases wages in post-congressional occupations in both the private and public sector, though the marginal effect decreases quite rapidly with experience. These authors argue that the quality of politicians in itself is unrelated to potential wages outside politics. Poutvaara and Takalo (2007) show that, depending on the level of political campaign costs, an increase in rewards for office holders may increase or decrease average candidate quality. Messner and Polborn (2003) introduce the consideration, rare in political economy models, that public office may be differently attractive to different sets of citizens and it is the combination of the characteristics of both office and citizen that determines who runs and the quality of the elected politicians. In their model, candidates for public office differ in competence, and have private information about the opportunity cost of holding public office and performing the associated tasks. Under general conditions, low-skill candidates are more likely to run than high-skill ones, overcoming the fact that voters prefer candidates that they perceive as high-skill, given their better performance. Messner and Polborn (2003) show that the expected quality of running candidates might actually decrease as the remuneration of the official increases. However, for sufficiently high levels of remuneration, the job becomes more and more attractive and eventually the expected quality of running candidates increases.

gender-h citizen. If a citizen does not run at all, her payoff is $y_i^h - t(p_{\bar{s}})$.

Figure 3 provides a different overview of the relative payoffs of a given gender. It represents the most interesting situation, where the rewards from public office are sufficiently high to attract some high-skill individuals to politics if the prospects of election are sufficiently good. Any candidate who runs for office but loses becomes employed in the private market, but still has to pay campaign costs. Therefore, her payoff must be below the case where she would not run for office. If she runs for office and wins, her payoff is above the return she would get in the private market, even if she is high-skill. From this figure, it is clear that the citizen's decision on whether to run for office or not is focused on the probability of winning the election – which is endogenous to the model – and on the relative payoffs.

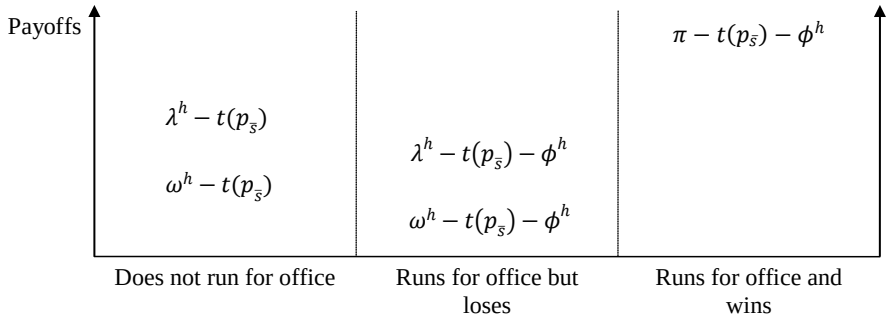

Figure 3: Relative position of the payoffs for citizens, candidates, and office-holders.

The specific trade-off faced by the individuals in evaluating whether to run for office depends on both the gender and the skill level. We define two new objects, $\theta^F = (\pi - \lambda^F)/\phi^F$, for females and, correspondingly, $\theta^M = (\pi - \lambda^M)/\phi^M$ for males, which is the payoff of holding office relative to the wage for a high-skill individual in private sector, corrected by the cost of campaigning. To induce a *status quo* situation where women are under-represented in elected bodies, we consider that the higher relative cost of campaigning for females dominates the lower opportunity cost in the private sector and thus fewer females are attracted to the political arena in the *status quo*. That is, we assume $\theta^M > \theta^F$. To simplify the model further, we also consider $\theta^M < (\pi - \omega^F)/\phi^F$.

2.2 The citizen-candidate game

Citizens in this economy play a citizen-candidate game, along the lines of Besley and Coate (1997) and Osborne and Al Slivinski (1996). The game is divided into three

stages. In the first stage, each citizen decides whether or not to run for public office. Citizens make their decisions on whether or not to be a candidate so as to maximize their own expected utility. This decision is made on the basis of rewards in the public and private sectors, the cost of running a political campaign, and the endogenously determined probability of election. If an individual decides to run, his or her candidacy is publicly known.

In the second stage of the game, all citizens, candidates or not, vote. Each citizen casts a vote for one candidate and one candidate only. Any votes for non-candidates are void. The measure p of candidates receiving the highest share of votes is elected and, whenever necessary, ties are broken with a random draw. In the third and last stage of the game, citizens – the non-candidates, the defeated candidates, and the elected – collect their payoffs. In order to eliminate trivial equilibria where all citizens run for office, we consider, as Caselli and Morelli (2004), the cost ϕ to be infinite for a non-null measure v of citizens. This infinite cost is distributed randomly across males and females so that the number of "potential" male and female candidates is the same.[19] To eliminate equilibria where some public offices go unfilled, we assume that ϕ is paid only when the measure of candidates exceeds the measure of offices available; otherwise there would be no point in campaigning. The maximum number of candidates is therefore $\mu = 1 + p - v$. Obviously, given the assumptions above, half of the potential candidates (0.5μ) are males and the remaining are females.

Now we turn to the workings of the political campaign in itself. Voters have incomplete information about the candidates and cannot perfectly distinguish between high- and low-skill individuals. However, each candidate emits a high-signal ($\overline{s}$) or a low-signal ($\underline{s}$), observable by all voters, and the unconditional probability that a signal is correct is $\sigma > 0.5$. Voters do not discriminate on the basis of gender, but on the emitted signal. That is, we consider that the inference voters make on the quality of candidates does not depend on gender, after the higher cost of candidacy by female candidates has been incurred. Hence, females have the same odds of election as their male counterparts. The final equilibrium is computed by backward induction and the mass of citizens that hold public office can be divided into female members, q, and male members, k, where $p = k + q$.

Define $p_{\overline{s}}^{M}$ as the fraction of male office holders who have high-ability, and $p_{\overline{s}}^{F}$ the

[19] We assume that men and women are equally competitive insofar as their propensity to run for office and decide to do so based only on the relative payoffs of private employment and public office. Gneezy et al. (2009) run a controlled experiment to determine whether males and females have different propensities to select themselves into competitive environments and find that the answer depends on the cultural characteristics of society – matrilineal or patrilineal. The authors conclude that there are no intrinsic gender differences as far as the propensity to compete is concerned.

fraction of female office holders of high-ability. The fraction of office holders that have high-ability determines the overall quality of elected politicians, and is given by $p_{\overline{s}} = (k/p)p_{\overline{s}}^M + (q/p)p_{\overline{s}}^F$. In order to simplify matters, we consider $p < 0.5(1-s)\mu$. This inequality implies that no citizen votes on a signal-$\underline{s}$ candidate as long as there is a signal-$\overline{s}$ candidate running for office, as the expected quality of the latter is higher. This is shown in Lemma 1 in Appendix B. Let $\mu_{\overline{s}} = \sigma s \mu$ denote the maximum number of high-ability, high-signal candidates and $\mu_{\underline{s}} = (1-\sigma)(1-s)\mu$ denote the maximum number of low-ability, high-signal candidates. Obviously, these are evenly distributed between male and female populations.

After the layout of the model, the aims of this paper can now be simply stated. We analyze the process whereby candidates endogenously arise from a population with two identifiable groups, males and females, both comprising high- and low-skill individuals. Given the relatively higher cost of running for office, females will be under-represented in the *status quo*, that is, the share of elected females is below 50 percent. We can then study the effects of imposing a quota on the quality of the elected body, $p_{\overline{s}}$. Clearly, a gender-based quota changes the incentives to run for public office, discouraging male candidacies and encouraging female candidacies. Depending on which males and which females – high or low-skill – are most affected, the overall quality of those elected may increase, decrease, or remain unchanged.

3 The *status quo* with under-representation

We now briefly characterize the *status quo* equilibrium, with no quotas. Our objective here is to determine the ensuing overall quality of those elected, $p_{\overline{s}}$, and the measure of females elected, for different values of θ^M and θ^F, the relative incentives that high-skill male and female individuals face when deciding to run for office. A formal and exhaustive characterization of the equilibrium is provided in Appendix B.

Since citizens condition their votes solely on the signal candidates emit, all candidates with the same signal – whether females or males – face the same probability of election. Let $P_{\overline{s}}$ denote the probability that a high-signal candidate is elected. Then, a high-skill, high-signal male citizen stands for office if and only if

$$P_{\overline{s}}\left[\pi - t(p_{\overline{s}}) - \phi^M\right] + (1 - P_{\overline{s}})\left[\lambda^M - t(p_{\overline{s}}) - \phi^M\right] \geq \lambda^M - t(p_{\overline{s}}) \qquad (1)$$

The left-hand side of the equation above represents the expected payoff of campaigning for office, and the right-hand side the sure payoff from remaining in the private sector.

Equivalently, a high-skill, high-signal female runs for office if and only if

$$P_{\bar{s}}\left[\pi - t(p_{\bar{s}}) - \phi^F\right] + (1 - P_{\bar{s}})\left[\lambda^F - t(p_{\bar{s}}) - \phi^F\right] \geq \lambda^F - t(p_{\bar{s}})$$

Simplifying the two expressions above, the running conditions for males and females become

$$P_{\bar{s}}\theta^M \geq 1 \qquad \text{and} \qquad P_{\bar{s}}\theta^F \geq 1$$

Since $\theta^M > \theta^F$, whenever a high-skill, high-signal female citizen stands for office, so do *all* high-skill, high-signal male citizens. As to low-ability citizens that emit a high-signal, they face the exact same probability of election as high-skill, high-signal individuals, since they are indistinguishable from the perspective of the voters, but have a lower opportunity cost of holding office. It follows that whenever a high-skill, high-signal male citizen runs for office, it is advantageous for *all* low-skill, high-signal citizens to run for office as well.[20]

Let us now analyze how the quality of those elected changes with the relative incentives to run for office, θ^M and θ^F. Consider $\mu_{\underline{s}} \leq p$. If $\theta^M < 1$, the measure of high-ability office holders, as well as the quality of those elected, is 0, and half of the elected candidates are females. For $\theta^M = 1$, high-ability, high-signal males run for office only if they are elected for sure. As the measure of seats is higher than the measure of all low-ability, high-signal candidates, the remaining places may be filled by high-ability, high-signal males. Hence, $p_{\bar{s}}$ takes values in an interval, from 0 until some positive value. The measure of elected females is also an interval, with an upper bound at $0.5p$.

For higher values of θ^M, namely $1 < \theta^M < (0.5\mu_{\bar{s}} + \mu_{\underline{s}})/p$, high-ability, high-signal males must be indifferent between running or not. If they were not indifferent, then either all would run, so that $P_{\bar{s}}\theta^M < 1$, or none would run, so that $P_{\bar{s}}\theta^M > 1$. In either case, we obtain a contradiction. Hence, in equilibrium, $P_{\bar{s}}\theta^M = 1$. Overall quality is increasing in θ^M, since a higher relative return from holding office increases the number of high-skill candidates so as to decrease the probability of election. Since no high-ability female stands as candidate, the share of elected females is decreasing, but quality is increasing, in θ^M.

Finally, for $\theta^M \geq (0.5\mu_{\bar{s}} + \mu_{\underline{s}})/p$, all high-ability, high-signal males stand for office, as $P_{\bar{s}}\theta^M > 1$. The overall quality of office holders now depends on the value of θ^F. If $\theta^F < (0.5\mu_{\bar{s}} + \mu_{\underline{s}})/p$, there is no high-ability female candidate, since high-ability male candidates push down the probability of election, $P_{\bar{s}} = p/(0.5\mu_{\bar{s}} + \mu_{\underline{s}})$.

[20] For males this is obvious, for females it is implied by $\theta^M < (\pi - \omega^F)/\phi^F$.

So, high-skill, high-signal females run only if $\theta^F \geq (0.5\mu_{\bar{s}} + \mu_{\underline{s}})/p$. For the case $(0.5\mu_{\bar{s}} + \mu_{\underline{s}})/p \leq \theta^F < (\mu_{\bar{s}} + \mu_{\underline{s}})/p$ (and provided that $\theta^M > \theta^F$), high-ability, high-signal females must be indifferent between running or not. An increase in θ^F raises the measure of high-ability female candidates, so as to decrease the probability of election and respect the condition $P_{\bar{s}}\theta^F = 1$. Thus, the overall quality of candidates increases in θ^F, as well as the share of female office holders. For $\theta^F \geq (\mu_{\bar{s}} + \mu_{\underline{s}})/p$, all high-ability, high-signal females are candidates; quality is maximal, as well as female participation in politics $(0.5p)$.

For the case $\mu_{\underline{s}} > p$, the characterization of the equilibrium is as above, except that, for $1 \leq \theta^M < \mu_{\underline{s}}/p$, the probability that a high-skill, high-signal citizen is elected is $P_{\bar{s}} = p/\mu_{\underline{s}} < 1$, and hence $P_{\bar{s}}\theta^M < 1$. In this region, there are no high-ability candidates; the quality of the elected is 0 and the measure of females that hold public office is $0.5p$.

Figure 4 uses the features of the equilibrium to plot how the quality of elected males and females changes with the relative benefits of holding office.[21] We take θ for the gender not represented in the graph as given. High-quality, high-signal females stand as candidates only if the returns from holding office offset the relative high level of political discrimination. It is also interesting to note that high-quality, high-signal male candidates influence the expected returns of high-signal female candidates, because the decision of the former lowers the probability of election and this affects the decision of the latter on whether to run or not. Also obvious from this figure is an interesting corollary, that gender discrimination is generically associated with a higher expected ability of male policy-makers as compared to their female counterparts. Hence, male citizens contribute more toward quality in public office than do female citizens.

Figure 5 combines the two graphs above in a 3-D graph where the overall quality of those elected is plotted against θ^M and θ^F. For low values of both θ^M and θ^F, only low-skill individuals run and the overall quality equals 0. As θ^M increases, for the same θ^F – due, in our model, to a fall in λ^M or ϕ^M – some high-ability males run for office and the overall quality of those elected rises along the lines represented in Figure 4 above. The quality of the elected reaches a plateau when θ^M is sufficiently high – where all high-skill, high-signal males (and no high-skill females) stand for office. From that plateau onward, only an increase in θ^F can further increase the overall quality of elected politicians, by attracting high-skill females to run for public office.

Figure 6 represents the percentage of females elected for each pair of incentives

[21] We consider $\mu_{\underline{s}} < p$ to plot this and the following graphs.

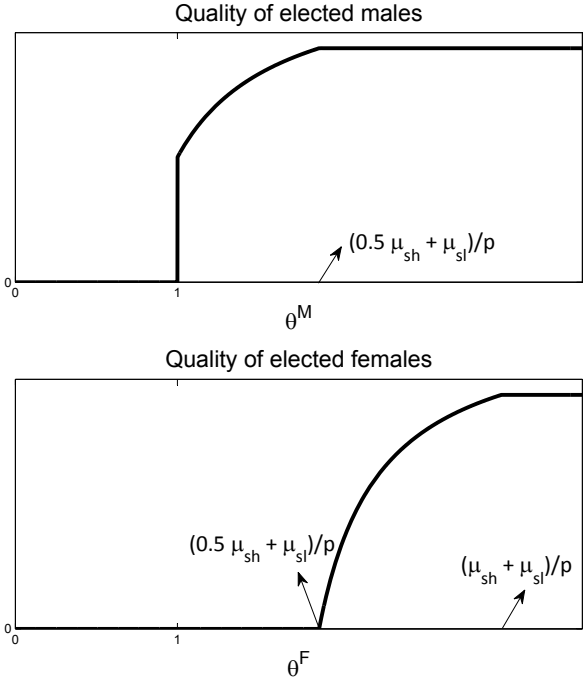

Figure 4: Quality of those elected and incentives to run for office in the *status quo*, by gender. In the figure, *sh* stands for $\overline{s}$, and *sl* stands for $\underline{s}$.

to run for office (θ^M, θ^F). An increase in θ^M leads to a decrease in the percentage of women elected, as high-skill, high-signal males enter political competition and thus diminish the probability of electing a low-skill, high-signal, female. On the other hand, an increase in θ^F, above a given threshold, induces high-ability, high-signal females to run for office, thus increasing the share of women in the elected body. For sufficiently high values of θ^M and θ^F, all high-ability, high-signal citizens are running, and thus half of the elected citizens are females.

4 A model with gender quotas

We now consider the imposition of a minimal quota on the number of women elected for public office and describe the resulting political equilibrium. The quota increases the probability of election for women candidates – regardless of being low- or high-skill – and concomitantly decreases the probability of election for men. Let $\overline{q} \in [q^{sq}, 0.5p]$ denote the quota level, where q^{sq} is the measure of female office holders in the *status*

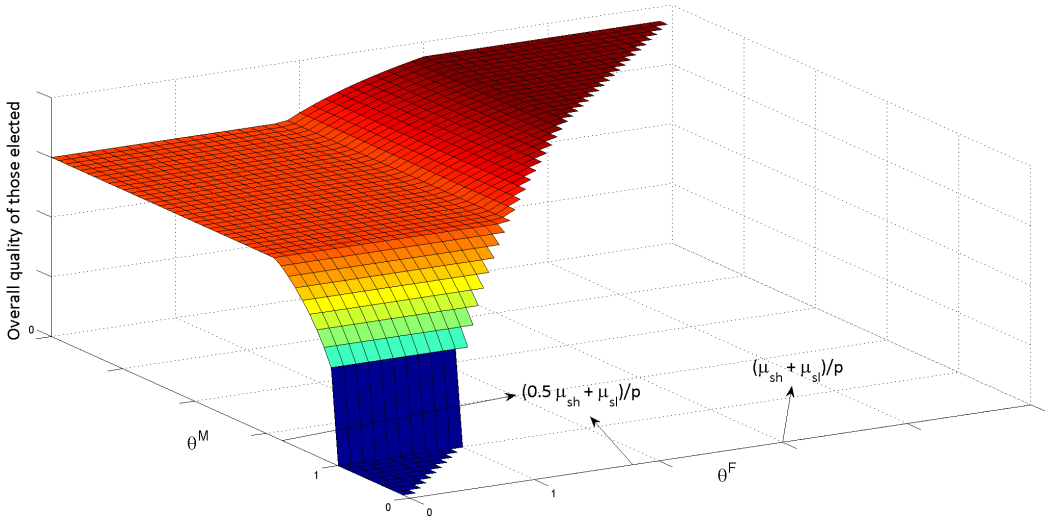

Figure 5: Quality of those elected and gender incentives to run for office in the *status quo*. In the figure, *sh* stands for $\overline{s}$, and *sl* stands for $\underline{s}$.

quo.[22] For each level of the quota, $\overline{q}$, and given the relative incentives to run for office, θ^M and θ^F, the political process delivers $p_{\overline{s}}^M(\overline{q})$ and $p_{\overline{s}}^F(\overline{q})$, the quality of elected males and females, respectively. From this, the overall quality of elected politicians, $p_{\overline{s}}$, follows immediately. Each different possible combination of θ^M and θ^F delivers a different relationship between quotas and quality.

We focus on two important cases, summarized in Table 2. These depend exclusively on the *status quo* of our economy, more concretely on whether some or all high-ability, high-signal males and some or all high-ability, high-signal females are running for office. This distinction is important, since the analysis differs slightly between the two cases. We immediately discard the four bottom left-hand possibilities, where the *status quo* would not deliver under-representation of women, as imposed by $\theta^M > \theta^F$. We also ignore the outcome where there are initially only low-quality politicians elected, in the upper left-hand corner. In this case initial quality is 0, which is far from interesting, and, more importantly, no under-representation arises in the *status quo*. Finally, the situation in which all high-ability, high-signal males and females stand for office in the *status quo* also leads to no under-representation and is thus neglected. In sum, we analyze the case where some high-skill, high-signal males and no high-skill, high-signal females run for office in the *status quo*, labeled

[22]We consider only cases where the quota is active, in the sense that the measure of reserved seats for women is greater then the measure of women that hold office in the *status quo*. Additionally, the maximum quota value implies an equal share of male and female citizens in public office.

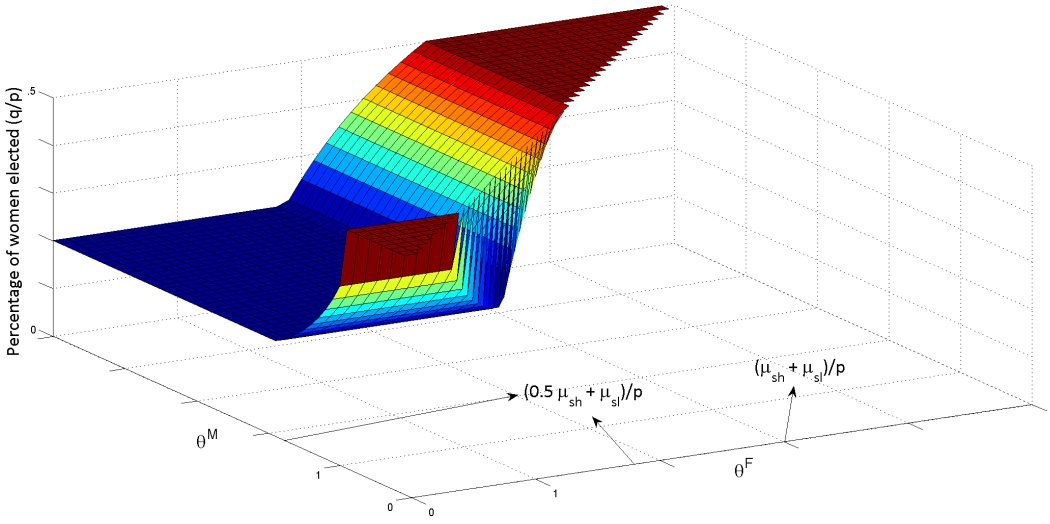

Figure 6: Percentage of women elected and gender incentives to run for office in the *status quo*. In the figure, *sh* stands for $\overline{s}$, and *sl* stands for $\underline{s}$.

CASE I, and the situation where in the *status quo* all high-skill, high-signal males run for office (but not all high-skill, high-signal females), labeled CASE II.

Table 2: Two cases to be analyzed.

STATUS QUO	No type-$\overline{s}$ males	Some type-$\overline{s}$ males	All type-$\overline{s}$ males
No type-$\overline{s}$ females	NOT INTERESTING	CASE I	CASE II
Some type-$\overline{s}$ females	NOT INTERESTING	NOT INTERESTING	CASE II
All type-$\overline{s}$ females	NOT INTERESTING	NOT INTERESTING	NOT INTERESTING

4.1 Case I – Some type-$\overline{s}$, signal-$\overline{s}$ male citizens stand for office in the *status quo*

In this case, high-skill males that emit a high-signal must be indifferent between running or not in the *status quo*. Hence, $\min\{1, \mu_{\underline{s}}/p\} \leq \theta^M < (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$. Since there is no high-skill, high-signal female candidate, the quality of elected officials in the *status quo* is determined only by the number of high-skill males running and being elected. The quality level is $p_{\overline{s}} = 1 - \mu_{\underline{s}}/(p\theta^M)$ and the measure of elected females is simply $q^{sq} = 0.5\mu_{\underline{s}}/\theta^M$. The following proposition analyzes the effects of imposing an exogenous quota $\overline{q} \in [q^{sq}, 0.5p]$ on the quality of those elected.

Proposition 1. *Suppose that* $\min\{1, \mu_{\underline{s}}/p\} \leq \theta^M < (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$. *Then,*

(i) imposing a gender quota $\overline{q} \in [q^{sq}, 0.5p]$ *never raises the quality of the elected body;*

(ii) for any quota level, reducing the relative weight of political discrimination versus private labor market discrimination (increasing θ^F*) weakly improves the quality of those elected for public office.*

Proof. See Appendix C. □

Given θ^M, we need to compute, for different values of θ^F and the quota level $\overline{q}$, the incentives for each of the four groups of individuals to run for office – high- and low-skill males and females that emit a high-signal. An increase in the quota level has the immediate effect of reducing the quality of those elected. Since a quota reduces the measure of reserved places for men, some high-ability males will no longer stand as candidates; otherwise the relative return from their candidacy would be negative. Hence, the quality of elected males is decreasing in the quota level. Regarding females, if $\theta^F < \max\{1, \mu_{\underline{s}}/p\}$, no high-ability female ever stands for office. Let us focus on the region $\max\{1, \mu_{\underline{s}}/p\} \leq \theta^F < \theta^M$. A quota increases the probability of election for high-signal females, and, for higher quota levels, some high-ability females will be willing to stand for office. As in the case of males, the equilibrium requires that high-ability, high-signal females are indifferent between running or not. Also, given the symmetry property between males and females, it is not possible to have all high-ability, high-signal women standing for office for any $\overline{q} \leq 0.5p$. The result is that the quality of elected females is 0 in the *status quo*, remains 0 for lower quota levels, but may increase for higher quota values. The overall quality of those elected for public office is decreasing in $\overline{q}$ as long as the quota discourages some high-ability males from running, but does not encourage any high-ability female to run. It is constant when the probability of election for high-signal females is sufficiently high, such that high-ability female candidates replace unmotivated high-ability male citizens that are fleeing to the private sector.

Figure 7 provides a graphic perspective of some of the main features of Proposition 1. For low levels of θ^F, *i.e.*, for high levels of political discrimination relative to private labor market discrimination, the quota necessarily leads to a decrease in the overall quality of those elected. This is simple to explain: the quota encourages women to run for office, but only low-quality, high-signal women have an incentive to do so; as high-quality males are discouraged from running, the overall quality of those elected decreases. For higher values of θ^F, that is, lower levels of political discrimination relative to discrimination in the private labor market, the quota changes the rewards

from entering political office sufficiently so that some high-skill females stand as candidates. However, as long as $\theta^F < \theta^M$, this does not occur immediately at q^{sq}. Hence, given θ^F, quality first decreases, as the quota discourages high-quality males from participating, but then stabilizes, when some high-skill females find it advantageous to stand for office, a situation in which they replace discouraged high-ability males.

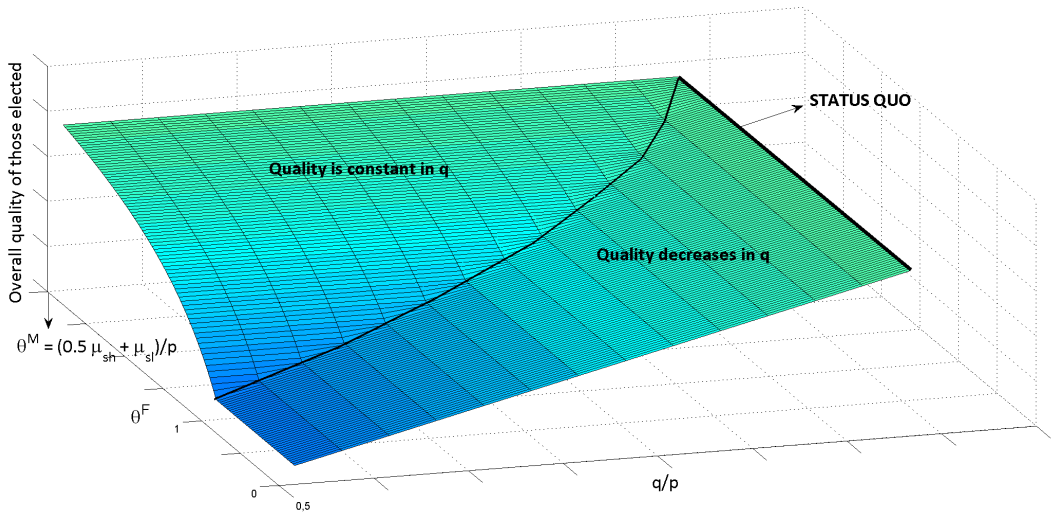

Figure 7: Quotas, incentives for high-skill females, and the overall quality of those elected – CASE I. In the figure, sh stands for $\overline{s}$, and sl stands for $\underline{s}$.

One interesting byproduct of this analysis is the following. For a given quota level, the lower political discrimination is relative to private labor market discrimination – higher θ^F – the higher is the overall quality of those elected. To see this, recall that, if some high-ability, high-signal females are candidates, they must be indifferent between running or not. Hence, if θ^F increases, they are willing to stand for office with a lower probability of election, which, given $\overline{q}$, encourages more high-ability, high-signal females to stand as candidates. In the extreme case of no discrimination (or equal discrimination in the political market and in the private labor market), there is no decrease in quality as the quota increases. This suggests that lowering discrimination in the political market may be a good way to ensure that gender quotas will not compromise the quality of elected politicians.

4.2 Case II – All type-$\overline{s}$, signal-$\overline{s}$ males citizens stand for office in the *status quo*

Consider now $\theta^M \geq (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$, so that all high-skill, high-signal male citizens run for office when gender quotas are absent. The following proposition shows that, in this case, it is possible that higher quotas raise the overall quality of those elected. All that is needed is that quotas attract high-ability female candidates without creating a disincentive for high-ability males to exit the political arena.

Proposition 2. *Suppose that* $\theta^M \geq (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$. *Then,*

(i) there exists a quota level $\overline{q} \in [q^{sq}, 0.5p]$ *which raises the quality of the elected body as compared to the status quo only if:*

(a) $\max\{1, \mu_{\underline{s}}/p\} \leq \theta^F < (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$, *provided that both* θ^F, θ^M *and the quota level are sufficiently high, or;*

(b) $(0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p \leq \theta^F < (\mu_{\overline{s}} + \mu_{\underline{s}})/p$ *(provided that* $\theta^F < \theta^M$*).*

(ii) for any quota level, reducing the relative weight of political discrimination versus private labor market discrimination (increasing θ^F*) weakly improves the quality of those elected for public office.*

Proof. See Appendix D. □

Proposition 2 states that the overall quality of those elected increases over the *status quo* if either one of two conditions is satisfied. In both, the quota cannot discourage any high-ability, high-signal male candidate from running for office, at least for low quota values. In the first, females are not running in the *status quo*, but would be willing to run for a quota value $\overline{q} < 0.5p$. The quota increases the probability of election for high-signal females, but decreases it for high-signal males. The overall quality of those elected increases over the *status quo* if there exists a quota level $\overline{q} \in [q^{sq}, 0.5p]$ such that the measure of high-ability females that run for office and are elected offsets the fall in the share of high-ability males elected. In the second, females are indifferent between standing or not as candidates in the *status quo*. A quota attracts more high-ability, high-signal females to run for public office without discouraging high-skill men, therefore increasing the quality of those elected. In any other situation, namely if the relative weight of political versus private labor market discrimination is sufficiently high ($\theta^F < \min\{1, \mu_{\underline{s}}/p\}$), or if the quota leads high-ability males to exit the political arena in sufficiently large numbers without creating the necessary incentive to attract sufficient high-ability females, overall quality decreases.

In Figure 8 we provide a graphic description of the effect of quotas on the quality of those elected.[23] First note that, for values of θ^F low enough, no high-ability female stands for office in the *status quo* and an increase in the gender quota leads to a decrease in the quality of office holders. This is what some public discussion of gender quotas has emphasized. However, the situation changes for higher values of θ^F, that is, lower levels of political discrimination. Below, we depict several regions for θ^F separately.

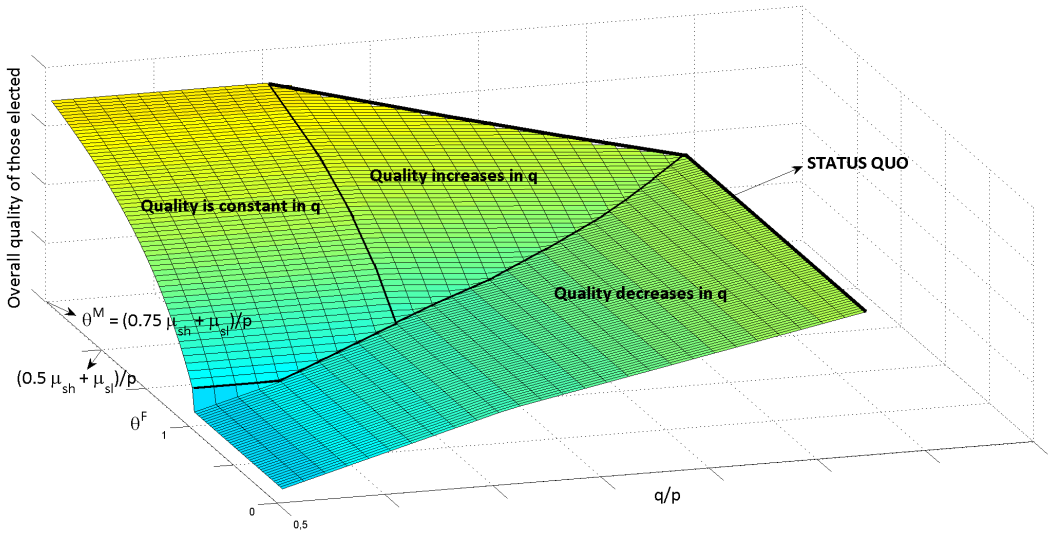

Figure 8: Quotas, incentives for high-skill females, and the overall quality of those elected – CASE II. In the figure, *sh* stands for $\overline{s}$, and *sl* stands for $\underline{s}$.

For $\theta^F < 1$, the increase in the quota will, at first, decrease the share of high-ability males elected, and, at higher quota values, even deter high-skill men from running, without attracting high-skill females. That is, a quota reduces the number of places available to male candidates, so that fewer high-ability males are elected even if all of them incur the costs of campaigning and run for office. In addition, as the probability of election for high-signal males decreases, some high-ability males may simply quit the political arena and flee to the private sector. If $\mu_{\underline{s}} > p$, this outcome also holds for $\theta^F < \mu_{\underline{s}}/p$.

If the relative benefit for female candidates from running for office is high enough, so that $\max\{1, \mu_{\underline{s}}/p\} \leq \theta^F < (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$, two different outcomes are possible. Given θ^F, the quota either induces high-ability, high-signal males to quit the political

[23] In the discussion that follows, we consider $\theta^M < (\mu_{\overline{s}} + \mu_{\underline{s}})/p$. Thereafter, we discuss the case where $\theta^M \geq (\mu_{\overline{s}} + \mu_{\underline{s}})/p$.

arena and only thereafter attracts high-ability, high-signal females; or attracts high-ability, high-signal females prior to discouraging any high-ability, high-signal male from standing for office. Figure 9 provides a 3-dimensional graphic illustration of these two outcomes. In the first case, and starting from q^{sq}, a quota leads first to a decrease in overall quality, as it reduces the seats for high-signal males – both high- and low-skill – replacing them with low-ability females. For larger quota values, some high-ability males may even quit the political arena, which reduces quality further. However, as is clear from the graph, at a given point, further increases in the quota induce some high-ability females to run for office. From this point onward, high-skill male candidates are being replaced by high-ability female candidates and the quota increases female representativeness without affecting the overall quality of those elected. This outcome requires that $\theta^F < 0.5\mu_{\underline{s}}\theta^M/(p\theta^M - 0.5(\mu_{\overline{s}} + \mu_{\underline{s}}))$.

In the second case, the quota induces high-ability, high-signal females to run for office prior to discouraging any high-ability male candidate. This requires a sufficiently high value of θ^F, namely $\theta^F > 0.5\mu_{\underline{s}}\theta^M/(p\theta^M - 0.5(\mu_{\overline{s}} + \mu_{\underline{s}}))$. However, the quality of office holders does not necessarily increase relative to the *status quo* – it increases only if the measure of high-ability, high-signal females that are running more than offsets the fall in the measure of high-ability males that were elected in the *status quo*, but are no longer elected due to the fall in the number of reserved seats for males. Once the quota reaches higher values and high-ability males quit the political arena, quality becomes independent of the quota. In this case, the effect of quotas on the quality of politicians is characterized by non-linear effects, say, by first decreasing, then increasing, and thereafter having no effect on quality.

Finally, consider $(0.5\mu_{\overline{s}}+\mu_{\underline{s}})/p \leq \theta^F < \theta^M < (\mu_{\overline{s}}+\mu_{\underline{s}})/p$. In this region, any quota above q^{sq} attracts more high-ability females to the political arena without immediately discouraging high-ability males that stand for public office. The result is a higher share of high-ability office holders. This holds up until the point where the quota is sufficiently high. Thereafter, high-ability males become discouraged and exit the political arena, and the quality of office holders becomes independent of the quota. Figure 10 represents this case.[24]

Note that in the above characterization there exists a quota level $\overline{q} < 0.5p$ whereby after that level some high-ability males always exit the political arena. The value of the quota at which that occurs obviously depends on the value of θ^M – the higher is the relative payoff from holding office, the higher is the reduction in the probability of election that high-ability, high-signal male candidates are willing to accept and

[24]In the figure, the value of θ^M is set to $(0.75\mu_{\overline{s}} + \mu_{\underline{s}})/p$, and so this is the upper value that θ^F can take.

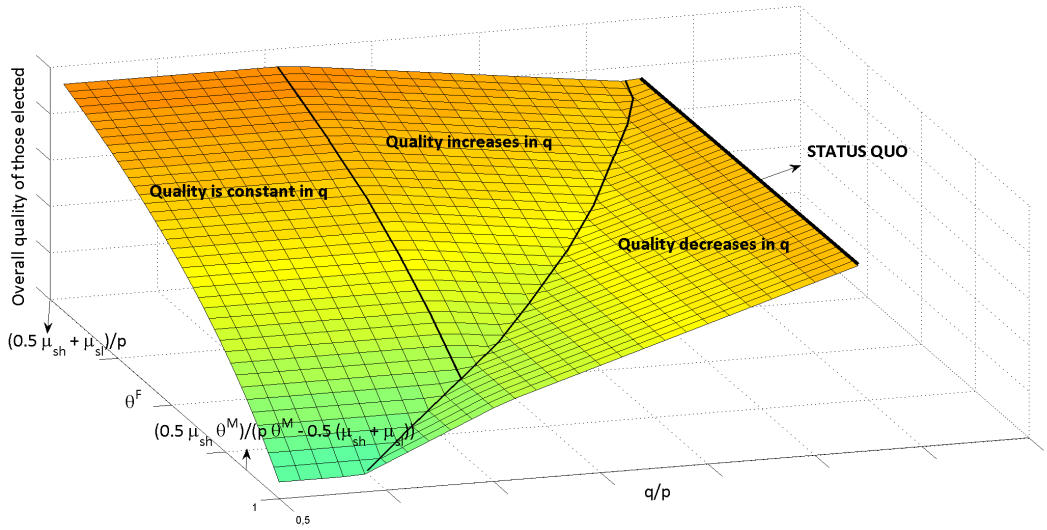

Figure 9: Quotas, incentives for high-skill females, and the overall quality of those elected – selected region for CASE II, where no high-ability female runs for office in the *status quo*. In the figure, *sh* stands for $\overline{s}$, and *sl* stands for $\underline{s}$.

still run. For $\theta^M > (\mu_{\overline{s}} + \mu_{\underline{s}})/p$, all high-ability, high-signal males stand for office for any quota $\overline{q} \leq 0.5p$, the quota region we are interested in. In this situation, the region where quotas have no effect on overall quality – the flat region in Figure 10 – would disappear, and for sufficiently high values of θ^F quality would be monotonically increasing in $\overline{q}$ up to a quota of $0.5p$.

A decrease in political discrimination as compared to private labor market discrimination, associated with attractive rewards from public office – both θ^M and θ^F take large values – increases the relative return of women from politics, thereby encouraging more high-ability females to stand in the political arena without discouraging high-ability males. For a given quota, there is a higher share of high-ability citizens in the pool of candidates, which necessarily leads to a higher quality in elected officials.[25] A more informative signal – higher σ – also increases the quality of those elected for any quota level, since the proportion of high-ability, high-signal citizens willing to enter the candidate pool increases as the screening by voters is more effective. An increase in the share of high-skill individuals in the population, s, has a similar effect. An increase in the measure of seats, p, needs to be analyzed with caution, since it also affects the share of places reserved for women, $\overline{q}/p$. In order to eliminate this effect, we can consider an increase in p that is accompanied by a proportional change in $\overline{q}$. This change weakly increases the chances of election for high-ability types –

[25]This can be easily inferred from Figure 8.

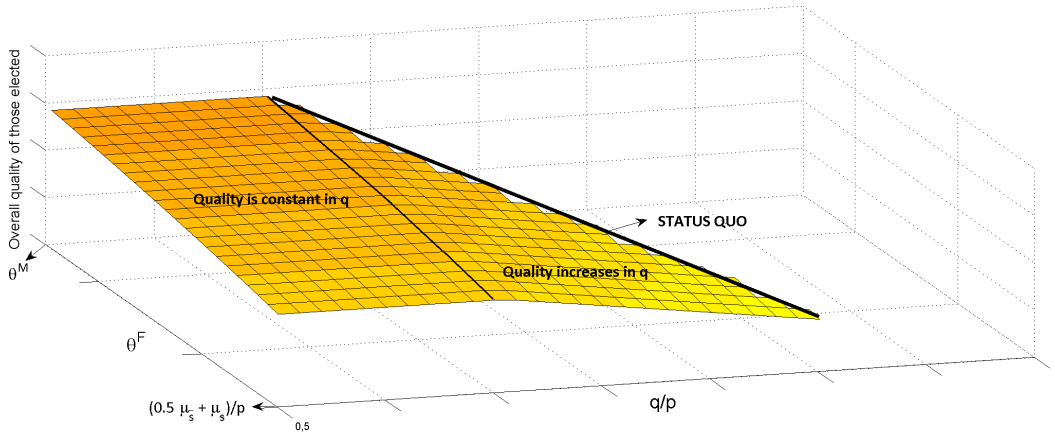

Figure 10: Quotas, incentives for high-skill females, and the overall quality of those elected – selected region for CASE II, where some high-ability females run for office in the *status quo*. In the figure, *sh* stands for $\overline{s}$, and *sl* stands for $\underline{s}$.

both males and females, if running – for any θ^M, θ^F and $\overline{q}/p$. Hence, the share of high-ability candidates weakly increases, and so does quality.[26]

Our model suggests that policies to avoid gender discrimination in the political market, associated with high rewards from holding office, do not create a trade-off between gender quotas and quality of public officials; in fact, the opposite is true. Additionally, an increase in the share of high-ability individuals and an increase in the effectiveness of political campaigns in screening candidates have important consequences on the quality of those elected and on the effectiveness of a gender quota. In fact, it is the interaction of these parameters of the economy with the quota level that determines whether it is possible to increase the representativeness of females without harming the quality of office holders and actually increasing it over the *status quo*.

5 Conclusion

This paper models the relationship between gender quotas and the quality of the elected public officials in an economy where individuals from two publicly identifiable groups – males and females – composed of high- and low-skill individuals, endogenously decide whether to run for office, in a citizen-candidate game. The model is applicable to any selection process – in politics, academia, or elsewhere – imposing a quota on a verifiable characteristic in the presence of an imperfectly observable

[26]There are regions where an increase in p has no effect on quality whatsoever, for instance, if all high-ability, high-signal males but no high-ability females are running for office.

characteristic such as candidate quality. Imposing a quota increases the probability of election for the discriminated group and decreases it for the originally over-represented group, but the impact on the overall quality of those elected depends on exactly which candidates are encouraged to run from the discriminated group – high or low-skill – and discouraged from doing so from the other group. The overall effect of the quota on the quality of politicians can be positive, negative, or null. When high-skill females are relatively discouraged from running – due to political discrimination – a higher quota decreases the overall quality of those elected. However, when the incentive for high-skill females to run for office is relatively high – due to low political discrimination – higher quotas may not translate into any decrease in the overall quality of public officials.

Importantly, a small increase in quotas can decrease quality of elected public officials, whereas a higher increase in quotas reverses the effect – a non-linear effect that can bring the quality of those elected for relatively high quotas well above the *status quo* level, where women were under-represented. Another important lesson is that the introduction of gender quotas should not be dissociated from policies lowering political discrimination across genders, as lower discrimination always weakly increases the quality of office holders. Other features of the economy and the political process, such as the rewards from public office, the share of high-skill individuals, or the effectiveness of political campaigns as screening devices, are key for determining the effect of quotas on the quality of politicians. The answer to the question posed in the title is straightforward: yes, gender quotas can help raise the quality of politicians.

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Appendices

A Women in parliament

Table 3: Women in parliament, Lower House.

	1997			2007		
	average %	st. dev.	# countries	average %	st. dev.	# countries
% Women in lower house – total	10.20	8.17	193	15.98	10.09	193
% Women in lower house – quota	14.11	6.42	10	19.23	9.34	48
% Women in lower house – no quota	9.94	8.23	183	15.05	10.17	145
Quota in 1997 and quota in 2007	14.11	6.42	10	22.89	7.55	10
No quota in 1997 and quota in 2007	7.79	5.53	38	18.24	9.62	38
No quota in 1997 and no quota in 2007	10.45	8.68	145	15.05	10.17	145

B Characterization of the *status quo* equilibrium

Note that each candidate votes for herself/himself. Given our assumption that citizens cannot anticipate differences in average quality between the pool of male and the pool of female candidates, even if they exist, there is no reason for non-candidates to discriminate between genders – they condition their vote solely on the signal emitted by candidates, regardless of gender. From an immediate generalization of (1), it is obvious that a type-i, signal-j, gender-h candidate will run for office if and only if

$$P_j \frac{\pi - y_i^h}{\phi^h} \geq 1$$

where P_j is the probability that a signal-j candidate is elected. Due to the private market discrimination, whenever a type-$\overline{s}$, signal-$\overline{s}$, gender-h citizen prefers to run for office, so does a type-$\underline{s}$, signal-$\overline{s}$ citizen of the same gender. Similarly, if a type-$\overline{s}$, signal-$\underline{s}$, gender-h citizen is running for office, so must be a type-$\underline{s}$, signal-$\underline{s}$ citizen of the same gender. We now introduce the following lemma.

Lemma 1. *If the measure of signal-$\overline{s}$ candidates is non-zero, then non-candidates never vote for a signal-$\underline{s}$ candidate.*

Proof. Let $\tilde{C}_j$ denote the measure of signal-j candidates and suppose that $\tilde{C}_{\overline{s}}$ is non-empty. If voters believe that the number of elements of type-$\overline{s}$ is higher in $\tilde{C}_{\underline{s}}$ than in

$\tilde{C}_{\overline{s}}$, then some type-$\overline{s}$, signal-$\underline{s}$ are candidates. This implies that all low-ability, low-signal citizens are candidates as well, since from our assumptions, $\theta^M < (\pi - \omega^F)/\phi^F$ and $\theta^M < (\pi - \omega^M)/\phi^M$. Given that $0.5(1-s)\mu > p$, we have $\tilde{C}_{\underline{s}} > p$. Hence, $P_{\overline{s}} = 0$, and no signal-$\overline{s}$ candidate is elected. This implies that $\tilde{C}_{\overline{s}}$ is empty: a contradiction. □

We now analyze the quality of those elected and the share of females in politics as a function of θ^M and θ^F (with $\theta^M > \theta^F$). Several regions are considered.

$\theta^M < 1$

Whenever $\theta^M < 1$, no type-$\overline{s}$ citizen, male or female, runs for office, as the expected utility of holding office for any high-skill individual is negative. Voters simply randomize their voting decisions, as all candidates have the same expected ability. Obviously, quality is 0, and the measure of elected females is representative of the population, that is, $q^{sq} = 0.5p$.

$\theta^M = 1$

If $\theta^M = 1$, type-$\overline{s}$, signal-$\overline{s}$ male citizens run for office if elected for sure. Hence, all type-$\underline{s}$, signal-$\overline{s}$ citizens (males and females) must be running as well, as $\theta^M < (\pi - \omega^F)/\phi^F$ and $\theta^M < (\pi - \omega^M)/\phi^M$. If $\mu_{\underline{s}} < p$, the remaining places are filled by type-$\overline{s}$, signal-$\overline{s}$ male candidates, and $P_{\overline{s}} = 1$. If we let $C^h_{\overline{s}}$ denote the measure of high-skill, high-signal candidates of gender h, then $C^M_{\overline{s}} \in [0, p - \mu_{\underline{s}}]$, and the quality of elected males is

$$p^M_{\overline{s}} \in \left[0, 1 - \frac{0.5\mu_{\underline{s}}}{p - 0.5\mu_{\underline{s}}}\right]$$

The overall quality of those elected is

$$p_{\overline{s}} \in \left[0, 1 - \frac{\mu_{\underline{s}}}{p}\right]$$

Finally, the measure of elected females is $q^{sq} \in [0.5\mu_{\underline{s}}, 0.5p]$. If we consider instead that $\mu_{\underline{s}} \geq p$, there are more low-ability, high-signal individuals than the number of offices. The probability of election is $P_{\overline{s}} = p/\mu_{\underline{s}} < 1$, and no high-ability male stands as candidate. The result is $p_{\overline{s}} = 0$ and $q^{sq} = 0.5p$.

$1 < \theta^M < (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$

Consider first that $\mu_{\underline{s}} < p$. In this region, any type-$\overline{s}$, signal-$\overline{s}$ male citizen must be indifferent between running or not. Suppose not. Then, either none would run, which implies $P_{\overline{s}} = 1$, so that $P_{\overline{s}}\theta^M > 1$, a contradiction. Or all of them would run, which implies $P_{\overline{s}} = p/(0.5\mu_{\overline{s}} + \mu_{\underline{s}})$ and $P_{\overline{s}}\theta^M < 1$, another contradiction. Therefore, we must have $P_{\overline{s}}\theta^M = 1$. As $\theta^F < \theta^M$, no type-$\overline{s}$, signal-$\overline{s}$ female citizen runs for office, but all low-type, high-signal citizens do. The measure of high-skill, high-signal male candidates is found by solving the following equation

$$\frac{p}{C^M_{\overline{s}} + \mu_{\underline{s}}}\theta^M = 1$$

which yields $C^M_{\overline{s}} = p\theta^M - \mu_{\underline{s}}$. The quality of elected males is

$$p^M_{\overline{s}} = \frac{C^M_{\overline{s}}}{C^M_{\overline{s}} + 0.5\mu_{\underline{s}}} = 1 - \frac{0.5\mu_{\underline{s}}}{p\theta^M - 0.5\mu_{\underline{s}}}$$

The probability of election is $P_{\overline{s}} = 1/\theta^M$ and the overall quality of the elected body is

$$p_{\overline{s}} = \frac{C^M_{\overline{s}}}{C^M_{\overline{s}} + \mu_{\underline{s}}} = 1 - \frac{\mu_{\underline{s}}}{p\theta^M}$$

Finally, $q^{sq} = 0.5\mu_{\underline{s}}/\theta^M$. If $\mu_{\underline{s}} \geq p$, the above characterization still holds for $\mu_{\underline{s}}/p \leq \theta^M < (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$. For $1 < \theta^M < \mu_{\underline{s}}/p$, no high-ability male stands for office, and the characterization is similar to the case of $\theta^M = 1$.

$\theta^M \geq (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$

In this region, all signal-$\overline{s}$ male candidates stand for office and the quality of elected males is $p^M_{\overline{s}} = \mu_{\overline{s}}/(\mu_{\overline{s}} + \mu_{\underline{s}})$. To see this, note that if $\theta^F < (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$ no high-ability female stands as candidate, since for the current probability of election $P_{\overline{s}} = p/(0.5\mu_{\overline{s}} + \mu_{\underline{s}})$, the expected return of running for office is negative ($P_{\overline{s}}\theta^F < 1$). As $p\theta^M/(0.5\mu_{\overline{s}} + \mu_{\underline{s}}) > 1$, all high-signal males must be running. If $0.5\mu_{\overline{s}} + \mu_{\underline{s}} \leq p\theta^F < \mu_{\overline{s}} + \mu_{\underline{s}}$ (provided that $\theta^F < \theta^M$), then type-$\overline{s}$, signal-$\overline{s}$ females must be indifferent between running or not running, and consequently all high-signal males stand for office. Finally, if $\theta^F \geq (\mu_{\overline{s}} + \mu_{\underline{s}})/p$ all signal-$\overline{s}$ female citizens run for office, and consequently so do all signal-$\overline{s}$ male citizens. The characterization of the equilibrium is as follows.

(i) If $\theta^F < (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$, no type-$\overline{s}$ female runs for office. The probability of election

is $P_{\overline{s}} = p/(0.5\mu_{\overline{s}} + \mu_{\underline{s}})$. The quality of those elected is $p_{\overline{s}} = 0.5\mu_{\overline{s}}/(0.5\mu_{\overline{s}} + \mu_{\underline{s}})$ and the fraction of elected females is $q^{sq} = 0.5\mu_{\underline{s}}p/(0.5\mu_{\overline{s}} + \mu_{\underline{s}})$.

(ii) If $(0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p \leq \theta^F < (\mu_{\overline{s}} + \mu_{\underline{s}})/p$, high-ability, high-signal females are indifferent between running or not. The measure of high-skill female candidates is found by solving the following equation

$$\frac{p}{C^F_{\overline{s}} + 0.5\mu_{\overline{s}} + \mu_{\underline{s}}}\theta^F = 1$$

which yields $C^F_{\overline{s}} = p\theta^F - 0.5\mu_{\overline{s}} - \mu_{\underline{s}}$. The probability of election of a high-signal citizen is $P_{\overline{s}} = 1/\theta^F$, and the average quality of elected females is

$$p^F_{\overline{s}} = \frac{C^F_{\overline{s}}}{C^F_{\overline{s}} + 0.5\mu_{\underline{s}}} = 1 - \frac{0.5\mu_{\underline{s}}}{p\theta^F - 0.5(\mu_{\overline{s}} + \mu_{\underline{s}})}$$

The share of elected females is

$$q^{sq} = P_{\overline{s}}(C^F_{\overline{s}} + 0.5\mu_{\underline{s}}) = p - \frac{0.5(\mu_{\overline{s}} + \mu_{\underline{s}})}{\theta^F}$$

Finally, the overall quality of those elected is

$$p_{\overline{s}} = \frac{C^F_{\overline{s}} + 0.5\mu_{\overline{s}}}{C^F_{\overline{s}} + 0.5\mu_{\overline{s}} + \mu_{\underline{s}}} = 1 - \frac{\mu_{\underline{s}}}{p\theta^F}$$

(iii) For $\theta^F \geq (\mu_{\overline{s}} + \mu_{\underline{s}})/p$ the probability of election is at its minimum, $P_{\overline{s}} = p/(\mu_{\overline{s}} + \mu_{\underline{s}})$. All high-signal females run for office, implying $C^F_{\overline{s}} = 0.5\mu_{\overline{s}}$, and hence $p^F_{\overline{s}} = p_{\overline{s}} = \mu_{\overline{s}}/(\mu_{\overline{s}} + \mu_{\underline{s}})$. Finally, $q^{sq} = 0.5p$.

C Proof of Proposition 1

Consider an exogenous quota $\overline{q} \in [q^{sq}, 0.5p]$. Recall that in CASE I only some high-ability, high-signal males stand for office in the *status quo* (they are indifferent between running or not), and so $1 \leq \theta^M < (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$ if $\mu_{\underline{s}} < p$, and $\mu_{\underline{s}}/p \leq \theta^M < (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$ if $\mu_{\underline{s}} \geq p$. Obviously, for $\overline{q} = q^{sq}$, the equilibrium is as posited in Appendix B.

Let $P^M_{\overline{s}}$ denote the probability that a signal-$\overline{s}$ male candidate is elected, and note that $P^M_{\overline{s}} = (p - \overline{q})/(C^M_{\overline{s}} + 0.5\mu_{\underline{s}})$ – the measure of places reserved for males over

high-signal male candidates. Let $\overline{q}^M = p - 0.5\mu_{\underline{s}}/\theta^M$, and observe that $\overline{q}^M \geq 0.5p$. Suppose not. Then

$$p - \frac{0.5\mu_{\underline{s}}}{\theta^M} < 0.5p \Leftrightarrow \theta^M < \frac{\mu_{\underline{s}}}{p}$$

If $\mu_{\underline{s}} < p$, the minimum value that θ^M can take is 1 and we obtain a contradiction. If $\mu_{\underline{s}} \geq p$, the minimum value that θ^M can take is $\mu_{\underline{s}}/p$, and we get $p > p$, another contradiction. This implies that, for $q^{sq} \leq \overline{q} \leq 0.5p$, a non-null measure of type-$\overline{s}$, signal-$\overline{s}$ male citizens stands for office. This measure, $C^M_{\overline{s}}$, is obtained by solving the following equation

$$\frac{p - \overline{q}}{C^M_{\overline{s}} + 0.5\mu_{\underline{s}}}\theta^M = 1$$

yielding

$$C^M_{\overline{s}} = (p - \overline{q})\theta^M - 0.5\mu_{\underline{s}},\ q^{sq} \leq \overline{q} \leq 0.5p$$

Note that, given θ^M, a higher quota decreases the measure of high-ability male candidates so that the probability of election remains unchanged. The quality of elected males is

$$p^M_{\overline{s}} = 1 - \frac{0.5\mu_{\underline{s}}}{(p - \overline{q})\theta^M},\ q^{sq} \leq \overline{q} \leq 0.5p$$

Similarly, let $\overline{q}^F = 0.5\mu_{\underline{s}}/\theta^F$, and note that $\overline{q}^F \leq (>)0.5p$ is equivalent to $\theta^F \geq (<)\mu_{\underline{s}}/p$. Therefore, if $\mu_{\underline{s}} \leq p$, we get $\overline{q}^F \leq 0.5p$ for $1 \leq \theta^F < \theta^M$. If $\mu_{\underline{s}} > p$, we obtain $\overline{q}^F > 0.5p$ for $1 \leq \theta^F < \mu_{\underline{s}}/p$, and $\overline{q}^F \leq 0.5p$ for $\mu_{\underline{s}}/p \leq \theta^F < \theta^M$. We now consider these cases separately.

$\mu_{\underline{s}} \leq p$ **and** $1 \leq \theta^F < \theta^M$

The measure of high-skill, high-signal female candidates is

$$C^F_{\overline{s}} = \begin{cases} 0 & \text{, if } q^{sq} \leq \overline{q} \leq \overline{q}^F \\ \overline{q}\theta^F - 0.5\mu_{\underline{s}} & \text{, if } \overline{q}^F < \overline{q} \leq 0.5p \end{cases}$$

and the quality of elected females is

$$p^F_{\overline{s}} = \begin{cases} 0 & \text{, if } q^{sq} \leq \overline{q} \leq \overline{q}^F \\ 1 - \frac{0.5\mu_{\underline{s}}}{\overline{q}\theta^F} & \text{, if } \overline{q}^F < \overline{q} \leq 0.5p \end{cases}$$

The quality of the elected body is

$$p_{\overline{s}} = \begin{cases} \frac{1}{p}\left[(p-\overline{q}) - \frac{0.5\mu_{\underline{s}}}{\theta^M}\right] & \text{, if } q^{sq} \leq \overline{q} \leq \overline{q}^F \\ 1 - \frac{0.5\mu_{\underline{s}}}{p}\frac{\theta^M+\theta^F}{\theta^M\theta^F} & \text{, if } \overline{q}^F < \overline{q} \leq 0.5p \end{cases}$$

Hence, $p_{\overline{s}}$ is weakly decreasing in $\overline{q}$ and weakly increasing in θ^F.

$\mu_{\underline{s}} > p$ **and** $\mu_{\underline{s}}/p \leq \theta^F < \theta^M$

This case is similar to the previous one and all the above characterization holds.

$\mu_{\underline{s}} > p$ **and** $1 \leq \theta^F < \mu_{\underline{s}}/p$

Here, high-ability males exit politics as the quota increases, but no high-ability female stands for office for any $\overline{q} \leq 0.5p$. Therefore,

$$p_{\overline{s}} = \frac{1}{p}\left[(p-\overline{q}) - \frac{0.5\mu_{\underline{s}}}{\theta^M}\right], \; q^{sq} \leq \overline{q} \leq 0.5p$$

which is strictly decreasing in the quota, $\overline{q}$, and does not depend on θ^F.

D Proof of Proposition 2

In CASE II, all high-ability, high-signal males stand for office in the *status quo*, and thus $\theta^M \geq (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$. Again, for a quota $\overline{q} = q^{sq}$, the equilibrium is as depicted in Appendix B.

If the quota is such that all high-skill, high-signal males run for office, male quality is $p^M_{\overline{s}} = \mu_{\overline{s}}/(\mu_{\overline{s}} + \mu_{\underline{s}})$. This occurs for $\overline{q} \leq p - 0.5(\mu_{\overline{s}} + \mu_{\underline{s}})/\theta^M$. If the quota is above this value, the quality of elected males is as depicted in Appendix C. Let $\overline{q}^M_1 = p - 0.5(\mu_{\overline{s}} + \mu_{\underline{s}})/\theta^M$ and $\overline{q}^M_2 = p - 0.5\mu_{\underline{s}}/\theta^M$, and note that $\overline{q}^M_2 \geq 0.5p$. The argument follows the same steps as in Appendix C. The term $\overline{q}^M_1$ is below $0.5p$ if and only if $\theta^M < (\mu_{\overline{s}} + \mu_{\underline{s}})/p$. Thus, we can write $p^M_{\overline{s}}$ as

$$p^M_{\overline{s}} = \begin{cases} \frac{\mu_{\overline{s}}}{\mu_{\overline{s}}+\mu_{\underline{s}}} & \text{, if } q^{sq} \leq \overline{q} \leq \min\{\overline{q}^M_1, 0.5p\} \\ 1 - \frac{0.5\mu_{\underline{s}}}{(p-\overline{q})\theta^M} & \text{, if } \min\{\overline{q}^M_1, 0.5p\} < \overline{q} \leq 0.5p \end{cases}$$

Regarding the quality of elected females and overall quality, we have to consider several regions for θ^F separately.

$\theta^F < 1$

In this situation, no high-ability female ever stands for office. The quality of elected females, $p_{\overline{s}}^F$, is 0. Thus, the quality of those elected

$$p_{\overline{s}} = \begin{cases} \frac{p-\overline{q}}{p}\frac{\mu_{\overline{s}}}{\mu_{\overline{s}}+\mu_{\underline{s}}} & \text{, if } q^{sq} \leq \overline{q} \leq \min\{\overline{q}_1^M, 0.5p\} \\ \frac{1}{p}\left[(p-\overline{q}) - \frac{0.5\mu_{\underline{s}}}{\theta^M}\right] & \text{, if } \min\{\overline{q}_1^M, 0.5p\} < \overline{q} \leq 0.5p \end{cases} \tag{2}$$

is decreasing in the quota level, $\overline{q}$, and does not depend on θ^F.

$1 \leq \theta^F < (0.5\mu_{\overline{s}} + \mu_{\underline{s}})/p$

As shown in Appendix B, no high-ability female runs for office in the *status quo* in this region. A higher quota raises the probability of election for high-signal females. Possibly, for a quota below $0.5p$, high-ability, high-signal females will become indifferent between running or not. Furthermore, in this region it is not possible to have all high-ability, high-signal females standing for office for any $\overline{q} \leq 0.5p$. To see this, note that the measure of female candidates is $C_{\overline{s}}^M = \overline{q}\theta^F - 0.5\mu_{\underline{s}}$, and the maximum value this can take is $0.25\mu_{\overline{s}}$. Let $\overline{q}^F = 0.5\mu_{\underline{s}}/\theta^F$, and consider first that $\mu_{\underline{s}} > p$ and $1 \leq \theta^F < \mu_{\underline{s}}/p$, so that $\overline{q}^F > 0.5p$. The quality of elected females is 0 and the overall quality of those elected is given by (2).

Now, consider the following cases: *(i)* $\mu_{\underline{s}} > p$ and $\mu_{\underline{s}}/p \leq \theta^F < (0.5\mu_{\overline{s}}+\mu_{\underline{s}})/p)$; *(ii)* $\mu_{\underline{s}} \leq p$. In both situations, type-$\overline{s}$, signal-$\overline{s}$ females stand for office for a quota below $\overline{q} \leq 0.5p$ (they will be indifferent between running or not). The quality of elected females is

$$p_{\overline{s}}^F = \begin{cases} 0 & \text{, if } q^{sq} \leq \overline{q} \leq \overline{q}^F \\ 1 - \frac{0.5\mu_{\underline{s}}}{\overline{q}\theta^F} & \text{, if } \overline{q}^F < \overline{q} \leq 0.5p \end{cases}$$

If $\overline{q}_1^M \leq \overline{q}^F$, the quality of those elected is

$$p_{\overline{s}} = \begin{cases} \frac{p-\overline{q}}{p}\frac{\mu_{\overline{s}}}{\mu_{\overline{s}}+\mu_{\underline{s}}} & \text{, if } q^{sq} \leq \overline{q} \leq \overline{q}_1^M \\ \frac{1}{p}\left[(p-\overline{q}) - \frac{0.5\mu_{\underline{s}}}{\theta^M}\right] & \text{, if } \overline{q}_1^M < \overline{q} \leq \overline{q}^F \\ 1 - \frac{0.5\mu_{\underline{s}}}{p}\frac{\theta^M+\theta^F}{\theta^M\theta^F} & \text{, if } \overline{q}^F < \overline{q} \leq 0.5p \end{cases}$$

Again, $p_{\overline{s}}$ is weakly decreasing in $\overline{q}$ and weakly increasing in θ^F. Finally, consider $\overline{q}^F < \overline{q}_1^M$. This is equivalent to stating that $\theta^F > 0.5\mu_{\underline{s}}\theta^M/(p\theta^M - 0.5(\mu_{\overline{s}} + \mu_{\underline{s}}))$. We

get

$$p_{\overline{s}} = \begin{cases} \frac{p-\overline{q}}{p}\frac{\mu_{\overline{s}}}{\mu_{\overline{s}}+\mu_{\underline{s}}} & \text{, if } q^{sq} \leq \overline{q} \leq \overline{q}^F \\ \frac{p-\overline{q}}{p}\frac{\mu_{\overline{s}}}{\mu_{\overline{s}}+\mu_{\underline{s}}} + \frac{\overline{q}}{p}\left[1 - \frac{0.5\mu_{\underline{s}}}{\overline{q}\theta^F}\right] & \text{, if } \overline{q}^F < \overline{q} \leq \min\{\overline{q}_1^M, 0.5p\} \\ 1 - \frac{0.5\mu_{\underline{s}}}{p}\frac{\theta^M+\theta^F}{\theta^M\theta^F} & \text{, if } \min\{\overline{q}_1^M, 0.5p\} < \overline{q} \leq 0.5p \end{cases}$$

Hence, quotas increase quality over the *status quo* if $\exists\, \overline{q} \leq \min\{\overline{q}_1^M, 0.5p\}$ such that

$$\frac{p-\overline{q}}{p}\frac{\mu_{\overline{s}}}{\mu_{\overline{s}}+\mu_{\underline{s}}} + \frac{\overline{q}}{p}\left[1 - \frac{0.5\mu_{\underline{s}}}{\overline{q}\theta^F}\right] > \frac{0.5\mu_{\overline{s}}}{0.5\mu_{\overline{s}}+\mu_{\underline{s}}}$$

which is equivalent to

$$\overline{q} > \frac{0.5(\mu_{\overline{s}}+\mu_{\underline{s}})}{\theta^F} - \frac{0.5\mu_{\overline{s}}}{0.5\mu_{\overline{s}}+\mu_{\underline{s}}} \tag{3}$$

Hence, for quality to increase, θ^M and θ^F must be sufficiently high, so that $\overline{q}^F < \overline{q}_1^M$, and the quota value must respect (3). Finally, note that quality is weakly increasing in θ^F.

$(0.5\mu_{\overline{s}}+\mu_{\underline{s}})/p \leq \theta^F < (\mu_{\overline{s}}+\mu_{\underline{s}})/p$

Let us now consider the final region, where some high-ability, high-signal females are running for office in the *status quo*, and let $\tilde{q}^F = 0.5(\mu_{\overline{s}}+\mu_{\underline{s}})/\theta^F$. Note that $\tilde{q}^F > 0.5p$, which implies that one cannot have all high-ability females running for office for any $\overline{q} \leq 0.5p$. The quality of elected females is

$$p_{\overline{s}}^F = 1 - \frac{0.5\mu_{\underline{s}}}{\overline{q}\theta^F},\ q^{sq} \leq \overline{q} \leq 0.5p$$

Now, suppose that $\overline{q}_1^M \geq 0.5p$. The quality of those elected is

$$p_{\overline{s}} = \frac{p-\overline{q}}{p}\frac{\mu_{\overline{s}}}{\mu_{\overline{s}}+\mu_{\underline{s}}} + \frac{1}{p}\left[\overline{q} - \frac{0.5\mu_{\underline{s}}}{\theta^F}\right],\ q^{sq} \leq \overline{q} \leq 0.5p$$

Quality is increasing in $\overline{q}$ and thus quotas improve quality over the *status quo*. Also, quality is increasing in θ^F. Now, consider $\overline{q}_1^M < 0.5p$. The quality of those elected is

$$p_{\overline{s}} = \begin{cases} \frac{p-\overline{q}}{p}\frac{\mu_{\overline{s}}}{\mu_{\overline{s}}+\mu_{\underline{s}}} + \frac{1}{p}\left[\overline{q} - \frac{0.5\mu_{\underline{s}}}{\theta^F}\right] & \text{, if } q^{sq} \leq \overline{q} \leq \overline{q}_1^M \\ 1 - \frac{0.5\mu_{\underline{s}}}{p}\frac{\theta^M+\theta^F}{\theta^M\theta^F} & \text{, if } \overline{q}_1^M < \overline{q} \leq 0.5p \end{cases}$$

It is immediate that a quota results in an increase in quality for levels slightly above the *status quo*, and remain constant when high-ability, high-signal females entering

politics replace high-ability, high-signal males who are exiting to the private labor market. An increase in θ^F raises the quality of those elected.