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ABSTRACT

We study the impact of gender quotas on the acquisition of human capital. We assume that individuals' formation of human capital is influenced by the prospect of landing high-pay top positions, and that these positions are regulated by gender-specific quotas. In the absence of quotas, women consider their chances of getting top positions to be lower than men's. The lure of top positions induces even men of relatively low ability to engage in human capital formation, whereas women of relatively high ability do not expect to get top positions and do not therefore engage in human capital formation. Gender quotas discourage men who are less efficient in forming human capital, and encourage women who are more efficient in forming human capital. We provide a condition under which the net result of the institution of gender quotas is an increase in human capital in the economy as a whole.

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1. Motivation

We present an economic rationale for instituting quotas that mandate the promotion and appointment to top positions of female workers rather than of male workers. We evaluate the impact of gender quotas on the formation of human capital in the economy at large. We contribute to the affirmative action literature and to the ongoing debate regarding the introduction of quotas for women.

In many developed countries, the labor-force participation rate of women is about 10 to 15 percentage points lower than that of men. The representation of women on corporate boards averages about 10 percent in Europe, and about 16 percent in the United States.¹ In 2013, among the CEOs of the Fortune 500 companies, only 4.2 percent were women, among the CEOs of the Fortune 1000 companies, only 4.6 percent. No wonder that company boards are pressured to appoint female directors. In 2011, the European Commission warned European firms not to neglect to promote women. Many countries have already instituted female quotas for their highest “boards,” namely parliaments, as well as for boardrooms. In 2003,

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¹ According to the World Bank (<http://data.worldbank.org/indicator/SL.TLF.TOTL.FE.ZS?display=default>), the female labor force as a percentage of the total labor force in 2011 was 44.4 in China; about 46 in the United States, the United Kingdom, and Germany; and about 47 in Norway, Sweden, and France.

Norway passed and enacted legislation mandating female quotas for the boards of directors of public companies. The goal of 40 percent representation of women was reached in 2009. Spain implemented female quotas in 2007, and in 2011 quota laws were passed in Italy, Belgium, the Netherlands, and France. Finland and Sweden successfully increased the number of women on boards by non-legislative means. Several other European countries are fiercely debating the issue.

Economic performance does not seem to be adversely affected when quotas are implemented. Several studies conclude that firms managed by both men and women are more successful, more efficient, and generate higher profits than firms managed only by men. Carter et al. (2003) find a positive relationship between corporate performance and the proportion of women or minorities on the board of the 1997 Fortune 1000 companies. Similar results are found for companies all over the world (Desvaux et al., 2008); for the Fortune 500 companies in 1996–2000 (Catalyst, 2004); for Danish companies (Smith et al., 2006); and for Dutch and, again, for Danish companies (Marinova et al., 2010). Matsa and Miller (2013) study the effect of the Norwegian quota on corporate decision making. They find that gender quotas do not lead to less profitable business decisions at large, but entail a decrease in employee layoffs, which in the short run causes an increase in relative labor costs.

Suppose that women (men) consider their chances of professional advancement to depend on the presence of female (male) workers in higher positions. Several studies align with this perspective. Gilbert (1985) refers to the importance of same-gender role models in male and female students' professional development. High-Pippert and Comer (1998) study the consequences of female political empowerment. They find that women who are represented by women in the House of Representatives in the US are more interested in politics than women who are represented by men. Niederle et al. (2013) conduct a laboratory experiment aimed at gauging the effect of instituting a gender quota. The introduction of affirmative action results in a better representation of high-performing women in tournament-type competitions, which is partly attributed to women's belief in their ability to perform well, and partly to their dislike of competing with men. Drawing on data pertaining to managers in California's savings and loan industry, Cohen et al. (1998) investigate whether the gender composition of an organization affects men's and women's job mobility. They find that women are more likely to end up being promoted or hired into a management position when the share of women in that position and above is higher. Cohen et al. (1998) infer that the presence of women in managerial positions is crucial for getting more women into management, a demonstration effect of sorts.

Could it be that quotas encourage women to acquire tools and skills that help their rise to top positions? Do quotas affect human capital formation? Revisiting Norway, in 2000 43.5 percent of women aged between 25 and 34 attained tertiary education. This share increased to 44.8 percent in 2003, and to 53.7 percent in 2012.² During that period, the percentage of women on boards of public limited companies nearly doubled every two years - from six percent in 2002 to 40 percent in 2009 (Storvik and Teigen, 2010). Associations are not causality, but a link is plausible.

Why should policy makers and social planners care about human capital at all? Both theory and evidence suggest that human capital accumulation is an important engine of economic growth and development (Lucas, 1988; Mankiw et al., 1992; Barro, 2001). Castelló and Doménech (2002) highlight the negative relationship between human capital inequality and GDP growth. Furthermore, inequalities in human capital translate into inequalities in earnings (see, for example, De Gregorio and Lee, 2002). The negative relationship between income inequality and economic performance has been widely researched in the growth literature as long as two decades ago (Alesina and Rodrik, 1994; Persson and Tabellini, 1994).

In section 2 we study the altered human capital formation environment when gender quotas are set so as to increase the presence of women in top positions. We provide a condition under which the institution of gender quotas results in an increase in the economy-wide human capital. Section 3 concludes.

2. Analysis

Suppose that individuals' acquisition of human capital is influenced by their ability and by a gender-specific prospect of getting a top position: individuals consider their chances of obtaining a top position to be influenced by their human capital, and by their gender. In a setting without quotas, men hold a higher share of top positions than women. Given a similar ability distribution among men and women, even men of relatively low ability have reason to engage in human capital formation because they have a reasonable prospect of getting a top position. In contrast, even women of relatively high ability do not engage in human capital formation because of their slim prospect of achieving the same. In a setting with quotas, men who are less efficient in forming human capital realize that they are not as likely to get a top position; the expected reward to human capital for them declines and men therefore invest less in human capital. Conversely, in such a setting women who are more efficient in forming human capital will expect to get a top position, and therefore will form a higher level of human capital. Then, because of relative advantage in ability, the human capital formed by women who are encouraged to acquire it by quotas will be greater than that of men who are discouraged by quotas. In sum, the economy-wide human capital per worker goes up.

Specifically, consider the following framework. Let the distributions of the ability to form human capital of both men and women be non-uniform, and not too dissimilar. For example, these distributions can follow a bell-shaped curve, and be akin to the distributions of many human cognitive traits such as intelligence and social skills, which are similar for both genders.

² See Eurostat education and training data (edtr/edat/edatm/edatm1/edat.lfse.07), retrieved on July 2, 2013, from <http://epp.eurostat.ec.europa.eu/portal/page/portal/education/data/database>.

(Our analysis goes through smoothly when ability is approximated by IQ.) The acquisition of human capital depends on the cost, which is assumed to be inversely related to ability, and on the anticipated reward. We assume that individuals choose their human capital at the beginning of their (working) life.

Because individuals acquire human capital before they start to work, their human capital investment decision is influenced by how they perceive their job market prospects. Let the job markets for men and women be separate in the sense that men compete with other men for a certain number of top positions, and so do women. When employed, individuals of gender $j=f,m$ (f for female, m for male) hold a “top-ranked” position, t , or a “bottom-ranked” position, b . Getting a top position depends on the number of top positions available for workers of the individual’s gender, and on the individual’s human capital, h . The earnings of an individual depend on the individual’s human capital and on a coefficient $w_i, i=t,b$ that measures the returns to human capital in position i where, naturally, $w_t > w_b$.

The expected net utility of an individual whose ability to form human capital is $a \in (0,1)$ is

$$u_i(h) = w_i h - (1 - a)h^2. \tag{1}$$

Thus, in (1) we assume that the cost of acquiring human capital is inversely related to ability, and that the cost function of acquiring human capital takes the convex form $(1 - a)h^2$. Consequently, the individual’s chosen level of human capital is

$$h_i(a) = \frac{w_i}{2(1 - a)}.$$

For workers of each gender, the parameter a has a density distribution and a cumulative distribution over the interval $(0,1)$, namely, $j(a)$ and $J(a) = \int_0^a j(x)dx$, respectively, for $j=f,m$. We assume that $\int_0^1 m(a)da = \int_0^1 f(a)da = 1$.³

The number of top positions assigned to gender j is σ_j , and the number of all top-ranked positions is a constant T ; namely, $\sigma_m + \sigma_f = T$.⁴

Suppose that top positions are assigned to men (women) according to their human capital in a decreasing order.⁵ Workers know their place in the distribution of ability, and expect to obtain a top position if their ability is no less than a_j for $j=f,m$, where

$$\sigma_j = \int_{a_j}^1 j(a)da,$$

and, consequently, $a_j = J^{-1}(1 - \sigma_j)$.

The total quantity of human capital acquired by workers of gender j who expect to obtain a top position is

$$H_{tj}(a_j) = \int_{a_j}^1 h_{tj}(a)da = \int_{a_j}^1 \frac{w_t}{2(1 - a)} j(a)da,$$

and the total quantity of human capital acquired by workers of gender j who expect to obtain a bottom position is

$$H_{bj}(a_j) = \int_0^{a_j} h_{bj}(a)da = \int_0^{a_j} \frac{w_b}{2(1 - a)} j(a)da.$$

Suppose that some top positions are reallocated to women. Then σ_m decreases to σ'_m , and σ_f increases to σ'_f , while still

$$\sigma'_m + \sigma'_f = \sigma_m + \sigma_f = T. \tag{2}$$

Let $a'_j = J^{-1}(1 - \sigma'_j)$. Then, we have that $a_f > a'_f$, and that $a_m < a'_m$. The change in human capital acquired by gender j is

$$\Delta H_j = \int_{a'_j}^{a_j} \frac{w_t - w_b}{2(1 - a)} j(a)da;$$

it is positive for female workers, and it is negative for male workers.

The allocation of top positions to women results in an increase in the economy-wide human capital whenever $\Delta H_f + \Delta H_m > 0$, which translates into the condition

$$\int_{a'_f}^{a_f} \frac{w_t - w_b}{2(1 - a)} f(a)da + \int_{a'_m}^{a_m} \frac{w_t - w_b}{2(1 - a)} m(a)da > 0. \tag{3}$$

³ The analysis can also go through for $\int_0^1 m(a)da \neq \int_0^1 f(a)da$.

⁴ We normalize the number of all positions to one, that is, denoting by B the constant number of all bottom-ranked positions, we assume that $B + T = 1$.

⁵ Several studies note that career trajectories and human capital are strongly related (Becker, 1993; Metz and Tharenou, 2001; Tharenou, 2001; Ng et al., 2005; Ballout, 2007). Therefore, by argumentum a contrario, we take it that firms assign top positions in a decreasing order of human capital endowments.

Because

$$\int_{a'_f}^{a_f} \frac{1}{1-a} f(a) da > \frac{1}{1-a'_f} \int_{a'_f}^{a_f} f(a) da,$$

and because

$$\frac{1}{1-a'_m} \int_{a_m}^{a'_m} m(a) da > \int_{a_m}^{a'_m} \frac{1}{1-a} m(a) da,$$

then for (3) to hold, it is sufficient that

$$\frac{1}{1-a'_f} \int_{a'_f}^{a_f} f(a) da + \frac{1}{1-a'_m} \int_{a'_m}^{a_m} m(a) da \geq 0. \quad (4)$$

Due to (2),

$$\int_{a'_f}^{a_f} f(a) da = \int_{a_m}^{a'_m} m(a) da,$$

and (4) is equivalent to

$$a'_f = F^{-1}(1 - \sigma'_f) \geq M^{-1}(1 - \sigma'_m) = a'_m. \quad (5)$$

Condition (5) says that for the allocation of top positions to women to bring about an increase in the economy-wide human capital, it is sufficient that after the allocation, the least able woman hoping to secure a top position is more able than the least able man hoping to secure a top position. Typically, σ_m is considerably greater than σ_f , and even after the allocation σ'_m is often still greater than σ'_f . Then, if $f(a)$ and $m(a)$ are not too dissimilar, condition (5) will indeed hold. If $f(a) = m(a)$, the preceding analysis supports legislation that mandates employers to give preference to the promotion of female workers, as long as the number of women in top positions in the economy at large is not the same as that of men.

It can be shown that we will obtain the same results as before when we relax the assumption of separate job markets for men and women if individuals expect to obtain a top position according to their *gender-specific* ability, namely, if they assess their chances of advancement on the basis of gender-specific representation at higher positions. For a given human capital distribution, suppose that irrespective of gender, firms hire T individuals top down from this human capital distribution.⁶ Let the corresponding number of top positions assigned to gender j be σ_j . Consider now those individuals who as yet neither work, nor form human capital. These individuals know their place in the gender specific ability distribution. If individuals' expectations of ending up in top positions is informed by (the *gender specific*) σ_j and by their ability, they will (again) expect to obtain a top position if their ability is not lower than a_j , where $\sigma_j = \int_{a_j}^1 j(a) da$. Consequently, individuals with $a \geq a_j$ will invest more in human capital than individuals with $a < a_j$. Consider then the resulting human capital distribution (for both men and women), which evolves from the utility maximization of all the individuals. Although firms pay attention only to human capital attributes, they will hire σ_m top position male workers, and σ_f top position female workers. As before, as long as condition (5) is satisfied, the allocation of top positions to women increases the acquisition of human capital in the economy at large. In this case, however, an unequally distributed number of top positions between men and women is an "endogenous" outcome, driven by the individuals' optimization behavior.

3. Conclusions

A substantial literature debates the costs and benefits of improving the representation of female workers in high-level positions. Whereas most studies focus on the demand side, we concentrate in this paper on the supply side. We conjecture that human capital formation is linked to the prospect of promotion to top positions, which is gender-specific. Quotas affect the chances of a promotion. Consequently, they can discourage men and encourage women to form human capital. If newly encouraged women are more efficient in forming human capital than displaced men, the net effect will be an increase in human capital in the economy as a whole. This result is obtained irrespective of whether we assume that job markets for men and women are separate or not. Put differently, we show that there are social gains from imposing quotas on gender types that are either discriminated against or, as implied in the last paragraph of section 2, if there is an endogenous equivalent where gender evidence is used as a predictor of success. There is social gain because the ex ante margins between the two genders are unequal. In this sense, we provide an aggregation: individuals invest in human capital to get a chance of top jobs,

⁶ We naturally assume that the least able top position worker forms more human capital than the most able bottom position worker, namely that $h_{ij}(a_j) > h_{ij}(a_j)$.

and aggregation shows that the increase in human capital of the previously under-represented group more than offsets the reduction of the human capital of the over-represented group.

Two strands in the received literature link with dynamics, specifically - with the duration of quotas. In his job market signaling model, Spence (1973) presents an example where employers have different beliefs about men and women, requiring women to satisfy a higher educational threshold (relative to men) in order to convince employers that they are of high ability. As a result, even able women do not get educated, whereas able men do. In the spirit of our approach, what would happen in such a setting if gender quotas were imposed? Presumably, this would force employers to lower the educational threshold for women, encouraging relatively high-ability women to get educated and obtain top positions. In turn, this might change employers' beliefs about women, even making it possible to remove the quotas after a time.

A disadvantage of quotas that has been pointed out (for example, by Coate and Loury, 1993) is the reinforcement of negative stereotyping. The idea is that if the favored workers think that they are likely to be hired anyway (due to the quotas), this will reduce their incentive to acquire the relevant human capital. But then, the employers' beliefs about the quality of these workers, who without the quotas would not have been hired, are confirmed under the quota, thereby working against the possibility of removing the quotas after a time. However, the policy that we have suggested is actually immune to this criticism because it only recommends quotas for top positions, and for such positions, presumably, a high level of education would be required despite the quotas.

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