CESifo WORKING PAPERS

9705
2022

April 2022

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CESifo

Impressum:

CESifo Working Papers
ISSN 2364-1428 (electronic version)
Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH
The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute
Poschingerstr. 5, 81679 Munich, Germany
Telephone +49 (0)89 2180-2740, Telefax +49 (0)89 2180-17845, email office@cesifo.de
Editor: Clemens Fuest
https://www.cesifo.org/en/wp
An electronic version of the paper may be downloaded
· from the SSRN website: www.SSRN.com
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CESifo *Working Paper No. 9705*

Gender Discrimination in Competitive Markets

Abstract

We propose a competitive general equilibrium theory of gender discrimination in labor market where male and female workers are equally productive, but the female workers are deliberately paid less than the male due to subjective discrimination. Pioneering works of Becker (1957) and Arrow (1973), in terms of partial equilibrium models, have argued that the forces of competition would restrict subjective discrimination which leads to increasing cost for a firm and reduce the return to capital. In contrast, using a general equilibrium framework as in Jones (1965), we show that discrimination can perpetuate even in perfectly competitive markets. We also show that the return to capital can increase with discrimination if the capital intensive sector is also female worker dominated. If international trade policy, or any competitive price shock, reduces return to capital, increasing discrimination may be attempted to compensate the capital. Thus, policy intervention may be essential to contain discrimination in competitive markets.

JEL-Codes: J160, J700.

Keywords: gender discrimination.

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1 Introduction

Fundamental theoretical work on economics of discrimination is due to Becker (1957), followed by Arrow (1973, 1998). One of the major arguments dealt with in their work had to do with the inherent tendency of forces of competition containing the incidence of discrimination in market place. Subjective discrimination would always raise the cost for a firm and the threat of undercutting in a competitive market would not allow such firms to survive. Therefore, for competitive industries discrimination is likely to be less. In this paper we challenge such an assertion in terms of a simple general equilibrium model of competitive markets due to the foundational work of Jones (1965) and show how discrimination can perpetuate and be sustained in such a structure.[1] If all firms in any industry suffer from prejudiced social perception that discrimination is good, return to capital can in fact increase with increasing discrimination , a result that is an antecedent of the well known Stolper-Samuelson theorem in trade theory. We do not set out to explain why there is discrimination

[1] See also Markusen (2021) for a good instructional review of this general equilibrium approach.

at all , but if it is there why forces of competition would nurture or encourage such a social anomaly. Symmetric competitive firms with subjective belief that discrimination is desirable can very well represent a competitive industry and attract capital to produce. Increasing degree of discrimination may not affect the return to capital at all or sometimes may increase such returns, just as an increase in average cost in a labor intensive sector benefits capitalists in a general equilibrium model. The general equilibrium mechanism demonstrates that average wage can drop when male workers are paid a top up at the cost of female workers when the degree of discrimination varies across sectors. Thus the general equilibrium approach opens up a plethora of possibilities unexplored in the partial equilibrium approach.

This addresses one of the major concerns of Arrow work as stated in Wan (1987) as "Since discrimination survives ... the model must have ... limitations." We argue that if somehow the society carries a preconceived baggage of subjective discrimination , maybe as a Bayesian prior, competitive markets may do nothing to contain it. If there is a wage gap between male and female workers , it can jolly well benefit capital and of course male workers in a general equilibrium. Moreover, increasing discrimination may not adversely affect output or return to capital or may actually increase it under reasonable conditions. Greater share of female labor force in capital intensive industries would increase return to capital. Thus the general equilibrium approach instead of a partial equilibrium one drastically alters the conventional result. An important consequence of our result is that we cannot leave competitive markets to take care of the gender discrimination problem on their own. Policy intervention may indeed be much needed even in competitive markets. Moreover, a crucial corollary that emerges from our model is that, under plausible assumptions, anti-trade (protectionist) policies may motivate capitalist to implement gender discriminations as it may dampen the negative impacts such protectionist policies may have on capital return. Put differently, freer trade may reduce motivation on part of capitalist to discriminate. It is notable that this conclusion is not limited to international trade. In fact, the same argument holds for any competitive price shock that affects the capital intensive sector. Black and Strahan (2001) show empirically that deregulation in the US banking sector resulted in reduced gender discrimination.

Several other papers in the literature have dealt with the extent and impact of discrimination. Although earlier analyses were all on racial discrimination, gender discrimination in labor market has occupied a contemporary and central place in such discussions both in terms of household and

labor market issues. While earlier literature such as Ashenfelter (1972) and Aigner and Cain (1977) have focused on gender related wage gap in labor markets, most of the contemporary works are empirical and deal with the magnitude of such discrimination. Using a microdata set during 1980-2010, Blau and Kahn (2017) provide new evidence for gender discrimination in the labor market. Our objective is to start from this empirical evidence and analyze the impact of such discrimination in a competitive general equilibrium system. In fact our theory will work as a policy guide as the extent of benefit from such discrimination is shown to depend on the technological and labor related characteristics of industries. It is the return to capital which becomes pivotal as a signal of the degree of tolerance towards discrimination[2] Theoretical literature on labor market discrimination is thin and, to the best of our knowledge, the general equilibrium formulation of the Becker-Arrow problem is absent. Our objective in this paper is to fill this gap.

2 A model of discrimination

Consider an economy that produces two goods, denoted by X and Y. Both goods use capital, female (F) and male (M) workers, with the following production functions:

$$X = X(K_X, L_{XF}, L_{XM})$$
$$Y = Y(K_X, L_{XF}, L_{XM})$$

where K_i and L_{ij} are capital and labor of type $j = F, M$ used in sector $i = X, Y$, respectively. We maintain all neoclassical assumptions on these production functions. Furthermore, let all markets be competitive. Assume that male female workers are discriminated such that $W_M = \alpha W_F, \alpha > 0$, where W_j is the wage rate of type $j = F < M$. Hence, equilibrium conditions require that:

$$w_F[\lambda + (1-\lambda)\alpha]a_{LX} + ra_{KX} = P_X \tag{1}$$
$$w_F[\lambda + (1-\lambda)\alpha]a_{LY} + ra_{KY} = P_Y \tag{2}$$

[2]See Santos Silva and Klasen (2021) for a good survey of theoretical literature on gender discrimination and growth. Readers also benefit from Autor's MIT Lectures on discrimination (see Autor , 2003).

where λ is female share of employment in both sector and a_{iK} and a_{iL} denote, respectively, the unit capital and labor requirements in sector $i = X, Y$. Note here that labor productivity is identical regardless of genders. Maintaining constant prices, differentiating equations 1 and 2 and simplifying, we obtain:

$$\hat{w}_F\theta_{LX} + r\theta_{KX} = -\theta_{LX}(1-\theta_F)\hat{\alpha} \tag{3}$$

$$\hat{w}_F\theta_{LY} + r\theta_{KY} = -\theta_{LY}(1-\theta_F)\hat{\alpha} \tag{4}$$

where θ_{hi} is the distributive share of factor $h = L, K$ in sector $i = X, Y$. Moreover, $\theta_F \equiv 1-(1-\lambda)\alpha$ is female's share of wage (i.e., the portion of distributive share of labor that goes to female workers in this economy). Hence, $\theta_F\theta_{LX}$ can be interpreted as the effective female distributive share of labor. We term θ_F as female *participation rate* in the labor market.

Solving equations (3 and (4) for $\hat{w}_F$, we obtain:

$$\hat{w}_F = -(1-\theta_F)\hat{\alpha} \tag{5}$$

$$\hat{w}_M = \theta_F\hat{\alpha} \tag{6}$$

$$\hat{r} = 0 \tag{7}$$

Hence, equations (5) and (6) leads to the following result.

Proposition 1 *Gender discrimination sustains in the economy given the lack of institutional intervention.*

Notably, this result is irrespective of factor intensity ranking. Also note that the effective wage cost for one unit of labor is $w \equiv [\lambda + \alpha(1-\lambda)]w_F$, hence, $\hat{w} = 0$. Also, factor employment conditions are of the standard form:

$$a_{LX}X + a_{LY}Y = L \tag{8}$$

$$a_{KX}X + a_{KY}Y = K \tag{9}$$

Since, $\hat{w} = \hat{r} = 0$, gender wage changes do not lead to factor substitution effect, Therefore, we conclude that $\hat{X} = \hat{Y} = 0$.

We say that sector Y is male dominated if the male share of the wages is higher that of sector X (i.e., $\theta_{MX} \equiv (1-\lambda_X)\alpha_X > (1-\lambda_Y)\alpha_Y \equiv \theta_{MY}$). Needless to say that if sector Y is male dominated, it implies that sector X is female dominated. It is also clear that sector X is male dominated if $\lambda_X < \lambda_Y$ given that male-discrimination is uniform across the economy (i.e., $\alpha_X = \alpha_Y = \alpha$).

Now let one sector be male dominated, but let $\alpha_X = \alpha_Y$. Then, equations (3) and (4) change to:

$$\hat{w}_F\theta_{LX} + r\theta_{KX} = -\theta_{LX}\theta_{MX}\hat{\alpha} \tag{10}$$

$$\hat{w}_F\theta_{LY} + r\theta_{KY} = -\theta_{LY}\theta_{MY}\hat{\alpha} \tag{11}$$

By solving the above system of equations for $\hat{w}_f$ and r, we obtain:

$$\hat{w}_F = \frac{r\theta_{LX}\theta_{LY}}{w\Theta}(k_X\theta_{MY} - k_Y\theta_{MX})\hat{\alpha} \tag{12}$$

$$\hat{r} = \frac{\theta_{LX}\theta_{LY}}{\Theta}(\theta_{MX} - \theta_{MY})\hat{\alpha} \tag{13}$$

Hence, we conclude the following proposition directly from equation (12).

Proposition 2 *Sustained gender discrimination results in a decrease in female wages if sector X is capital intensive and female dominated. Moreover, such a increase in discrimination raises female wages if sector Y is capital intensive and and $\theta_{MY} > \frac{k_y}{k_X}\theta_{MX}$.*

That is, gender discrimination depresses female wages,in addition to widening male-female wage gap, if the female dominated sector is also capital intensive. However, despite widening male-female wage gap, female wages also rises if sector Y is sufficiently male dominated (more than a threshold indicated in this proposition).

Proposition 3 *An increase in gender discrimination increases (decreases) the return to capital if i) sector Y is both capital (labor) intensive and female dominated; or ii) sector Y is both labor (capital) intensive and male dominated.*

A number of implications emerge form the above results for an small open economy. Suppose sector Y is the import competing sector and it is labor intensive. Recall that Now, if a tariff is

imposed to protect workers, then capitalist may favor discrimination to dampen the effects of tariffs. Hence, we have the following corollary.

Corollary 1 *Suppose Sector Y is a labor intensive import competing good. If the government imposes a tariff on Y to protect workers, then the capital owners will favor gender discrimination to dampen the effects of this protectionist policy if Y is male dominated. That is, gender discrimination may be a substitute for free trade.*

This is an interesting and somewhat provocative observation. It follows from the celebrated Stolper-Samuelson theorem, whereby a tariff-induced increase in price of Y would benefit workers and hurt capitalists since Y is labor intensive. Now, this theorem combined with Propositions (1) and (2), capitalists (who can be implicitly viewed as firm owners in our setup) can discriminate against female workers to dampen the negative impact of protectionism on themselves if Y is male dominated. This result is in a sense somewhat provocative as it relates free trade with potential motivation for gender discrimination. It points out that two seemingly unrelated socio-economic movements, i.e., gender equality in workforce and protectionism may very well be inter-related. Gender discrimination, viewed from owners of capital, can be a substitute for free trade.

This corollary implies that international trade can easily lead to less discrimination in our framework. When trade reduces return to capital and labor is relatively better off, capitalist may attempt to reduce discrimination if capital intensive sector is also male dominated. It is similar to the effects of the capital intensive sector experiencing technical progress resulting in reduction in labor costs. Thus, in order to mitigate the negative effects of trade on the return to capital, discrimination need to be reduced. This is consistent with the fact that competition may reduce discrimination, albeit through the general equilibrium framework and the effects of any shock that influence return on capital such as trade.

It is clear from our ongoing analysis that in the presence of wage discrimination if one could increase female participation rate the average wage cost will decline. Thus such a regulatory policy, call it affirmative action, will be more efficient by cutting costs of production and thus increasing return to capital. Suppose it could be implemented only in the labor intensive sector, then the return to capital will fall via the well known Stolper-Samuelson proposition. Hence, such a policy will be resented and resisted by the investors. If the same policy is implemented in the capital

intensive sector , investors would welcome such a move. The general equilibrium structure with the possibility that capital may run around for the best possible return drastically modifies the original perspectives of Becker (1957) and Arrow (1973).Though our paper talks about gender discrimination , it is obvious it is applicable wherever there is discrimination of one group vis a vis other independent of the criteria of discrimination. It is equally applicable in such areas provided we can identify similar economic categories as we are dealing with in this paper.

As a final note it is notable that in the short-run, when capital is not mobile, the conventional results will hold, that is, gender discrimination will unambiguously reduce the sector specific return to capital.

3 Conclusion

The economic theory of discrimination, pioneered by Becker (1957), states that forces of competition ultimately eliminate discrimination in the labor market. However, the empirical literature indicates otherwise, that gender discrimination in the labor market has persisted. Our paper develops a theoretical model of discrimination within the general equilibrium framework similar to Jones (1965). We show that competitive market may do nothing to curtail gender discrimination in the labor market. Our results also have interesting implications with regard to trade policy.

We consider an open economy with two goods and two production factors, labor and capital. We conclude an number of interesting results. If a sector is capital intensive and female dominated, gender discrimination depresses economy-wide female wages in addition to widening male-female wage gap. Moreover, we show that gender discrimination increases the return to capital if the capital intensive sector is and female dominated (i.e, labor intensive sector is male dominated).

The implication of our results vis-a-vis international trade policy. It unveils a seemingly unrelated channel and motivation for gender discrimination. Viewing capital owners as owners of firms, a protectionist policy to protect workers may invoke gender discrimination in an economy. In a sense, we showed that gender discrimination can be viewed as a substitute for free trade.

Our theoretical results open a new interesting avenue for empirical research on intersectoral differences in degree of discrimination and hence appropriate policies. Capital owners will have different incentives to support or criticize discrimination. Discrimination may persist along with

competition and rising profits and also can be be contained under similar circumstances. The parameters that will determine such difference must be made transparent.

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