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Abstract

Our paper introduces the dimension of social psychology in a model of efficiency wages and gender diversity. In this context, we show that women earn lower wages than men but provide in return relatively less effort. Therefore in order to increase women's productivity, the firm increases their level of employment. In our efficiency-wage theory, women's lower wages is explained by assuming that efficiency-wages function for women are believed to be different from those of men. This could be the case if the firm believes that women do not react with more effort to higher wages because they are not work career oriented, so it might not be worth it to pay them high wages. In that case, firms would employ more women for the minimum possible wage. This assumption can be based on stereotypes describing about women as more averse to wage competition pressure than men and less career oriented.

Key Words: Gender Diversity, Social Psychology ,Stereotypes, Efficiency Wage Gap.

1.Introduction

According to the canonical model of efficiency wages, there is an increasing causal relationship between the wage paid by firms and the level of effort provided by workers (Akerlof and Yellen, 1986, Katz, 1986).

Therefore ,in equilibrium, firms with an homogenous labor force may find it profitable to pay wage in excess of market clearing. This theory is able to explain a great number of stylized labor markets facts, including real wage rigidity, dual labor markets, and discrimination among observationally distinct groups. Because of the impact of the wage setting on the workers' effort function, profit-maximizing firms are expected to set an optimal wage such that the elasticity of effort function with respect to wage is equal to one. This well-known result of the standard efficiency wage model is due to Solow (1979) and is known as the Solow condition. However, it has been suggested that the Solow condition does not hold in general. This is an important issue, since it casts doubt on the possibility of equilibrium with unemployment in an efficiency wage model. A large number of papers have been proposed in the literature to prove effort-wage elasticity lower or higher than one. Among other papers, Akerlof and Yellen (1986) present a static model with external costs to account for the downside risk from shirking labor. In Schmidt-Sörensen (1990), fixed employment costs per worker are introduced in the profit function. Pisauro (1991) sets out a model with specific taxes on labor. Lin and Lai (1994) show that the Solow condition does not hold in an inter temporal maximizing framework with turnover costs. Marti (1997) and Faria (2000) examine models that combine the shirking and the turnover models of efficiency wage, with the possibility of managerial supervision. The role

of the quality of job matching on efficiency wages is analyzed by Jellal and Zenou (1999). When job matching is unobservable, firms can either set wages such that the effort-wage elasticity is lower or greater than one. Finally, Jellal and Zenou (2000) consider a more general dynamic efficiency wage model with learning by doing, where workers accumulate a stock of knowledge that allows them to increase their effort.

In this paper, we propose a new idea to show that the Solow condition does not hold in general. Indeed, we analyze optimal efficiency wage policy in a labor market with equally productive workers who only differ by gender. The theoretical issue of gender and efficiency wage is not developed in the literature our model aims to fill this gap by extending the canonical efficiency wage theory. Economists have shown growing interest in the consequences of gender diversity of teams. Higher female participation to the labor market has implied changing workplace demographics and more gender-diverse teams.

In all labor markets in the world, we see that women often receive lower wages than men for comparable work and hold less prestigious job positions. Indeed, despite the real improvements, there are still large gender differences on labor markets, such as women lagging behind men with respect to wage levels or opportunities for career advancement. Indeed, one of the most frequently cited studies documenting this stylized fact are that of Bertrand and Hallock (2001) which indicates that woman represent only 2.5% of senior executives of a large sample of American companies. In 1998, the median weekly earnings of women working full time reached only 76% of men (Bowler, 1999).

The traditional approach in labor economics to understanding gender differences in outcomes has discussed demand-side explanations such as discrimination, and supply-side explanations based on the accumulation of human capital and family constraints. Thus, the main factors driving gender differences in the labor market can be categorized into three elements: productivity, discrimination and preferences (Azmat and

Petrongolo, 2014). Mainly, the standard explanation of the gender gap outcomes, argues that women seem to be less competent than men or are discriminated by employers.

A new explanation appears in the recent literature, it relates to the difference gender preferences (Croson and Gneezy, 2009). It is an alternative to supply side explanations for gender gap issue that is associated to social psychological attributes and social preferences. Indeed, Potential differences in preferences and psychological attributes might offer additional insight into gender gaps in participation to the labor market, in the types of jobs held, and in the performance in a given job.

In effect, if women have a lower taste for risk or competition pressure than men or if women put more value on equity and social preferences, they will be less likely candidates for positions characterized by a high level of risk and competition effort. As these positions are precisely those corresponding to higher wages and efforts, this may explain the under representation of women in positions socially valued.

Our paper includes the dimension of social psychology in a model of efficiency wages and gender diversity. We show that women earn lower wages than men but provide in return relatively less effort. Therefore in order to increase women's productivity, the firm increases their level of employment. In our efficiency-wage theory, women's lower wages is explained by assuming that efficiency-wages function for women are different or believed to be different from those of men. This could be the case if the firm believes or assumes wrongly or correctly that women do not react with more effort to higher wages because they are not work career oriented , so it might not be worth it to pay them high wages. In that case, firms would either employ women for the minimum possible wage. This assumptions can be based on stereotypes about women, describing in general men as more work-oriented, and women as more averse to wage competition than men and family-oriented. If the stereotype-based assumptions about female reactions to incentives are

correct, paying women lower wages is rational behavior, however, if the assumptions are not correct, lower wages for women might be economically inefficient (Schwieren, 2003).

Our theoretical findings confirm some results of Schwieren (2003) who presents an experiment which is a combination of efficiency-wage effects with knowledge about common stereotypes of women and men. This experiment is conceptualized to test efficiency-wage theory and then to test whether women get paid less than men in an experimental market, and if this is the case, why. Her findings are striking: female workers receive significantly lower wages than male workers, no matter whether men or women are in the role of the firm. However, this does not pay for the firms, as women's reactions to low wages are equal to those of men: low effort.

The remainder of the paper is organized as follows. In section 2, we present the standard efficiency model. The gender efficiency wages gap is considered in section 3. Concluding comments are in section 4.

2. The Standard Efficiency Wage Model

In the canonical model of efficiency wage (Akerlof and Yellen ,1986) the Solow condition depends on a production function that is labor augmenting in effort $F\big(ne(w)\big)$ where $e(w)$ is the effort function for the workers, w is the level of wage in the representative firm and n is the number of homogenous workers , with the standard assumption of concavity F'(.) > 0, F"(.) < 0 and $e'(w) > 0$, $e"(w) < 0$.

Then without gender issue, the optimal efficiency wage is solution of the following simple optimization:

$$\mathrm{Max}_{n,w}\ \Pi(n,w) = F\big(ne(w)\big) - wn \qquad (1)$$

In this context with an homogeneous labor force and given the effort function and the assumption on the production function, the maximization of the profit function with respect to n and w yields :

$$\frac{\partial \Pi(n,w)}{\partial n} = F_n\big(ne(w)\big) - w = 0 \qquad (2)$$

$$\frac{\partial \Pi(n,w)}{\partial w} = F_e\big(ne(w)\big)ne'(w) - n = 0 \qquad (3)$$

From these equilibrium conditions we obtain the standard Solow condition for an optimal efficiency wage.

PROPOSITION 1:

In labor market with a homogeneous labor force, the optimal value of the efficiency wage is given by the Solow condition: For each worker, the elasticity of effort function with respect to wage is equal to one:

$$\varepsilon(w) = \frac{w}{e}\frac{e'(w)}{e(w)} = 1$$

Proof:

It is standard, then omitted.

2. Gender Psychology and Efficiency Wage

In the standard literature of efficiency wage, the effort of each worker is unobservable but the aggregate effort is observable. It is indeed difficult to estimate the quality of the work, the degree of motivation. In this case, the employer has to rely on his pecuniary compensation (the wage) to motivate workers. The main result is that in the standard model the effort–wage elasticity is equal to one. In this canonical model, the effort

function depends only on pecuniary compensations and not on other factors that may affect productivity. We believe that this does not capture the entire story (Jellal and Zenou, 1999). Indeed, several studies have emphasized the fact that motivation and thus effort are strongly affected not only by wages, but also by non-pecuniary aspects of the job. Economists are often accused by sociologists and industrial psychologists of being too narrow in their focusing exclusively on monetary variables ignoring the perhaps more important psychological ones.

This leads us to extend the standard efficiency wage to take into account the impact of gender diversity. In particular we assume that that efficiency-wages function for women are different or believed to be different from those of men. This could be the case if the firm believes wrongly or correctly that women do not react with more effort to higher wages because they are not work career oriented and are more averse to competition.

In order to capture this idea, we focus on the micro-foundations of the female worker's effort function. It may be related to the general insights of the cognitive theories of equity of J. Adams and his successors, the so called Equity Theory. Clearly, the notion of comparison is at the center of these theories, the comparison with the others in the first case, and the comparison with the market in the second case. The wages equity theory of Adams (1964) is an application of the cognitive dissonance theory developed by Festinger (1957).Indeed, to avoid cognitive dissonance, individuals (workers) modify their behavior a situation deemed unfair. This results in a modification of the effort of the employee in order s to restore psychologically the situation fair.

Therefore we can suppose that the disutility (or cost) of effort e_f is affected directly by the worry about the consequences of wage comparison $(w_f - w_m)$and competition. Indeed, if the female workers feel that their wage w_f is unfair, and given their limited attention, each proved effort may be more costly. One simple way to model this situation is as follows. The representative female worker has an utility function given by:

$$V = w_f e_f - \Psi\left(e_f + \alpha\left(w_f - w_m\right)\right) \qquad (4)$$

Where $w_f e_f$ is income-wage (or consumption) and $\Psi\left(e_f + \alpha\left(w_f - w_m\right)\right)$ is the global disutility of effort where the additional term denotes the weight function of worrying about the wage competition aversion induced by the relative difference $\left(w_f - w_m\right)$ where w_m is the male workers. . Higher is $0 \leq \alpha \leq 1$ higher is this aversion.

We suppose $\Psi(.)$ convex function with $\Psi' > 0$ and $\Psi'' > 0$, hence we have :

$$\frac{\partial^2 \Psi}{\partial e_f \partial\left(\alpha\left(w_f - w_m\right)\right)} > 0$$

meaning that that each effort is more costly in presence of subjective feeling of wage competition pressure. In order to obtain a simple characterization of female worker behavior, we specify the disutility function as follows:

$$\Psi\left(e_f + \alpha\left(w_f - w_m\right)\right) = \frac{1}{2}\left(e_f + \alpha\left(w_f - w_m\right)\right)^2$$

Therefore, since all female workers are assumed to be identical, the optimal female worker is given by:

$$V'(e_f) = w_f - \Psi'\left(e_f + \alpha\left(w_f - w_m\right)\right) = 0 \qquad (5)$$

This equilibrium condition gives us the following aggregate women effort:

$$e_f = w_f - \alpha\left(w_f - w_m\right) = (1-\alpha)w_f + \alpha w_m \qquad (6)$$

LEMMA 1:

Under wage competition aversion, the characterization of female effort function is given by: $e_f = w_f - \alpha\left(w_f - w_m\right) = (1-\alpha)w_f + \alpha w_m$

We observe that both pecuniary compensation w_f and non pecuniary attributes of the job α affect the female workers. We include this insight into a more general efficiency wage model with gender diversity.

The setting of our model considers an industry of identical firms with equally productive workers who only differ by gender. Effective labor is the only input in a separate production system that is labor augmenting in efforts and representative firm's profit in each period depend on the global output produced minus labor costs:

$$\Pi = F\left(e_f\left(\tilde{w}_f\right)n_f\right) + F(e_m(w_m)n_m) - w_f n_f - w_m n_m \qquad (7)$$

With $Q_f = F\left(L_f\right)$ and $L_f = e_f\left(\tilde{w}_f\right)n_f$

$Q_m = F(L_m)$ and $L_m = e_m(w_m)n_m$

Where $Q_f = F\left(e_f\left(\tilde{w}_f\right)n_f\right)$ and $Q_m = F(e_m(w_m)n_m)$ are the outputs of female and male workers, n_f and n_m are the female and male workers and

$e_f(\widetilde{w}_f)$ and $e_m(w_m)$ are the wage effort functions of each group of workers.

Hence, the optimization program for the representative firm is :

$$\max_{n,w} \Pi(n,w) = \Pi = F\left(e_f(\widetilde{w}_f)n_f\right) + F(e_m(w_m)n_m) - w_f n_f - w_m n_m$$

Sc: $$e_f(\widetilde{w}_f) = e\left((1-\alpha)w_f + \alpha w_m\right) \quad (8)$$

In this context of gender diversity, given the effort functions of labor force and the assumption on the system of production, the maximization of the profit function with respect to $n = (n_f, n_m)$ and $w = (w_f, w_m)$ yields :

$$\frac{\partial \Pi(n,w)}{\partial n_f} = F'(L_f)e_f(\widetilde{w}_f) - w_f = 0 \quad (9)$$

$$\frac{\partial \Pi(n,w)}{\partial w_f} = F'(L_f)e'_f(\widetilde{w}_f)(1-\alpha) - 1 = 0 \quad (10)$$

$$\frac{\partial \Pi(n,w)}{\partial n_m} = F'(L_m)e_m(w_m) - w_m = 0 \quad (11)$$

$$\frac{\partial \Pi(n,w)}{\partial w_m} = F'(L_m)e'_m(w_m)n_m + \alpha n_f F'(L_f)e'_f(\widetilde{w}_f) - n_m = 0 \quad (12)$$

From these equilibrium conditions, we obtain our main finding is given by the following result.

PROPOSITION 2:

In labor market with gender diversity, the optimal efficiency wages for women and men are given by the following generalized Solow conditions:

$$\varepsilon(\widetilde{w}_f) = 1 + \frac{\alpha}{(1-\alpha)}\frac{w_m}{w_f} \quad \text{and} \quad \varepsilon(w_m) = 1 - \frac{\alpha}{(1-\alpha)}\frac{n_m}{n_f}$$

Proof :

From (9)-(10), we have:

$$F'(L_f)e_f(\widetilde{w}_f) = w_f \text{ and } F'(L_f)e'_f(\widetilde{w}_f)(1-\alpha) = 1$$

and after some manipulations, we obtain the following equality:

$$\varepsilon(\widetilde{w}_f) = \widetilde{w}_f \frac{e'(\widetilde{w}_f)}{e(\widetilde{w}_f)} = \frac{\widetilde{w}_f}{(1-\alpha)w_f} = \frac{(1-\alpha)w_f + \alpha w_m}{(1-\alpha)w_f}$$

We finally deduce that the optimal efficiency wage for the female works is such that: $\varepsilon(\widetilde{w}_f) = 1 + \frac{\alpha}{(1-\alpha)}\frac{w_m}{w_f}$

From (11)-(12) we have the following equality:

$$F'(L_m)w_m e'_m(w_m)n_m + \alpha w_m n_f F'(L_f)e'_f(\widetilde{w}_f) = F'(L_m)e_m(w_m)n_m$$

From which we obtain:

$$w_m \frac{e'(w_m)}{e(w_m)} = 1 - \frac{\alpha w_m n_f F'(L_f)e'_f(\widetilde{w}_f)}{F'(L_m)e_m(w_m)n_m}$$

Since $F'(L_m)e_m(w_m) = w_m$ and $F'(L_f)e'_f(\widetilde{w}_f)(1-\alpha) = 1$ we obtain the condition for the optimal male workers efficiency wage which is given by:

$$w_m \frac{e'(w_m)}{e(w_m)} = \varepsilon(w_m) = 1 - \frac{\alpha}{(1-\alpha)}\frac{n_m}{n_f}$$

Q.E.D.

These results show us that the consideration of the social preferences of women workers has fundamentally changed the conditions characterizing the salaries of women and men. Hence the wage gap is mainly determined by preferences.

COROLLARY 1:

The wage of male workers is higher than the wage of the female workers:

$$w_m > w_f$$

Proof:

The generalized Solow equilibrium conditions are given by:

$$\varepsilon(\tilde{w}_f) = 1 + \frac{\alpha}{(1-\alpha)}\frac{w_m}{w_f} \qquad \text{and} \qquad \varepsilon(w_m) = 1 - \frac{\alpha}{(1-\alpha)}\frac{n_m}{n_f}$$

With $\varepsilon'(w_i)<0 \quad \forall i = f, m$ we deduce that $\tilde{w}_f = (1-\alpha)w_f + \alpha w_m < w_m$ and we obtain therefore our announcer result $w_m > w_f$.

Q.E.D

We observe that in a labor market model with workers who only differ by gender, the effort-wage elasticity function depends on the identity of workers. Indeed, the Solow condition is lower than one for male workers and greater than one for female workers.

We can finally interpret this result. When the effort-wage elasticity function $\varepsilon(w_m) = 1 - \frac{\alpha}{(1-\alpha)}\frac{n_m}{n_f}$ is very small, a low level of male workers is expected to be chosen by the representative firm and it is in the interest of the firm to set a high male wage value. Conversely, when the value of $\varepsilon(\tilde{w}_f) = 1 + \frac{\alpha}{(1-\alpha)}\frac{w_m}{w_f}$ is quite large this means that the female workers production function is not really sensitive to the women's level of effort which leads to a large size of female employment. Indeed, more female labor is needed in the firm and the level of wage is set at a low value. Clearly, in that case, it is useless to provide incentives for female workers to work hard.

4. Conclusion

Our paper introduced the dimension of social psychology in a model of efficiency wages and gender diversity. We have shown that women earn lower wages than men but provide in return relatively less effort. Therefore in order to increase women's productivity, the firm increases their level of employment. In our efficiency-wage theory, women's lower wages is explained by assuming that efficiency-wages function for women are believed to be different from those of men. This could be the case if the firm believes that women do not react with more effort to higher wages because they are not work career oriented , so it might not be worth it to pay them high wages. In that case, firms would employ more women for the minimum possible wage. This assumptions can be based on stereotypes about women, describing in general men as more work-oriented, and women as more averse to wage competition than men and family-oriented. If the stereotype-based assumptions about female reactions to incentives are not correct, paying women lower wages might be economically inefficient.

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