MALE-FEMALE WAGE DIFFERENTIALS IN JOB LADDERS

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Abstract

Much of the male-female wage differential exists because men and women are assigned to different jobs. Within narrow job categories, there is no male-female differential. Only a tortured taste theory of discrimination can reconcile these facts. Instead, we argue that differential movement along job ladders entails comparative advantage, so the ability standard for promotion is higher for women than for men. This implies that more able women will be passed over in favor of less able men. Women, assumed to have the same ability distribution as men, earn less. The differential reflects females' lower promotion probability, not a within-job discrimination.

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Extensive empirical research in the past two decades has found that much of the average difference in pay between men and women is attributable to the fact that women are less likely to be found on higher paying jobs (see Blau and Ferber [1987a, 1987b] and Cain [1986] for reviews and summaries of recent evidence and Goldin [1987] for historical evidence). Furthermore, the relative contribution of between-job components of variance to the aggregate wage differential increases as jobs are classified into finer and more disaggregated categories. For these categories, differences in wages between men and women found on the same type of job are quite small. For example, much of the data supplied by firms in job discrimination litigation appears to show that women have smaller probabilities of promotion into high paying jobs than men of similar characteristics; but if job is "held constant," then men and women earn roughly similar wages. These findings were anticipated many years ago by Edgeworth (1922) but have been difficult to incorporate into the main economic theory of discrimination based on taste factors alone (see Becker [1957]). It is indeed possible to imagine a pure taste explanation along the lines of the theory of discrimination between complementary factors, but such an interpretation seems strained. A more compelling explanation for sex differences in observed occupational choices rests on the connection between marginal returns to human capital investment and subsequent expected labor force participation stressed by Mincer and Polachek [1974] and Polachek [1981]. Indeed, Cox [1984], Mincer and Ofek [1982], Corcoran and Duncan [1979] and others have established close connections between career interruptions and earnings growth for women. This paper extends those ideas to firm-specific human capital investments as implemented by job assignments and life-cycle progression and promotion in a firm's job ladder.

In the usual supply-based theory of wage determination there is little room or indeed little need for the concept of "job." It is sufficient to maintain the hypothesis that a person's wage is uniquely and monotonically related to a vector of endowed and acquired worker characteristics. Even Occupation and Industry are not part of that theory (though see Sicherman [1987] for a study of wage growth and occupational mobility) and are included in earnings regressions mainly to reduce residual variance. Yet workers <u>are</u> categorized into jobs and the amount of wage growth associated with a year of experience is likely to depend on whether or not a job switch occurred in that year. A familiar example is the General Service (GS) wage schedule in federal government employment, where jobs are categorized by grades and steps (Borjas [1978]). Relatively small wage changes across steps maintain normal wage growth with experience within grades, but job changes accompanied by changes in grade usually result in much larger changes in wages and status. Use of such scales is ubiquitous in large establishments throughout the economy.

In this paper we think of a job as a set of technological opportunities. More productive jobs coexist with less productive jobs because good jobs carry costs in terms of set-up and internal training requirements. The job assignment decision comes down to comparing expected marginal product on that job with its marginal cost. Promotion choices hinge on two factors. First, the worker's ability is important because it is efficient to sort the most able workers to the most productive jobs. Second, the worker's propensity to remain on the job is important because any firm-specific learning is lost when a worker leaves the firm. These considerations are then applied to analyze male/female wage differences. Specifically, we analyze a market where women of equal ability have a lower probability of promotion than men, but where women and men are treated similarly within the same job. Women are assumed to have the same distribution of labor market ability as men but to have superior ability in non-market activities (see especially Gronau [1973a, 1973b]). The higher expected value of home time induces a higher probability of separation for women; and the privately optimal and socially efficient response is to require higher threshold levels of ability for promotion by females. The irony is that women, who are assumed to be as able as men in the labor market, and better elsewhere, end up earning less than men. Their overall "compensation" is higher, however, once the value of non-market time is included.

The most important results are:

1. A woman must have greater ability than a man to be promoted. Some women are denied a promotion that goes to a lower ability man.
2. Female wages are lower because they are less than proportionately represented on higher paying jobs. Within jobs, men and women are compensated according to the same formula.
3. Differential promotion rates imply that women receive lower average lifetime wages than men. The differential is exactly equalizing, so that employers are gender blind at the hiring stage even though men receive preferential treatment at promotion.
4. Promotion rates should differ less by gender at very high levels of ability than at middle or low levels of ability.

The next section analyzes the economic issues connected with job assignments in a two-job ladder. Section II discusses various market equilibrium wage and promotion policies that implement efficient job assignments. These policies and institutions are compared in section III. The paper concludes with a brief consideration of other theories in section IV.

I. A Model of Jobs

The timing of decisions is essential to the model. Three periods are necessary to capture two phenomena. There must be an initial period during which individuals are reviewed so that promotion or job change has some meaning. After the new job is acquired in period 2, there must be an additional period in which the learning that occurs in the new job can be lost stochastically if a separation occurs at the beginning of period 3.

The technology is specified as simply as possible. Each worker is endowed with an ability level, δ. After one period of work the worker's δ is perfectly revealed to everyone. There are two jobs, A, and B. Job A is more productive than B in period 3, for all levels of ability. All employees work for certain in periods 1 and 2, but remain with the firm in period 3 if and only if the third period wage exceeds the value of the non-market alternative. Quits are initiated at the beginning of period 3, after the promotion decision has been made.

Output is given as

(1) $q_1 = \delta$

$q_2^B = \delta$

$q_3^B = \delta$

$q_2^A = \delta\gamma_2$

$$q_3^A = \delta\gamma_3$$

where γ_2, γ_3 are exogenously given parameters with $\gamma_2 < 1 < \gamma_3$. The fact that $\gamma_2 < \gamma_3$ implies learning in job A. No learning occurs in job B. And since $\gamma_2 < 1$ there is an investment cost to assigning a worker to job A: higher productivity in period 3 comes at the expense of low productivity in period 2. In order to enjoy γ_3 in period 3, the worker must be trained in job A in period 2.

The assumption that $\gamma_2 < \gamma_3$ in job A, whereas the value of work in B is independent of having worked in that job for the previous period, implies that there is a larger cost of losing a worker on job A than on job B. This drives the later result that women must meet higher standards for promotion than men. But the assumption does not seem unreasonable. Learning is more important the more complex the task, and complex jobs are often more productive than routine and less complicated jobs.

Workers are certain to work in periods 1 and 2, but they work in period 3 only if their wage that period exceeds the non-market alternative value of time, ω, which is a random variable, revealed to worker and firm alike only at the start of period 3. The key difference between men and women is that the distribution function of ω for men, $F_m(\omega)$, is stochastically dominated by the distribution for women, $F_f(\omega)$. That is, $F_m(\omega) > F_f(\omega)$ for $\omega > 0$. Women have outside opportunities that are on average better than those for men.

A competitive firm chooses a job assignment rule and pay scale that maximizes worker utility subject to a profit constraint. After all, the firm can do no better than to replicate the socially efficient allocation of resources since there are no externalities in this problem. That amounts to making three choices. First, it must announce a wage for period 3 to ensure that work occurs only when its market value exceeds the alternative use of time. Second, the firm must promote efficiently. Third, it must announce wage scales in periods 1, 2 and 3 that attract workers.

The problem of achieving efficient separation is easy to solve: the firm just sets wages equal to personal output in period three. A worker in the A job receives $W_3^A = \delta\gamma_3$ and a worker in the B job receives $W_3^B = \delta$. Then the A worker stays if $\omega < W_3^A = \delta\gamma^3$. This is the efficiency criterion that resources move to their highest valued use. Similarly, the B stays if $\omega < W_3^B = \delta$, also efficient.

The second problem involves the firm's decision of whether or not to promote a given worker in period 2. The socially efficient (and privately optimal) choice in this model is to promote workers with higher ability. Formally, there exists some threshold ability level δ^* such that workers with $\delta > \delta^*$ are assigned to the A job and those with $\delta < \delta^*$ are assigned to the B job. The derivation follows:

Ignoring discounting for simplicity, a worker with ability δ who is assigned to A in period 2 has expected lifetime <u>social</u> output

$$\delta + \gamma_2\delta + \gamma_3\delta\int_0^{\gamma_3\delta} dF + \int_{\gamma_3\delta}^{\infty} \omega dF$$

where F is the distribution of ω. The worker stays with the firm in period 3 if $\omega < \gamma_3\delta$, where $\gamma_3\delta$ is perfectly observed from period 2 on.

The same worker has expected <u>social</u> output in B of

$$\delta + \delta + \delta \int_0^\delta dF + \int_\delta^\infty \omega dF.$$

The difference between the two, $D(\delta)$, is then

$$(2)\ D(\delta) = -\delta(1-\gamma_2) + \gamma_3\delta\, F(\gamma_3\delta) - \delta F(\delta) + \int_{\gamma_3\delta}^\infty \omega dF - \int_\delta^\infty \omega dF \quad .$$

Rearranging terms and integrating by parts, (2) may be written as

$$(3)\ D(\delta) = -\delta(1-\gamma_2) + \int_\delta^{\delta\gamma_3} F(\omega)d\omega \quad .$$

The worker should be promoted or not according to $D \gtrless 0$. We are able to show the following properties of $D(\delta)$. First, (3) implies that $D(\delta) \geq 0$ if $\gamma_2 = 1$. It always pays, independent of δ, to assign the worker to job A when there is no cost to doing so. The cost of job A is that output in period 2 is below δ, but if $\gamma_2 = 1$, no output is foregone.

Second, $D(\delta)$ is increasing in γ_3. At the lowest extreme, when $\gamma_3 = 1$, it never pays to promote to A because $D(\delta) < 0$ and there is no payoff.

Third, $D(0) = 0$ and

$$\lim_{\delta\to\infty} D(\delta) = \lim_{\delta\to\infty} \delta[-(1-\gamma_2) + (\gamma_3-1)] = \infty.$$

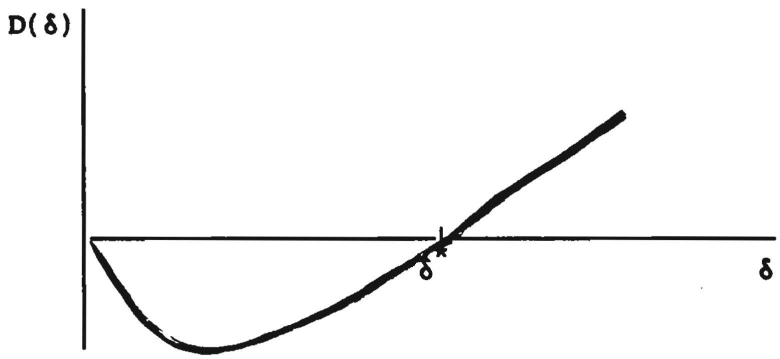
For the A job to be socially productive, it must be that what is sacrificed in period 2 is smaller than what is gained in period 1, or $1-\gamma_2 < \gamma_3-1$. Thus, there exists a δ sufficiently large that it pays to promote.

Fourth,

$$(4) \qquad D'(\delta) = -(1-\gamma_2) + \gamma_3 F(\gamma_3\delta) - F(\delta) \quad .$$

For $\delta = 0$, $D' = -(1-\gamma_2) < 0$. Coupled with $D(0) = 0$, this implies there are values of δ sufficiently low so that it does not pay to promote. By continuity of $D(\delta)$, this implies that there exists δ^* such that $D(\delta^*) = 0$. Fig. 1 shows $D(\delta)$.[1]

Figure 1



Since $D(\delta) \gtrless 0$ as $\delta \gtrless \delta^*$, it is socially efficient to promote workers with ability larger than δ^*. High ability workers have a comparative advantage in the good job because ability and job productivity are assumed to be complements.

The situation is more complex when workers have different distributions of alternatives in period 3. Consider the choice between promoting a man or woman. Now it is no longer true that the socially efficient rule is to promote the person with the highest ability. Even though the <u>realization</u> of ω is unknown at the time the promotion decision is made, the distributions of alternatives, $F_m(\omega)$ and $F_f(\omega)$, are known. As before, the efficient promotion rule is the one that maximizes expected lifetime social output. The result is that the threshold ability standard for promoting a woman is higher than that for a man. Some men are promoted when more able women are denied the good job.

The proof follows: From (3), the cutoff ability δ^* is defined by

$$(5)\qquad \delta^*(1-\gamma_2) = \int_{\delta^*}^{\delta^*\gamma_3} F(\omega)d\omega \quad .$$

If F shifts, δ^* changes as well. Write $F(\omega;\alpha)$ where α is a shifter. Since women have better alternative opportunities, define $F_m(\omega) \equiv F(\omega;\alpha_m)$ and $F_f(\omega) \equiv F(\omega;\alpha_f)$ where $\frac{\partial F}{\partial \alpha} > 0$ and $\alpha_m > \alpha_f$. Differentiate (5) with respect to α :

$$\frac{\partial \delta^*}{\partial \alpha}(1-\gamma_2) = \int_{\delta^*}^{\delta^*\gamma_3} \frac{\partial F}{\partial \alpha} d\omega + \left[\gamma_3 F(\gamma_3\delta^*) - F(\delta^*)\right] \frac{\partial \delta^*}{\partial \alpha}$$

and using the definition of $D'(\delta)$, in (4),

$$(6)\qquad -D'(\delta^*)\frac{\partial \delta^*}{\partial \alpha} = \int_{\delta^*}^{\delta^*\gamma_3} \frac{\partial F}{\partial \alpha} d\omega \quad .$$

The r.h.s. of (6) is positive because $\frac{\partial F}{\partial \alpha} > 0$ by definition. Inspection of figure 1 reveals that $D'(\delta^*)$ must be positive, therefore $\frac{\partial \delta^*}{\partial \alpha} < 0$ and higher α's result in lower δ^*. Men have higher values of α than women so $\delta_m^* < \delta_f^*$. |||

This result implies that there are women with δ such that $\delta_m^* < \delta < \delta_f^*$

who are not promoted, even though they have greater ability than men who are promoted. This is a surprising and important result and deserves some discussion. The derivation of the condition that $\delta_f^* > \delta_m^*$ shows that it is socially efficient to promote men over women of equal ability under the postulated conditions. Women have better outside opportunities, and are therefore more likely to leave the firm in period 3 ceteris paribus. Since the social cost of a departure is greater for the individual in job A than the one in B, given ability, males are given a certain kind of preference in promotions. To be promoted, a woman must be somewhat better than a man in order to compensate for her higher ex ante probability of departure and the social loss of the investment. The more likely she is to leave (relative to the male), the larger must be the compensating ability differential. Stated alternatively, women have a comparative (and absolute) advantage in the non-market sector and the efficient promotion rule encourages them to go there. However, as the ability at work gets sufficiently high, the required ability differential gets smaller.[2] Then both males and females are sure to work because their values at work are certain to exceed their alternatives. Males and females of very high market abilities are identical and are promoted similarly. The promotion probabilities are the same for high ability males and females if the underlying distributions of ability are gender neutral.

II. The Labor Market

This section considers alternative labor market institutions and wage policies that implement the efficient promotion rule. Although the previous analysis was done in terms of a social planner, a firm offering a three period contract in a competitive market also has to select the efficient promotion rule through the forces of competition.

1. Segregated Firms

Firms that segregate by sex have little difficulty implementing the scheme that the social planner designed in the previous section. Only three prices are necessary. The firm offers one wage, say, W_2 in period 2, to all workers that equals the expected value of output over the first two periods, given that efficient promotion occurs in period 2. (Offering a wage in period 1 as well is possible but redundant.) In period 3, wages are simply conditioned on observed output. This implements the efficient separation condition. Specifically, A's receive $\gamma_3\delta$ and B's receive δ, and leave only when it is efficient to do so. This wage policy also ensures that no profit is left for the firm from period 3 output, and since the firm pays wages in period 2 equal to the first two periods' expected output, the firm is left with zero profit on average. No other firm can offer more to a worker.[3]

2. Integrated Firms

The situation is more complicated if firms are integrated. We define integration to mean that the same wage structure, but not necessarily the same promotion criterion, applies to all workers. Of course, it would be possible to have an integrated firm that is de facto segregated, offering women a different set of wages and promotion rates than men. But formally, that is equivalent to housing two segregated firms under the same roof and the discussion of the last paragraph applies. After analyzing the integrated firm, we compare the choice between the two organizational structures.

It is now necessary (and sufficient) to allow for two wages in period 2 as well as two wages in period 3. (Again, it is unnecessary to pay any wages in period 1.) Firms must offer both men and women their expected output when they sign on in period 1 and must ensure that efficient separation occurs in period 3. Efficient separation implies that wages in period 3 are equal to output, exactly, as in the case of a segregated firm:

$$W_3^A = \gamma_3 \delta \qquad \text{for A's}$$

and

$$W_3^B = \delta \qquad \text{for B's.}$$

Since workers are paid their output in period 3, the zero profit condition means that W_2^A and W_2^B must be chosen so that zero expected profits are earned on men and women alike over the first two periods. For men this condition is

$$\text{(7a)} \qquad \int_{\delta_m^*}^{\infty} (W_2^A - \gamma_2 \delta) g(\delta) d\delta + \int_{0}^{\delta_m^*} (W_2^B - \delta) g(\delta) d\delta - E(\delta) = 0$$

where $g(\delta)$ is the density of ability in the population, assumed the same for men and women. The corresponding condition for women is:

$$(7b) \qquad \int_{\delta_f^*}^{\infty} (W_2^A - \gamma_2 \delta) g(\delta) d\delta + \int_{0}^{\delta_f^*} (W_2^B - \delta) g(\delta) d\delta - E(\delta) = 0 \quad .$$

These two equations define a unique solution for the two unknown wages. Note that as the model has been structured, the wages paid in period 2 have no allocative effect. They serve merely as rent distributors. Equations (7a) and (7b) are distinct because men and women have different efficient ability cutoffs for promotion, ($\delta_m^* \neq \delta_f^*$) for efficient promotion. Furthermore, men and women have different expected outputs in period 2 because men are more likely to be promoted and the A job is less productive in period 2 than the B job ($\gamma_2 < 1$). Finally, since men have a larger probability of being in A than women, and since $\delta_f^* > \delta_m^*$, it follows that $W_2^A < W_2^B$ is easily seen from combining and rewriting (7a) and (7b) as (8):

$$(8) \qquad \int_{\delta_m^*}^{\delta_f^*} (W_2^A - \gamma_2 \delta) g(\delta) d\delta = \int_{\delta_m^*}^{\delta_f^*} (W_2^B - \delta) g(\delta) dG \quad .$$

$W_2^A < W_2^B$ is necessary for the equality in (8) because $\gamma_2 < 1$.

3. Wage Structures

Let us now compare a segregated firm to an integrated firm. The first question involves choice of segregation or integration. To understand the issue, recall that in the segregated firm, only one wage is paid to all workers in period 2, irrespective of job. Only one wage is necessary because the wage in period 2 is simply a rent transfer parameter. Only period 3 wages have allocative effects. There are no allocative consequences of the period 2 wage because workers are not permitted to choose jobs. Rather, they are efficiently assigned to them. All workers assigned to B have ex post regret. Everyone prefers to be selected for the A job because the period 2 wage is independent of job and the period 3 wage is always higher (by a factor of γ_3) in the A job. But ex ante they prefer the firm to use the correct (efficient) selection rule because that rule maximizes lifetime wealth and workers are identical ex ante.

An alternative to assigning workers directly to jobs in the segregated firm is to set up an efficient internal market and to allow workers to choose the jobs they prefer. This requires the firm to offer two wages in period 2 but the same two efficient wage schedules in period 3. If A's are paid W_2^A and B's are paid W_2^B in period 2, W_2^A can be set low enough to induce workers to choose A only when it is efficient for them to do so. At the correct prices, only those whose ability exceeds δ^* choose the A job. Since the difference $W_2^A - W_2^B$ alone affects their choice, the wage levels can be adjusted at a given spread to ensure the zero profit condition. A proof follows:

Consider a worker's job decision in period 2. If job A is chosen after observing δ, expected income over periods 2 and 3 is

$$W_2^A + \gamma_3\delta F(\gamma_3\delta) + \int_{\gamma_3\delta}^{\infty} \omega f(\omega)d\omega \quad .$$

If job B is chosen expected income is

$$W_2^B + \delta F(\delta) + \int_{\delta}^{\infty} \omega f(\omega)d\omega \quad .$$

Job A is chosen when the difference is positive, or (after integration by parts) when

$$(9) \qquad W_2^A - W_2^B + \int_{\delta}^{\gamma_3\delta} F(\omega)d\omega \equiv \Delta > 0 \quad .$$

But, $\frac{\partial\Delta}{\partial\alpha} = \gamma_3 \; F(\gamma_3\delta) - F(\delta) > 0$ so any wage spread that results in achoice of A by an individual with ability δ_0 also results in the same choice by all workers for whom $\delta > \delta_0$. Consequently, the wage spread that induces workers to choose efficiently is the one that makes the individual with ability δ^* indifferent between A and B. Then all with $\delta > \delta^*$ choose A and all with $\delta < \delta^*$ choose B. Substituting optimality condition (5) into (9) yields the efficient market wage differential.

$$(10) \qquad W_2^A - W_2^B = -(1-\gamma_2)\delta^* \quad .$$

Finally, zero profit is achieved without affecting job choice by adjusting the levels of W_2^A and W_2^B while maintaining the equilibrium difference in (10).

The period 2 wage spread that accomplishes efficient job choice for men is smaller than the one that does it for women because $\delta_m^* < \delta_f^*$. Thus, the free choice wage structures must be different in segregated male and segregated female firms. Now consider an integrated firm. If workers are allowed to choose jobs, it is necessary to have different wages for men and women in period 2 because the same spread cannot induce both men and women to choose efficiently. Thus, if wages are not gender specific, workers must be assigned by the firm and any convex combination of the optimal spreads for men and for women results in some members of each sex being unhappy ex post. If $W_2^B - W_2^A$ exceeds the optimum for men, some men who should be in the A job prefer not to be promoted. These are men whose ability exceeds δ_m^*, but whose ability falls short of the level necessary for them to freely choose job A at the quoted spread. Some men must be forced into promotions that they do not want to achieve efficient assignments.

Conversely, if $W_2^B - W_2^A$ falls short of the optimum for women, some women who would like to be promoted should not be. In this case women are not penalized enough (relative to the optimal spread) for taking job A, and women with ability lower than δ_f^* desire promotion. Some women must be denied promotions that they would like to have. What makes the denial even more surprising is that women who are denied promotion have higher ability than men who are forced into the promotion against their will, and also higher than some men who would choose the job voluntarily.

Gender-specific wages offer a way around this kind of "discrimination" in promotion. But then differential treatment at promotion is replaced by differential salary treatment within the same job. Both practices are obvious violations of Title VII of the Civil Rights Act of 1964. Both practices can be socially efficient.

4. Lifetime Output and Lifetime Wages

Let us return to the integrated firm that pays gender-neutral wages and assigns workers efficiently. It is necessarily the case that at the initial time of hiring, the expected lifetime market output of men exceeds that of a woman.[4] The proof of this proposition is as follows:

The expected total output in the firm of an efficiently assigned worker of gender i at the time of hire is

$$(11) \qquad Q_i = E(\delta) + \int_0^{\delta_i^*} \delta dG + \int_{\delta_i^*}^{\infty} \gamma_2 \delta dG + \int_{\delta_i^*}^{\infty}\int_0^{\gamma_3\delta} \gamma_3 \delta dF_i dG + \int_0^{\delta_i^*}\int_0^{\delta} \delta dF_i dG \quad .$$

Straightforward but tedious calculations yield the following expression for $Q_m - Q_f$:

$$(12) \qquad Q_m - Q_f = \int_{\delta_m^*}^{\delta_f^*} \delta[(\gamma_2-1) + (\gamma_3-1)F_m(\delta)]dG$$

$$+ \int_{\delta_m^*}^{\delta_f^*} \delta\Big[\gamma_3\Big(F_m(\delta\gamma_3)-F_m(\delta)\Big)+F_m(\delta)-F_f(\delta)\Big]dG$$

$$+ \int_{\delta_f^*}^{\infty} \gamma_3\delta[F_m(\gamma_3\delta)-F_f(\gamma_3\delta)]dG + \int_0^{\delta_m^*} \delta[F_m(\delta)-F_f(\delta)]dG$$

The second, third and fourth integrals in expression (12) are all positive by the stochastic dominance condition that $F_m(\delta) > F_f(\delta)$ for all $\delta > 0$.

Therefore a sufficient condition for $Q_m > Q_f$ is that the first integral be positive as well. But that follows from the conditions for efficient assignment. Consider a person with ability at the threshold for males. The net return for such a person in job A is $\gamma_2\delta_m^* + \gamma_3\delta_m^* F_m(\delta_m^*)$, where output $\gamma_3\delta_m^*$ in period 3 is multiplied by the probability of working in that period, $F_m(\delta_m^*)$. The corresponding expression for job B is $\delta_m^* + \delta_m^* F_m(\delta_m^*)$. Hence the integrand in the first integral in (12) is the difference in expected output in job A over job B. This difference is zero for a person at the cutoff ability and is strictly positive for people of ability greater than δ_m^*. Since the integral covers a subset of people with $\delta > \delta_m^*$, it must be positive. Otherwise the assignment would not be optimal. |||

Expected lifetime wages must be larger for men than for women as well, because the zero profit constraint implies that all net output is paid to workers. Gender is observable at the time of hire, so women are paid Q_f and men are paid Q_m over their lifetimes.

This result is superficially paradoxical. The distribution of ability, δ, is assumed to be the same for men as for women and yet women end up earning less over their lifetimes. But though expected earnings are smaller for females, total utility is larger. Women earn less on the job, but they produce larger alternative value on average when they leave the job. The sum of expected earnings, conditional on work, plus the alternative use of time when work does not occur, is unambiguously larger for women than for men.

This last proposition follows trivially from the assumption that women have the same ability at work and more ability elsewhere. Women could be guaranteed as much utility as men, simply by setting up a segregated firm that selects $\delta_f^* = \delta_m^*$. Wages could be set to induce women to work in period

3 when any male with corresponding ability δ would also choose to work in period 3. But the fact that women have higher alternatives means that there are some situations where leaving the job and labor market makes them even better off. Thus, women have higher expected utility.

III. The Choice Between Integrated and Segregated Wage and Employment Structures

All three forms of organization discussed above produce the same social allocation of resources. Segregation or integration with one wage spread and no worker choice over promotion, and integration with worker choice and gender-specific wages, all result in exactly the same individuals being promoted. They do have different empirical implications, however.

For example, gender-specific wages imply that men and women receive different wages within jobs. The average wage paid to men is higher and the spread between wages on the two jobs is lower for men. If gender-specific wages are not paid, then the average observed wage in the A job is higher for women than for men. Wages in period 2 are the same for men and women, and since wages equal output in period 3, women receive higher wages in period 3 than men because their promotion standard is higher. The same argument applies to the B job. Wages are the same in period 2 for men and women, but average wages paid in period 3 are higher because the ability cutoff is higher for women. Average observed ability is higher for women than men in both A and B jobs.

As the model has been presented, there is no clear reason why one scheme dominates. Segregation, gender-specific wages, and integrated firms with gender-neutral wages and gender-specific promotion policies all can be economically efficient. Other considerations must affect the choice between gender-specific wages and gender-neutral wages in an integrated firm.

The role of gender-specific wages is to induce individuals to choose voluntarily the right job. Without separate wages for the two jobs by gender in period 2, too many women want the A job and too many men want the B job. Who makes the job choice or assignment has no value when both firm and worker are symmetrically informed (or uninformed) about ability, but has important consequences if information is asymmetric. For example, if workers know their ability levels after period 1, but the firm does not, there is no way for the firm to make the appropriate assignment of workers to jobs. Gender-specific wages solve the problem and induce efficient self-selection. The firm can identify gender and need only offer the appropriate period 2 gender-specific wages for job A and B to induce workers to sort optimally. On the other hand, the firm should do the assigning if firms' assessments of ability are better than workers' assessments. In this case gender-neutral wages should be used.

Risk-aversion affects the choice between gender-specific and gender-neutral wages as well. Ex ante, risk-averse women prefer gender-neutral wages with no voluntary choice over jobs and risk-averse men prefer gender-specific wages with voluntary choice over jobs. Worker choice requires that individuals who are ex ante identical are offered different wages, in both periods 2 and 3. Since job assignments are the same under both schemes (allowing efficient choice does not change the allocation of workers to jobs), it is sufficient to determine whether the period 2 wage spread is larger with gender-specific wages than with gender-neutral wages. Workers who are risk-averse prefer the smaller wage spread.

Gender-neutral and gender-specific wage schemes have identical wage structures in period 3 (all workers are paid exactly their outputs), so only the period 2 wage spread need be considered. It can be shown that $W_2^B - W_2^A$ is larger in the gender-neutral case than the male gender-specific spread but smaller than the female gender-specific spread. As a result, risk-averse males prefer choice and gender-specific wages, whereas risk-averse females prefer no choice and gender-neutral wages.
The proof is given in appendix A.

The law provides another reason for choice. Ability is not unobserved, at the time of hire, but gender and wages are fully observed at all times. It is clear that paying gender-specific wages violates Title VII. But firms are less likely to be prosecuted for a differential promotion scheme because ability is difficult to observe. In order for the firm to be found in violation, a pattern of higher promotion rates for men of given ability would have to be demonstrated. This is a tougher task than documenting that wages in a given job differ systematically by gender.

One final full information alternative is considered. If workers are paid exactly their output in periods 2 and 3, then all workers choose jobs efficiently. Workers can be given full choice and wage policy rules can be independent of gender. Thus, let $W_2^A = \gamma_2\delta + \delta$ and let $W_2^B = 2\delta$. The extra δ term covers the output during period 1, for which payment is received in period 2. To see that choice is efficient, note that $W_2^B - W_2^A = \delta(1-\gamma_2)$.
A worker voluntarily chooses the A job when

$$W_2^B - W_2^A < \int_0^{\gamma_3\delta} \gamma_3\delta dF + \int_{\gamma_3\delta}^{\infty} \omega dF - \int_0^{\delta} \delta dF - \int_{\delta}^{\infty} \omega dF$$

where the right hand side is the difference in expected full income in period 3, or when

$$(1-\gamma_2)\delta < \int_{\delta}^{\gamma_3\delta} F(\omega)d\omega$$

(integrate by parts and substitute $(1-\gamma_2)\delta$ for $W_2^B - W_2^A$). But this is the efficiency criterion that defines δ^* in (5). Thus, the worker's job choice is efficient.

Again, the choice between schemes must depend on other factors. Risk-averse workers face additional income variation when wages in both period 2 and period 3 depend on ability. Wages that depend on ability and permit worker choice of jobs are not attractive to risk-averse workers. And of course the firm is in a better position to make job assignments if it has superior information on workers' abilities and prospects.

IV. Other Theories of Discrimination

A "jobs" theory of discrimination has the virtue that it addresses a stylized fact in the labor market: that women receive about the same treatment as men within a given job, but are less likely to be promoted into good jobs. A taste theory of discrimination with these implications seems ad hoc. Why should sex bias take the form of preventing movement across jobs, but result in no discrimination within? This is not the same as saying women are discriminated against only in good jobs. Treatment is gender-neutral in both A and B jobs. It is movement between those jobs that is not gender-neutral. The theory here derives an explicit rule for promotion bias according to sex and predicts the way it varies by firm-specific job value.

It is true, however, that one prediction of our model is at odds with available evidence. If women and men have the same underlying ability distribution, then the average wage of females found in the good job is larger than the average wage for men observed in that job. It does not seem correct empirically that the average wage in A type jobs is higher for women than it is for men, as implied by the model. However, this implication is specific to our distributional assumptions. In so far as the ability distribution is the result of acquired capacities through pre-market human capital investments, Mincer and Polachek's [1974] logic suggests that different expectations by men and women of market participation would result in different "ability" distributions as well as different alternative use of time distributions. While this does not affect the analysis above in its essentials, it would affect the conditional mean wage paid on the A job in the direction of the available data.

Appendix A:

Workers are paid exactly their outputs in period 3. Therefore the zero-profit condition amounts to ensuring that expected output over the first two periods equals expected wages over the first two periods. For males, this means

$$\text{(A1)} \qquad Q_m \equiv E(\delta) + \int_0^{\delta_m^*} \delta dG + \int_{\delta_m^*}^{\infty} \gamma_2 \delta dG = W_2^A[1-G(\delta_m^*)] + W_2^B G(\delta_m^*)$$

and for females it means

$$\text{(A2)} \qquad Q_f \equiv E(\delta) + \int_0^{\delta_f^*} \delta dG + \int_{\delta_f^*}^{\infty} \gamma_2 \delta dG = W_2^A[1-G(\delta_f^*)] + W_2^B G(\delta_f^*) \quad .$$

With gender-neutral wages, (A1) and (A2) define W_2^A and W_2^B . Now $Q_m - Q_f$ can be written as

$$Q_m - Q_f = \int_{\delta_m^*}^{\delta_f^*} \delta dG - \int_{\delta_m^*}^{\delta_f^*} \gamma_2 \delta dG = (1-\gamma_2) \int_{\delta_m^*}^{\delta_f^*} \delta dG \quad .$$

This and (A1) and (A2) imply that

$$W_2^B - W_2^A = \frac{Q_f - Q_m}{G(\delta_f^*) - G(\delta_m^*)} = \frac{(1-\gamma_2)}{G(\delta_f^*) - G(\delta_m^*)} \int_{\delta_m^*}^{\delta_f^*} \delta dG$$

Eq. (10) in the text implies that the gender-specific spread that induces efficient job choice for males has

$$W_{2_m}^B - W_{2_m}^A = (1-\gamma_2)\delta_m^* \quad .$$

Thus,

$$W_{2_m}^B - W_{2_m}^A < W_2^B - W_2^A \quad \text{if}$$

$$\delta_m^* < \frac{1}{G(\delta_f^*) - G(\delta_m^*)} \int_{\delta_m^*}^{\delta_f^*} \delta dG \quad .$$

Since $E(\delta | \delta > \delta_m^*) \geq \delta_m^*$,

$$\delta_m^* < \frac{1}{1 - G(\delta_m^*)} \int_{\delta_m^*}^{\delta_f^*} \delta dG$$

And since $G(\delta_f^*) < 1$, we have

$$\frac{1}{G(\delta_f^*)-G(\delta_m^*)} > \frac{1}{1-G(\delta_m^*)}$$

so

$$W_{2_m}^B - W_{2_m}^A < W_2^B - W_2^A \quad .$$

It follows that risk-averse men prefer choice and gender-specific wages.

A parallel argument implies

$$W_{2_f}^B - W_{2_f}^A < W_2^B - W_2^A \quad ,$$

so women prefer gender-neutral wages and no choice over job assignment to choice and gender-specific wages.

Footnotes

1 The critical value δ^* in figure 1 is unique. It is readily shown that $D(\delta)$ exhibits exactly one global minimum for $\delta > 0$ as shown in the figure, e.g., $D'(\delta)$ in (4) can only switch sign once. Since $D'(0) < 0$ and since

$$\lim_{\delta \to \infty} D(\delta) = \infty$$

this implies that $D(\delta)$ must have the appearance shown in figure 1.

2 To see this, note that if δ is sufficiently high, $F_m(\delta) = F_f(d) = 1$ so that $\frac{\partial F}{\partial \alpha} = 0$.

2 We assume that firms and workers are risk-neutral. Efficient policies for risk-averse agents are somewhat more involved than those described. See below.

3 It is not true that a man's output, conditional on employment throughout the three periods, exceeds that of a woman. The stricter promotion criterion for women sorts out the lower market ability females so that the pool that is left is higher quality among women than among the men.

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