

We begin with a model of the demand for male and female workers in a firm with a simple technology, assuming there is hierarchical discrimination against women. Although the effects of discrimination on the demand for labor are well known, they are presented here in a different context. We then extend the model to more complex technologies and derive the implications of hierarchical discrimination for the supply of male and female workers. Becker [1971] does not consider the effects of discrimination on the supply of labor, because he assumes all workers are homogeneous. When we extend the model to consider hierarchical discrimination, we assume workers vary in their ability to acquire the human capital necessary to move up the management hierarchy. Supply becomes important because labor supply elasticities may vary across workers. We derive a sorting equilibrium for the model and show that technological constraints, costs of acquiring human capital, and male tastes for discrimination determine unique distributions of men and women across the occupational hierarchy.

Hierarchical Discrimination in a One-Supervisor Firm: Demand

Consider a profit-maximizing firm that hires L_M male workers and L_F female workers, at a wage W_L , and one supervisor at a wage W_S , where $W_S > W_L$. Assume that male workers' distastes for female supervision are measured by δ ($\delta > 0$). If the firm hires a female supervisor, male workers demand a wage, $W_L(1+\delta)$, that includes a compensating differential, and total costs of labor are,

$$(1) \quad C_1 = L_M W_L (1+\delta) + L_F W_L + W_S.$$

Firms minimize costs by hiring a male supervisor unless all workers to be supervised are female. Firms will be segregated except at the lowest entry-level jobs.

A female supervisor may be hired to supervise males if she accepts a wage penalty to compensate her employer for the sum of the discriminatory wage differentials paid to male workers. Let p equal the wage penalty imposed on a female supervisor, expressed as a fraction of a male supervisor's wage. Then, costs of labor are

$$(2) \quad C_2 = L_M W_L (1+\delta) + L_F W_L + W_S (1-p)$$

when the supervisor is female. The firm is indifferent between a male or female supervisor when the female wage penalty exactly offsets the costs of male tastes for discrimination, that is, when

$$(3) \quad W_S p = L_M W_L \delta.$$

The wage reduction imposed on a female supervisor is the product of the number of male workers supervised, their wage rate, and their tastes for discrimination. The only situation in which a woman is likely to be hired to supervise men is one in which the wage differential between the supervisor and her workers is relatively large and the number of men to be supervised is small. Staff positions, such as public relations, in many large organizations meet these requirements. Managers in these positions may have a great deal of responsibility but, unlike managers in line positions, only a few employees report to them.

Hierarchical discrimination reduces the mean wages of women in two ways: fewer women are employed in managerial positions (an occupational effect) and, in each management level, female wages are reduced by the implicit compensation the female manager pays to the firm to cover the discriminatory employment costs (a wage effect).

Hierarchical Discrimination in a Multi-Supervisor Firm: Supply

Market Assumptions. To develop the implications of hierarchical discrimination on the supply

of male and female workers, consider a management hierarchy based on a Leontief production function ($y = \min[4E, 2S, L]$). That is, our example is a cost-minimizing firm with a strict hierarchical structure in which one executive (E) manages two supervisors (S), who each manage two laborers (L) (Figure 1).¹ All firms have this identical hierarchical structure and non-human capital is ignored. The labor market is assumed to be competitive, and, once human capital investments are made, all workers are equally productive in their management positions. Hence, the coefficients of the Leontief production function completely characterize the technology.

If we assume, as did Mincer [1974], that workers are of equal ability and that wage differences between each level in the management hierarchy are just sufficient to compensate workers for the investment they make to be promoted to the next level, then women will not manage men. Since no one earns rents and men exhibit positive distastes for female supervision, women have no incentive to take wage cuts in order to manage male workers and, therefore, only supervise other women. Wages are equalized across sex by occupation and females move up the management hierarchy only in segregated lines.

A more interesting scenario occurs if workers vary in ability. The supply of workers to different levels in the hierarchy is governed by their comparative advantage in skill acquisition and by the intensity of tastes for discrimination against female managers. To move above the laborer level in the management hierarchy, human capital must be acquired at a cost c_s to become a supervisor or c_e to become an executive.

Our model is static, with human capital investments made at the beginning of the period. Each worker knows his own costs of acquiring different types of management capital, and the distribution of costs for all other workers. We assume, for every worker, the investment costs of becoming an "executive" (who manages supervisors) are higher than the investment costs of becoming a "supervisor" (who manages laborers). Thus, for each individual "i", $c_{s,i} < c_{e,i}$. While this ranking is strict for each individual, it is possible that $c_{e,i} < c_{s,j}$ if $i \neq j$, because more able workers can acquire the human capital necessary to become managers at lower cost.

Labor market competition ensures that wages are equalized within each level of the management hierarchy. Although wages are equal, more able male managers earn rents because they are able to achieve the same managerial level at lower cost than less able managers.

Hierarchical Equilibrium with No Tastes for Discrimination. If men do not object to female managers, equilibrium wages and employment for the hierarchical management structure described above are shown in Figure 2. The disks in Figure 2 represent the bivariate distribution of ability for becoming supervisors and executives. Panel A describes the case where there is a positive correlation between the ability to become a supervisor or executive (that is, the least-cost executives are also the least-cost supervisors). Panel B describes the opposite case of a negative correlation between the ability to become a supervisor or executive.²

In the sorting equilibrium for a given technology, workers self-select into the occupation where they have a comparative advantage and have no incentive to change occupations. In Panel B, for example, able executives are not able supervisors and each worker's comparative advantage is clear: those in the northwest part of the distribution tend to be supervisors and those in the southeast tend to be executives. Each technology determines a unique proportion of workers in each occupation in the hierarchy and occupations and wages are determined by the equilibrium investment costs, denoted by c_e^* and c_s^* . In our example of the Leontief technology shown in Figure 1, c_e^* and c_s^* must be such that one-seventh of the workers are below the c_e^* line, two-sevenths are to the left of the c_s^* line, and the remaining four-sevenths are laborers

between those two lines.

The distribution in Panel A is more complex than that in Panel B because more able workers who can acquire the human capital necessary to become an executive at low cost can also acquire the human capital necessary to become a supervisor at low cost. To identify the occupations of these workers, add the "equal rents line" to the diagram. The "equal rents line" is parallel to the 45° line, and indicates those points for which the rent earned as an executive exactly equals the rent earned as a supervisor. Clearly, workers above the equal rents line but left of the c_s^* line maximize their rents as supervisors, while those below the equal rents line and beneath the c_e^* line maximize their rents as executives.

Note that, for either positive (Panel A) or negative (Panel B) correlation of ability, the following equilibrium conditions are satisfied at c_e^* and c_s^* : (1) the technology constraints are met, (2) the least-cost principle is satisfied, that is, workers who can become managers at least cost do so, and (3) no one has an incentive to change occupations.³

Hierarchical Equilibrium with Tastes for Discrimination. Now assume men insist on a compensating wage differential to be supervised by women. If there are enough women to fill the laborer ranks, no wage differentials are paid, managerial lines are completely segregated by sex, and we can superimpose the female and male distributions over one another to determine c_e^* and c_s^* .

Assume instead that the underlying distributions of managerial costs are the same for men and women, but women have self-selected into the workforce because women, unlike most men, have the alternative of pursuing household work as their primary activity. This self-selection is such that the number of women in the labor force is smaller than the number of men, so that, at the margin, some female executives must manage male supervisors, and some female supervisors must manage male laborers. To move up the managerial ranks a woman incurs the costs of human capital investments and the costs of compensating male workers' tastes for discrimination. Thus, the female distribution of managerial costs is shifted to the northeast, parallel to the 45° line, by an amount θ , the additional cost associated with assigning a female to manage male workers. The shift of the female distribution is indicated in Figure 3, where the relatively smaller disk for females reflects their self-selection into the workforce so that there are fewer female workers than male workers.

The additional employment cost, θ , associated with hiring a woman to manage male workers is the product of the workers' wage rate, the number of men supervised, and the strength of male distastes for female supervision, as discussed in the previous section (equation 3). For pedagogical reasons, we assume the cost, θ_e , of hiring a female executive over male supervisors equals the cost, θ_s , of hiring a female supervisor over male laborers. Then, the female cost distribution is simply shifted northeast by the amount θ on either axis as pictured in Figure 3.⁴

In competitive markets with effective tastes for discrimination, female managers' net wages decrease by θ and the only female managers are those for whom c_s^* (c_e^*) is greater than $c_{s,i} + \theta$ ($c_{e,i} + \theta$). Note that, at the margin and on average, female managers are more capable than male managers since discriminatory costs exclude all but the most capable females from management positions.

From Figures 1-3 and the accompanying discussion, we conclude that:

- a. High ability men in management positions earn rents equal to the difference between c_s^* (c_e^*) and $c_{s,i}$ ($c_{e,i}$). On average, these rents are higher than the rents earned by high ability women. Relatively few women earn rents, because their

rents have been appropriated by hierarchical discrimination.

b. Effective tastes for discrimination depend on: the entire distribution of ability for both males and females, technology, and tastes for discrimination, which may vary by level of supervision.⁵

c. An increase in tastes for discrimination lowers the average female salary by decreasing the number of females employed as managers, and by decreasing the wages paid to female managers relative to non-discriminatory wages and relative to male wages.

d. Hierarchical discrimination can persist in competitive markets so long as male distastes for female supervision are prevalent because the entire costs of discrimination are borne by female managers. Such discrimination produces wage differentials at all levels of the job hierarchy: female managers pay the costs of male distastes for female supervision, male laborers receive compensating wage differentials.

e. The equilibrium conditions set forth above are satisfied.

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1. The firm is characterized by a strict hierarchical structure in which the executive is directly responsible for the work of the supervisors, while each supervisor is directly responsible for the work of the laborers who report to him or her. Male distastes for female supervision are directed toward the immediate superior only.

2. In either the case of positive or negative correlation of investment costs, the distribution lies above the 45° line. This follows from our assumption that, for each individual, the cost of acquiring the human capital to become an executive is greater than the cost of acquiring the human capital to become a supervisor.

3. In general, extending the model to $n+1$ levels of supervision does not create any additional problems for the analysis. For the $(n+1)$ -level technology, n values of c_z^* are determined as above. The "equal rents" line becomes an $n-1$ dimensional facet whose sides meet the axes at 45° angles; the "edges" of the facets are where the c_s^* and c_e^* lines meet. The conclusions derived above continue to hold.

4. If costs of discrimination differ for executives and supervisors, the female distribution will not shift parallel to the 45° line but will be tilted away from the direction in which those costs are greater. For example, if θ_s is greater than θ_e (perhaps because supervisors manage more males than do executives), then the female distribution will be shifted further along the c_s

axis than along the c_e axis. This tilts the distribution away from the c_s^* line and makes it even less likely that women will become supervisors.

5. Tastes may also vary across male workers. Regardless of the correlation between discriminatory tastes and managerial ability, however, comparative advantage in "marketing" tastes implies that, among the males to be managed, those with lowest tastes for discrimination will be managed by females first. Thus, effective tastes for discrimination are a monotonically non-decreasing function of the relative number of female managers. No high-ability male manager with weak tastes for discrimination will ever exchange places with a lower-ability male with strong tastes for discrimination who is working for a female. This follows because transfers between inframarginal managers and laborers increase firm costs and eliminate managerial rents. Exchanges between a marginal laborer and a marginal manager are inconsequential in their cost impact. Hence, allowing for varying tastes across males does not change the analysis above, except to make the shifts in the female cost distribution both not parallel to the 45° line and a more complex endogenous function of the wage and employment determination process.