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Search, Bargaining, and Employer Discrimination

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This article analyzes Becker's ([1957] 1971) theory of employer discrimination within a search and wage-bargaining setting. Discriminatory firms pay workers who are discriminated against less and apply stricter hiring criteria to these workers. The highest profits are realized by firms with a positive discrimination coefficient. Moreover, once ownership and management are separated, both highest profits and highest utility can be realized by firms with a positive discrimination coefficient. Thus, market forces, like entry or takeovers, do not ensure that wage differentials due to employer discrimination disappear.

I. Introduction

In his seminal work on discrimination, Becker ([1957] 1971) assumes that some agents have a "taste" for discrimination. Wages for women and blacks are lower because employers, coworkers, or consumers require a premium to interact with these groups. Arrow (1972, 1973) and Cain (1986), among others, argue that wage differentials due to discrimination, however, can only be sustained as a short-run phenomenon in Becker's model. In the long run they disappear through segregation. That is, people

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belonging to a particular group avoid interaction with discriminatory agents (employers, consumers, or coworkers).[1] In the case of employer discrimination there is an additional argument why market forces eliminate wage differentials. As long as wage differentials exist, nondiscriminatory firms are more profitable, driving discriminatory firms out of the market.

This article reexamines Becker's ([1957] 1971) model of employer discrimination. The two main departures from Becker's framework are the introduction of search frictions in the labor market and wage setting by Nash bargaining. The resulting predictions differ substantially from those of Becker's original model. In particular, wage equalization does not take place, and profits are highest for firms with a positive discrimination coefficient (though more discriminatory employers have lower utility). In an extended setting with separation of ownership and management, utility as well as profits can be highest for firms with a positive discrimination coefficient. Thus, this article establishes that wage differentials caused by employer taste for discrimination may not be eliminated through market forces when there are search frictions, when both workers and firms have some bargaining power, and when ownership and management are separated.

Consider a model with two types of workers. One type is valued equally by all firms, while the valuation of the other type depends on the firm's taste for discrimination (its discrimination coefficient). For most of this article, workers belonging to the first group will be labeled "male" and those of the second group "female." As in Pissarides (1984, 1985), matches between workers and firms differ in productivity.

Employers' taste for discrimination affects profits through wages and hiring decisions. Compared to nondiscriminatory firms, discriminatory firms pay female workers a lower wage and male workers a higher wage, and the total wage bill is lower, provided that the firm is not too discriminatory. The discriminatory firms will, however, take nonprofit-maximizing hiring decisions. Nevertheless, being not too discriminatory yields a higher profit, because the positive effect of lower wages is of first order while the negative effect of suboptimal hiring is of second order. More precisely, there always exists a positive discrimination coefficient such that the wage effect dominates the hiring effect.

Although not too discriminatory, employers make higher profits; they have a lower utility, compared to nondiscriminatory employers. This suggests that in the long run discriminatory employers will be driven out of the market (through takeovers or by entry of nondiscriminatory employers). Employers' utility in discriminatory firms, however, may not

[1] This argument requires that there are enough nondiscriminatory employers/consumers/coworkers.

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be lower once ownership and management are separated. When the person who conducts the wage negotiation, say a manager, is not the residual claimant, discriminatory firms pay even lower wages for female workers. The reason is that a discriminatory manager incurs the entire utility loss of employing female workers but receives only part of the profits. Provided that the manager's share of the profits is sufficiently low, the sum of the manager's and the owners' utility is highest in firms with a (not too) discriminatory manager. This implies that the owners' profits are higher when employing such a discriminatory manager, even if the manager is compensated for the disutility from hiring female workers. Hence, market forces will drive out nondiscriminatory managers rather than discriminatory ones.

As mentioned above, the literature makes two arguments against persistent wage differentials due to discrimination: segregation and firm survival. Recently, several authors introduced search friction into Becker's model.[2] As this makes segregation costly, wage differentials due to consumer or coworker discrimination can exist in the long run. Regarding employer discrimination, one also has to address the issue of how discriminatory employers can survive in the long run. Their survival is possible when takeovers or entry are limited due to a lack of equally skilled nondiscriminatory employers.[3] This article shows that discriminatory firms are not driven out of the market, even when the supply of equally skilled nondiscriminatory employers (managers) is unlimited. In fact, the article shows that the reverse holds as the profit and utility-maximizing discrimination coefficient is greater than zero.

Closely related to the present article are Black (1995) and Bowlus and Eckstein (1998). They also analyze employer taste for discrimination in a search environment but assume that employers set the wages. In their models with wage posting, both profits and utility are decreasing in the discrimination coefficient. In contrast, the present article assumes wage bargaining, which is crucial for the main result, that employer discrimination can be profit maximizing as well as utility maximizing.[4]

In addition to demonstrating that employer discrimination can be both profit and utility maximizing, the model has implications for wages and employment of different groups. First, female workers earn less than male workers (for a given productivity), irrespective of whether the firm is discriminatory. Second, female wages are lower, and male wages are higher

[2] Akerlof (1985) and Borjas and Bronars (1989) consider a model with discriminatory consumers. Sattinger (1996) and Sasaki (1999) consider discriminatory coworkers. Black (1995) and Bowlous and Eckstein (1998) consider employer discrimination.

[3] See, e.g., Becker ([1957] 1971).

[4] Other discrimination papers where search frictions play a crucial role are Verma (1994) and Rosén (1997).

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(for a given productivity), in firms that are more discriminatory. Third, more discriminatory firms apply stricter hiring standards for female workers than for male workers. Furthermore, the model has implications for the relationship between wages, managerial characteristics, and the composition of the workforce. It also suggests that the inexistence of wage differentials within job cells need not rule out discrimination.

The article is organized as follows. Section II presents the basic model and shows that the highest profits are realized by firms with a positive discrimination coefficient. Section III introduces separation of ownership and management and shows that the profit- and utility-maximizing discrimination coefficient differs from zero and analyzes the (long-run) implications of the model when only firms that are utility maximizing survive. Section IV discusses the robustness of the model. Section V discusses the model's implications (other than the main result) and compares these with the existing empirical evidence. Section VI concludes the article.

II. Model and Analysis

The standard search model with noncooperative wage determination is taken as the starting point.[5] Following Becker ([1957] 1971), the important alternation is that the employer's utility is a function of both profits and employees' characteristics, such as sex and race.

It is a continuous time model with two types of workers: $i = f$ denotes female and $i = m$ male. The proportion of each type, α_i, is exogenously given. Employers differ in the disutility that they derive from employing an f-worker. An employer of type c derives a disutility of c for each f-worker that he employs (and zero disutility for each employed m-worker). The parameter c is distributed among employers according to the density function $g(c)$, $c \in [0, \bar{c}]$. The density function is continuous and differentiable, and $G(c)$ is the corresponding distribution function. The mass of jobs and workers is unity.

Workers and firms are risk neutral, infinitely lived, and have a common discount rate r. Workers are either unemployed or employed, and jobs are vacant or occupied. Only unemployed workers and vacant jobs engage in search. An unemployed worker is matched with a vacancy at the same constant rate ϕ as a vacancy is matched with an unemployed worker.[6] A match results in employment if and only if both firm and worker prefer employment to continuing search. Let z_i and $y(c)$ denote the probability

[5] The specific search model used here shares many features with Pissarides (1984, 1985).

[6] When the mass of workers equals the mass of jobs, the mass of unemployed equals the mass of vacancies. Assuming a matching technology with constant returns to scale implies that the matching rate is constant and the same for workers and firms, which simplifies the equilibrium existence proof.

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of employment for a type i worker and for a type c firm, respectively, given that a match has occurred. Employed workers separate from jobs at an exogenous rate s.

A match has productivity x, where x is a random drawing from the density function $f(x)$, with $x \in [0, \bar{x}]$. The function $f(x)$ is continuous, differentiable, and the same for all workers and firms. The corresponding distribution function is denoted $F(x)$. For simplicity, it is assumed that $\bar{x} < \bar{c}$.

Denote by U_i the present discounted utility of an unemployed worker and by $W_i(c, x)$ the present discounted utility of an employed worker holding a job with match productivity x in a firm with discrimination coefficient c. Without loss of generality, the income flow while unemployed is set equal to zero. In steady state, U_i satisfies

$$rU_i = \phi z_i\{E[W_i(c, x)|i] - U_i\}. \tag{1}$$

At the rate ϕz_i the worker finds employment, in which case the expected utility increases by $E\,[W_i(c, x)|i] - U_i$. Analogously, the present discounted utility for an employed worker of type i and productivity x in a job of type c satisfies

$$rW_i(c, x) = w_i(c, x) + s[U_i - W_i(c, x)], \tag{2}$$

where $w_i(c, x)$ is the wage.

Denote by $V(c)$ the present discounted value of a vacancy of type c and by $J_i(c, x)$ the present discounted value of a type c job occupied by a type i worker of productivity x. In steady state, $V(c)$ satisfies

$$rV(c) = \phi y(c)\{E[J_i(c, x)|c] - V(c)\}. \tag{3}$$

At a rate $\phi y(c)$ the vacancy is filled, in which case the expected value increases by $E[J_i(c, x)|c] - V(c)$. The present discounted value of a job $J_i(c, x)$ satisfies

$$rJ_i(c, x) = x - w_i(c, x) - c_i + s[V(c) - J_i(c, x)], \tag{4}$$

where $c_f = c$ and $c_m = 0$. The utility flow to the employer is $x - w_i(c, x) - c_i$. Using (3) and (4) gives

$$rV(c) = \frac{\phi y(c) E[x - w_i(c, x) - c_i|c]}{r + s + \phi y(c)}. \tag{5}$$

We now turn to the wage determination and the employment decision. Wages are assumed to be set by Nash bargaining. The worker's bargaining power is β, and the parties' outside options in the bargaining are their

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threat points.[7] Hence, the wage of a type i worker who works in a type c firm and has a match productivity x is determined by

$$\max_{w_i(c,x)} \Omega_i(c,x) = [W_i(c,x) - U_i]^{\beta}[J_i(c,x) - V(c)]^{1-\beta}. \tag{6}$$

The wage equation

$$w_i(c,x) = \beta[x - c_i - rV(c)] + (1-\beta)rU_i \tag{7}$$

is obtained by solving (6) and using (2) and (4). The wage is increasing in the productivity x and in the worker's outside option U_i but decreasing in the discrimination coefficient c_i and in the firm's outside option $V(c)$.

A match between a worker and a firm results in employment if and only if the worker and the firm gain from employment, that is, if $W_i(c,x) > U_i$ and $J_i(c,x) > V(c)$. Given that the wage is determined by (7), these conditions can be rewritten as $W_i(c) + J_i(c,x) > U_i + V(c)$. In flow terms, this is equivalent to $x - c_i > rU_i + rV(c)$. This latter inequality translates into a cutoff productivity $\mu_i(c)$, where firms hire a worker if and only if $x > \mu_i(c)$. The optimal cutoff level is given by

$$\mu_i(c) = \begin{cases} rU_i + rV(c) + c_i & \text{if } rU_i + rV(c) + c_i \leq \bar{x} \\ \bar{x} & \text{otherwise} \end{cases}. \tag{8}$$

Denote the proportion of type i workers among the unemployed by λ_i, the distribution of vacancies by $H(c)$, and its corresponding density function by $h(c)$. It follows that the employment probability is $z_i = \int_0^{\bar{c}}[1 - F(\mu_i(c))]h(c)dc$ and the hiring probability is $y(c) = \lambda_f[1 - F(\mu_f(c))] + \lambda_m[1 - F(\mu_m(c))]$. Using these equalities and equations (1), (2), (3), (4), and (7), we obtain expressions for rU_i and $rV(c)$:

$$rU_i = \frac{\beta\phi \int_0^{\bar{c}} \int_{\mu_i(c)}^{\bar{x}} [x - c_i - rV(c)] f(x) dx h(c) dc}{r + s + \beta\phi z_i}, \tag{9}$$

$$rV(c) = \frac{(1-\beta)\phi\left\{\lambda_f \int_{\mu_f(c)}^{\bar{x}} (x - c - rU_f) f(x) dx + \lambda_m \int_{\mu_m(c)}^{\bar{x}} (x - rU_m) f(x) dx\right\}}{r + s + (1-\beta)\phi y(c)}, \tag{10}$$

where the equilibrium cutoff levels are determined by (8). Notice that the cutoff levels given by (8) maximize (9) and (10), respectively.

To complete the model we need expressions for the proportions of

[7] Alternatively, one may assume that the outside options only serve as constraints in the bargaining. This would not affect the propositions in the article.

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unemployed workers of each type λ_i and for the distribution of vacancies $H(c)$. These are derived in appendix A.[8]

We now characterize the equilibrium outcomes of the value of a vacancy $V(c)$, of the workers' utility when unemployed U_i, of the wages $w_i(c, x)$, and of the cutoff productivity $\mu_i(c)$. First, we examine how the equilibrium value of a vacancy varies with the discrimination coefficient c. Taking the derivative of (10) with respect to c, and noting that $\partial rV(c)/\partial\mu_i(c) = 0$ for interior cutoff levels and $d\mu_f(c)/dc = 0$ for $\mu_i(c) = \bar{x}$, gives

$$\frac{drV(c)}{dc} = \frac{-(1-\beta)\phi\lambda_f[1 - F(\mu_f(c))]}{r + s + (1-\beta)\phi y(c)}. \tag{11}$$

It follows directly from (11) that $-1 < drV(c)/dc < 0$ if $\mu_f(c) < \bar{x}$ and $drV(c)/dc = 0$ if $\mu_f(c) = \bar{x}$.

Lemma 1. Employability: there exists a level $c = \hat{c}$, $\hat{c} \in (0, \bar{x})$, such that f-workers are only employable by firms of type $c < \hat{c}$.

Proof. It follows directly from (8) that lemma 1 holds if there exists a $\hat{c} \in (0, \bar{x})$ such that $rU_f + rV(c) + c \lesseqqgtr \bar{x}$ for $c \lesseqqgtr \hat{c}$. To prove this, it is sufficient to show that (i) $rV(c) + c$ is strictly increasing in c, (ii) $rU_f + rV(c) + c < \bar{x}$ for $c = 0$, and (iii) $rU_f + rV(\bar{c}) + \bar{c} > \bar{x}$. (i) It follows directly from (11) that $d[rV(c) + c]/dc > 0$. (ii) Assume to the contrary that $rU_f + rV(c) + c \geq \bar{x}$ for $c = 0$. Since $rV(c) + c$ is increasing in c, no female worker would be employable in any firm, and hence $rU_f = 0$. However, equation (10) implies that $rV(c) < \bar{x}$. Consequently, $rU_f + rV(c) + c \geq \bar{x}$ for $c = 0$ cannot hold. (iii) From $rU_f + rV(c) \geq 0$ and $\bar{c} > \bar{x}$, it follows that $rU_f + rV(\bar{c}) + \bar{c} > \bar{x}$. Q.E.D.

Lemma 2. Firms' utility: the present discounted value of a vacancy $V(c)$ is strictly decreasing in c for $c \in [0, \hat{c})$, and $V(c) = V(\hat{c})$ for $c \geq \hat{c}$.

Proof. From (11) and lemma 1 it follows that $drV(c)/dc < 0$ for $c < \hat{c}$ and that $drV(c)/dc = 0$ for $c \geq \hat{c}$. Q.E.D.

The discrimination coefficient affects the value of a vacancy negatively as long as the firm hires some f-workers.

Lemma 3. Workers' utility: the present discounted utility of an unemployed m-worker is higher than that of an unemployed f-worker, that is, $U_m > U_f$.

Proof. Lemma 3 follows directly from equation (9), $c_m = 0$, and $c_f \in [0, \bar{c}]$. Q.E.D.

Because firms value f-workers less, these workers have a lower utility.

Lemma 4. Wages: (i) $w_m(c, x) > w_f(c, x)$ for $c \in [0, \bar{c}]$; (ii) $w_m(c, x)$ is strictly increasing in c for $c \in [0, \hat{c})$, and $w_m(c, x) = w_m(\hat{c}, x)$ for $c \geq \hat{c}$; (iii) $w_f(c, x)$ is strictly decreasing in c.

Proof. Part i follows from the wage equation (7), and $rU_m > rU_f$. Part

[8] The existence proof of the equilibrium is available on request from the author.

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ii follows from the wage equation (7) and lemma 2. Part iii follows from the wage equation, and $d[rV(c) + c]/dc > 0$. Q.E.D.

For any given c and x, wages of m-workers are higher than those of f-workers (result i) for two reasons. First, m-workers have a better bargaining position ($rU_m > rU_f$). Second, a discrimination coefficient greater than zero lowers f-workers' wages directly. More discriminatory firms (that still hire f-workers) pay m-workers higher wages (result ii) because of their weaker bargaining position. The f-workers' wages decrease with the discrimination coefficient (result iii). The reason is that the negative direct effect of the discrimination coefficient dominates the positive effect of the firm's weaker bargaining position.

LEMMA 5. Cutoff productivity: (i) the m-workers' cutoff productivity $\mu_m(c)$ is decreasing in c for $c \in [0, \hat{c})$, and $\mu_m(c) = \mu_m(\hat{c})$ for $c \geq \hat{c}$; (ii) $\mu_m(0) > \mu_m(\hat{c})$; (iii) the f-workers' cutoff productivity $\mu_f(c)$ is strictly increasing in c for $c \in [0, \hat{c})$, and $\mu_f(c) = \bar{x}$ for $c \geq \hat{c}$; (iv) $\mu_m(0) > \mu_f(0)$.

Proof. (i) The cutoff equation (8) and lemma 2 imply that $\mu_m(c)$ is decreasing in c for $c \in [0, \hat{c})$ and that $\mu_m(c) = \mu_m(\hat{c})$ for $c \geq \hat{c}$. (ii) Part i implies that $\mu_m(0) \geq \mu_m(\hat{c})$. Since $V(c)$ is strictly decreasing in $c \in [0, \hat{c}]$, it follows from (8) that $\mu_m(0) = \mu_m(\hat{c})$ if and only if $\mu_m(0) = \mu_m(\hat{c}) = \bar{x}$. Now $\mu_m(\hat{c}) = \bar{x}$ implies that $rV(\hat{c}) = 0$ (since $\mu_f(\hat{c}) = \bar{x}$), which contradicts $\mu_m(\hat{c}) = \bar{x}$ (since $rU_m < \bar{x}$). Part iii follows from the cutoff equation (8) and from the fact that $c + V(c)$ is strictly increasing in c. Part iv follows from equation (8), and $rU_m > rU_f$. Q.E.D.

Firms with a high discrimination coefficient are more selective in employing women but less selective in employing men. The reason for the latter is that the option value $V(c)$ is decreasing in c. Thus, f-workers are better (of higher productivity), and m-workers are on average worse in more discriminatory firms. Moreover, because these two groups have different outside opportunities, nondiscriminatory firms also apply different hiring standards for women and men.[9]

We now analyze the relationship between the discrimination coefficient and profits. The present discounted value of profits from a vacancy in flow terms $r\Pi(c)$ is equal to $rV(c)$ net of the disutility c_i. Thus, the analogue to (5) in profit terms is

$$r\Pi(c) = \frac{\phi y(c) E[x - w_i(c, x)|c]}{r + s + \phi y(c)}. \tag{12}$$

[9] The cutoff levels also determine the exit rates from unemployment. For low values of c, m-workers have higher cutoff productivity levels than f-workers, while the reverse holds for high values of c. Hence, it is not possible to establish whether m-workers have a higher exit rate (lower unemployment rate), unless one restricts attention to special cases.

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Inserting the wage equation (7) into (12) yields

$$r\Pi(c) = \frac{\phi\lambda_f \int_{\mu_f(c)}^{\bar{x}} \{(1-\beta)(x - rU_f) + \beta[rV(c) + c]\} f(x)dx}{r + s + \phi y(c)} + \frac{\phi\lambda_m \int_{\mu_m(c)}^{\bar{x}} [(1-\beta)(x - rU_m) + \beta rV(c)] f(x)dx}{r + s + \phi y(c)}. \quad (13)$$

Differentiating $r\Pi(c)$ with respect to c, we obtain

$$\frac{dr\Pi(c)}{dc} = \frac{\partial r\Pi(c)}{\partial c} + \frac{\partial r\Pi(c)}{\partial rV(c)}\frac{drV(c)}{dc} + \frac{\partial r\Pi(c)}{\partial \mu_f(c)}\frac{d\mu_f(c)}{dc} + \frac{\partial r\Pi(c)}{\partial \mu_m(c)}\frac{d\mu_m(c)}{dc}. \quad (14)$$

A change in the discrimination coefficient affects profits through wages and hiring standards. The wage effect covers the direct effect of discrimination on the f-workers' wages (first term of [14]) and the indirect effect on the value of a vacancy (second term). The third and the fourth terms reflect the effect of c on the profits through its impact on the hiring standards applied to f-workers and to m-workers. In order to sign $dr\Pi(c)/dc$ for $c < \hat{c}$, we analyze first the wage effect.[10]

Using (13), we find that the direct wage effect is

$$\frac{\partial r\Pi(c)}{\partial c} = \frac{\beta\phi\lambda_f[1 - F(\mu_f(c))]}{r + s + \phi y(c)} > 0. \quad (15)$$

The indirect wage effect of c through the value of a vacancy is equal to

$$\frac{\partial r\Pi(c)}{\partial rV(c)}\frac{drV(c)}{dc} = \frac{\beta\phi y(c)}{r + s + \phi y(c)}\frac{drV(c)}{dc} < 0. \quad (16)$$

Equations (11), (15), and (16) imply that the sum of the two wage effects is unambiguously positive:

$$\frac{\partial r\Pi(c)}{\partial c} + \frac{\partial r\Pi(c)}{\partial rV(c)}\frac{drV(c)}{dc} = \frac{(r+s)\beta\phi\lambda_f[1 - F(\mu_f(c))]}{[r + s + \phi(1-\beta)y(c)][r + s + \phi y(c)]} > 0. \quad (17)$$

Hence, for given hiring standards, the wage bill decreases, and profits increase in c.

In appendix B, it is shown that the effect of c on profits through its impact on hiring standards is negative. Hence, the sum of the effects of wages on profits is positive while the effect on profits from changed hiring standards is negative. Being discriminatory lowers the wage bill for a given workforce but leads to nonprofit-maximizing hiring decisions.

Proposition 1. The highest profits are realized by firms with a positive discrimination coefficient.

[10] If $c \geq \hat{c}$, all the terms in (14) are equal to zero.

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Proof. At $c = 0$, $r\Pi(c) = rV(c)$, and hence, $\partial r\Pi(c)/\partial\mu_i(c) = \partial rV(c)/\partial\mu_i(c) = 0$. Thus, at $c = 0$,

$$\frac{dr\Pi(c)}{dc} = \frac{\partial r\Pi(c)}{\partial c} + \frac{\partial r\Pi(c)}{\partial rV(c)}\frac{drV(c)}{dc},$$

which by (17) is positive. Q.E.D.

In the absence of discrimination ($c = 0$), the chosen cutoff level is profit maximizing. Therefore, a small change in c leads to a hiring effect that is only of second order, while the effect on wages is of first order. Hence, a (not too) discriminatory firm makes higher profits than a nondiscriminatory firm. This result contrasts with Becker ([1957] 1971), Black (1995), and Bowlus and Eckstein (1998). In their models, the firms' profits are decreasing in the discrimination coefficient, given that there are wage differentials.

Within the present model, profits are, however, not monotonically increasing in c. For some values of c, the negative effect from suboptimal hiring outweighs the positive wage bill effect. This is most easily seen in the case where $c = \hat{c}$. If c is so high that no f-workers are hired, the discriminatory firm makes lower profits. It pays m-workers a higher wage than nondiscriminatory firms and forgoes profits by not employing f-workers.[11] Nonetheless, one clear prediction of the present model is that highly discriminatory firms that only or almost only employ male/white workers should earn lower profits than less discriminatory firms.

There are few empirical studies on the relationship between profitability and discrimination. None of them are directly applicable to our model since they do not consider the possibility of a nonmonotonic relationship between discrimination and profits.[12]

In Becker's model wage differentials due to employer taste for discrimination are unstable in the long run if ownership can be transferred at a low cost, or similarly if there is free entry of nondiscriminatory employers (see, e.g., Arrow 1972). Nondiscriminatory employers profit

[11] Formally, at $c = \hat{c}$, no f-workers are hired, and $r\Pi(\hat{c}) = rV(\hat{c})$. Since $rV(\hat{c}) < rV(0)$ and $rV(c) = r\Pi(c)$ for $c = 0$, we have $r\Pi(\hat{c}) = rV(\hat{c}) < rV(0) = r\Pi(0)$.

[12] Hellerstein, Neumark, and Troske (1997) investigate the relationship between profits and discrimination across product markets that differ in their degree of competitiveness. In their model (as in the present), more discriminatory firms employ fewer women. Among plants with high levels of product market power, those that employ relatively more women are more profitable. In contrast, there is no such relationship for plants with low levels of market power. Examining a cross section of 48 metropolitan areas Reich (1981) finds a negative correlation between profits and the ratio of black workers' wages to white workers' wages. He interprets this result as being inconsistent with Becker's theory of employer discrimination. Cain (1986) discusses Reich' s study and interpretation extensively. Hersch (1991) finds that firms charged with violations against equal opportunity laws experience a negative stock price reaction.

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by buying out discriminatory employers, and with free entry of nondiscriminatory employers only the most profitable types of firms survive. In the present model, a similar long-run stability problem arises. Although discriminatory employers may make higher expected profits, they have lower expected utility than nondiscriminatory employers. (Recall that $V(c)$ is decreasing in c.) The next section shows that this long-run stability problem may not arise when ownership and management are separated.

III. Separation of Ownership and Management

So far we have implicitly assumed that employers are owner-managers. This section considers separation of ownership and the management. That is, the person who takes the hiring decision and bargains with the worker is not the sole owner, or more precisely, is not the residual claimant. One can think of managers and shareholders, an owner and the personnel director, or a partnership where one partner is in charge of hiring and wage bargaining. Subsequently, "manager" refers to the person who takes the hiring decisions and conducts the wage bargaining and "owners" to the party whose utility is affected by profits but who is not in charge of these decisions.

It is assumed that the manager may or may not have a taste for discrimination and maximizes his own utility, whereas the owners only care about profits. It is crucial that the manager's utility depends on profits. Profits may either enter directly into the manager's remuneration package through, for example, stock options, or indirectly through the likelihood of keeping the job. For simplicity, we assume that the manager's wage consists of a fixed payment a and a proportion t of the profits. When the job is vacant, the manager's instantaneous utility is a and the owners' return is $-a$. When the job is occupied by a worker of type i and the manager is of type c, the manager gets a flow utility of $a + t[x - w_i(c, x)] - c_i$, and the owners' return is $-a + (1 - t)[x - w_i(c, x)]$.

Denote by $V^M(c)$ the present discounted value of a vacancy to a manager of type c, and by $J_i^M(c)$ the present discounted value of a job occupied by a worker of type i, and of productivity x to a manager of type c. In steady state, $V^M(c)$ and $J_i^M(c)$ satisfy

$$rV^M(c) = a + \phi y(c)\{E[J_i^M(c, x)|c] - V^M(c)\}, \tag{18}$$

$$rJ_i^M(c) = a + t[x - w_i(c, x)] - c_i + s[V^M(c) - J_i^M(c)]. \tag{19}$$

The present discounted value of a vacancy to the owners with a manager of type c, $rV^O(c)$, and the present discounted value of a job occupied by a worker of type i to the owners with a manager of type c, $rJ_i^O(c)$, satisfy

$$rV^O(c) = -a + \phi y(c)\{E[J_i^O(c, x)|c] - V^O(c)\}. \tag{20}$$

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$$rJ_i^O(c) = -a + (1-t)[x - w_i(c,x)] + s[V^O(c) - J_i^O(c)]. \tag{21}$$

The wage is now determined by the maximization problem

$$\max_{w_i(c,x)} \Omega_i(c,x) = [W_i(c,x) - U_i]^{\beta}[J_i^M(c,x) - V^M(c)]^{1-\beta}, \tag{22}$$

where U_i and $W_i(c,x)$ are defined by (1) and (2). Solving (22) and using (2) and (19) gives the wage equation

$$w_i(c,x) = \beta\left[x + \frac{a}{t} - \frac{c_i}{t} - \frac{rV^M(c)}{t}\right] + (1-\beta)rU_i. \tag{23}$$

Comparison of (7) and (23) shows that the direct effect of the discrimination coefficient is now magnified by a factor $1/t$.

In accordance with the previous section, one can show that the optimal discrimination coefficient, from the owners' point of view, differs from zero if the manager is not compensated for his disutility of hiring f-workers. There is, however, an even stronger result. Denote by $S(c) = V^M(c) + V^O(c)$ the sum of the manager's and owners' utility from a vacant job.

PROPOSITION 2. The discrimination coefficient that maximizes the sum of the owners' profit and the manager's utility $S(c)$ is positive if

$$t < \frac{\beta(r+s)}{r+s+(1-\beta)\phi y(c)}. \tag{24}$$

Proof. See appendix C.

When t is small, the wage set in the bargaining is reduced by more than the discrimination coefficient c. The manager carries the full utility loss from hiring an f-worker but receives only part of the extra profits. Thus, when the manager's share of the profits is small, owners can compensate a slightly discriminatory manager for his disutility (e.g., through a higher a) and still earn higher profits. In this case there is no (economic) incentive to replace a discriminatory manager. On the contrary, employing a nondiscriminatory manager leads neither to higher utility nor to higher profits.[13]

The above analysis shows that the profit- and utility-maximizing discrimination coefficient is larger than zero. Next we explore the long-run properties of the model, that is, the properties of the model where only

[13] The model implicitly assumes that the manager cannot affect the number of jobs. In principle, one could expand the model, allowing the manager to first choose firm size and then to make the hiring decisions. Assuming decreasing returns to the number of jobs, discriminatory managers choose smaller firm sizes. Because the effect of the discrimination coefficient on firm size is of second order, the result is likely to hold also in such an extended setting.

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firms with the highest profits to the owners survive. Assume as before that the number of jobs in the economy is given.

Definition. The discrimination coefficient c^* is a long-run equilibrium discrimination coefficient if there exists no other c such that $S(c) > S(c^*)$.

Proposition 3. Given that condition (24) is satisfied, there exist no nondiscriminatory firms in the long run.

Proof. Using proposition 2 and noting that the proof of proposition 2 is independent of distributional assumptions of $G(c)$, it follows directly that there exists a $c > 0$ such that $S(c) > S(c = 0)$. Hence, $c^* = 0$ is not possible. Q.E.D.

While the (long-run) inexistence of nondiscriminatory firms is derived for a given number of jobs, proposition 3 does not depend on this assumption. An analogous result obtains when one allows free entry of firms and of manager types. In this case, one needs to extend the model to include firm search cost (or a cost of opening a vacancy) and to endogenize the matching rate. The point is that if owners can choose the type of the manager, they never pick a type with $c = 0$ since this would give a lower total utility and thereby lower profits.[14]

The empirical evidence on the long-run survival rates of discriminatory firms is scarce. One exception is Hellerstein et al. (1997). Consistent with the model presented here, they find little evidence that more discriminatory firms (those with lower proportion of female workers) grow less or that they are taken over by nondiscriminatory firms. This study is, however, not directly applicable to the model presented here. As in the case with the relationship between profits and discrimination, the present theory does not imply a monotonic relationship between discrimination and long-run survival rates, while Hellerstein et al. (1997) assumes a monotonic relation.

It would be interesting to further characterize the long-run value of the discrimination coefficient and its comparative statics—in particular, the effects of the degree of search friction on the equilibrium discrimination coefficient. Unfortunately, this issue cannot be addressed within the present framework. More precisely, the general functional form of the distribution of the productivity makes it impossible to find an explicit expression for the profit-maximizing discrimination coefficient. This, however, is a prerequisite to explore this question. Hence, any further advancement has to be made within a simplified version of the model. To this end, we simplify and assume that all workers are equally productive in all jobs, while leaving the model otherwise unchanged.

[14] Of course, if the supply of different manager types is restricted, or if managers differ in their ability, types with suboptimal discrimination coefficients also exist in the long-run equilibrium.

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Result. (i) For $\phi < \tilde{\phi}$, there exists a long-run equilibrium where all managers have the same discrimination coefficient c_I^P and hire both f-workers and m-workers. The discrimination coefficient c_I^P is decreasing in ϕ. (ii) For $\phi > \tilde{\phi}$, there exists a long-run equilibrium where some managers have a discrimination coefficient c_F and hire only f-workers, and others have a discrimination coefficient c_I^M and hire both f-workers and m-workers where $c_F < c_I^M < c_I^P$.[15]

This result implies that larger search frictions (smaller ϕ values) are associated with a larger long-run equilibrium discrimination coefficient. It is, however, not necessarily true that wage differentials are also positively related to search frictions. While a larger discrimination coefficient indeed increases wage differentials, the underlying increase in search frictions has an ambiguous effect on wages (through the workers' outside option). In fact, it is possible to construct examples where this latter effect is countervailing and dominant such that an increase in ϕ enlarges wage differentials. Thus, even though wage differentials are eliminated in the limit when search frictions tend to zero, wage differentials do not in general monotonically increase with search frictions.

This example also shows that there are long-run equilibriums where owners choose different manager types. The reason is that the distribution of c in the economy affects the composition of searching workers, which in turn affects the equilibrium distribution of c. This result is isomorphic to the result that firms with different production technologies can coexist in sequential search models where workers of different productivities search in the same market (e.g., Acemoglu 1999).

IV. Robustness

Two key assumptions for the results are wage determination through bargaining and search frictions. Wage bargaining implies that discriminatory firms pay f-workers less than nondiscriminatory firms; search frictions imply that firms with (not too) positive discrimination coefficients also hire female workers.

When firms bargain, wages are not a choice variable of the firm. As a result, nondiscriminatory firms cannot mimic the discriminatory firms, even if this would be profitable. In contrast, if firms were to post wages as in, for example, Black (1995) and Bowlous and Eckstein (1998), discriminatory firms have no longer an advantage in the wage determination process. Nondiscriminatory firms choose their wage and hiring policies to maximize profits, while discriminatory firms set these policies taking into account their disutility from employing one group of workers. As a result, they set suboptimal wages and/or take suboptimal hiring decisions. Hence, in markets where firms post wages, discriminatory firms

[15] Proof omitted and available on request from the author.

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make ceteris paribus lower profits and tend to be driven out of the market. In combination with the prediction of the present theory, this implies that discrimination and wage differentials due to employer discrimination should be larger in labor markets (countries) where wages are mainly determined through individual bargaining as opposed to posting.

The results have been derived under the implicit assumption that wage bargaining takes place under complete information, in particular, that the employer's taste for discrimination is common knowledge. Consider instead a situation where the firm has private information about its discrimination coefficient and the workers can only observe a noisy signal. In order to derive an explicit solution in this asymmetric information setting, one needs to impose a specific bargaining procedure. (See Kennan and Wilson [1993] for a survey of bargaining with private information.)

To keep the analysis tractable, we consider the following simplified wage-setting game. All workers are equally productive in all jobs. There are only two types of firms, discriminatory with $c = \tilde{c}$ and nondiscriminatory ($c = 0$). Workers make take-it-or-leave-it offers after observing a noisy signal of the firm's type. The exogenous signal is either D or N, where the conditional probability that the firm is discriminatory is higher for signal D. Potential candidates of such a signal might be sex, age, or race of the owner/manager.

It can be shown that proposition 1 remains valid within this modified framework.[16] There exist parameter values such that discriminatory firms make higher profits than nondiscriminatory firms. The intuition is the same as in the complete information case. When an f-worker observes signal D, she makes a lower wage offer than after observing signal N. In contrast, exploiting the lower outside option of a discriminatory firm, m-workers ask for a higher wage after observing the signal D than after observing signal N. As before, the lower wage of f-workers outweighs the higher wage demanded by m-workers. Other features of the full information equilibrium outcome also remain unchanged. Discriminatory firms employ a lower proportion of f-workers than nondiscriminatory firms, f-workers have, on average, lower wages in discriminatory firms, and m-workers earn, on average, more in such firms.

While this is merely a simple example, I conjecture that the result can be replicated in modified versions with different assumptions about the bargaining procedure, such as the number of offers each party can make, the identity of the party making the first or the last offer, as well as with different assumptions about productivity of workers or the distribution of firm types. Crucial is that the workers can observe a signal with some informational value about the employer's discrimination coefficient. Provided that there is an informative signal to which the workers can adjust

[16] Proof available on request from the author.

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their wage offer and their acceptance wage, proposition 1 should hold for various specifications of the wage-setting game under asymmetric information.[17] In the absence of an informative signal, workers cannot update their expectations about a firm's type. Consequently, workers adopt a uniform wage offer and acceptance strategy, and discriminatory firms do not earn higher profits than nondiscriminatory ones.

For simplicity, on-the-job search is excluded. Clearly, since the wage that a worker earns in a firm depends on the match quality and on the discrimination coefficient, there would be incentives for both f-workers and m-workers to engage in on-the-job search. Since the key point here is that f-workers receive lower wages in discriminatory firms and that firms make higher profits the lower the wage is, I would expect the result to hold also in such a setting as long as wages are bargained over.

The results still hold if all workers were equally productive or if general productivity levels differ among workers. Match-specific productivity differences, however, yield the most tractable model. For the same reason the discrimination coefficient is assumed to be continuously distributed without mass points.

V. Wage Predictions and Evidence

Wages and Managerial Characteristics

In this section further predictions of the model about wages are derived and compared to the existing empirical evidence. For a sample of 821 U.S. colleges and universities, Pfeffer, Davis-Blake, and Julius (1995) investigate the impact of the sex and ethnicity of the school's president on the composition of senior administrators. The authors find that the proportion of female (ethnic minority) administrators is larger when the school's president is female (from an ethnic minority). Under the assumption that female managers have (on average) a lower discrimination coefficient, this finding is consistent with both the present theory and Becker's ([1957] 1971) theory of employer discrimination.

In a recent study on Swedish employees, Hultin and Szulkin (1999) find that the proportion of female managers in an organization has a significant positive effect on the wages of female employees and a negative insignificant effect on the wages of male employees. Again assuming that female managers have (on average) a lower discrimination coefficient, the

[17] The party with incomplete information, however, has to be able to give at least one offer. Otherwise, the result does not hold because the acceptance wage of f-workers (and m-workers) is independent of the signal. With an endogenous signal, i.e., a choice variable, the analysis would of course become more complicated. If it is sufficiently costly for the nondiscriminatory firm to mimic the strategy that signals a high discrimination coefficient, there seems little reason to presume that proposition 1 cannot be supported.

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evidence by Hultin and Szulkin (1999) is consistent with the present theory. It is, however, difficult to reconcile with Becker's theory because the wage-taking behavior of the firms implies that there is only one wage for a given type of employee.

Wages and the Composition of Workers

Under the assumption that all jobs are identical but firms differ in their discrimination coefficient, the present model is applicable to intraoccupational wage differentials across firms. Another interpretation of the model is that firms are identical and have several occupations, but that the discrimination coefficient differs between these occupations. This interpretation makes the model also applicable to interoccupational wage differentials.

Section II has shown that more discrimination (higher c values) increases the proportion of m-workers and their wages and decreases f-workers' wages. Hence, working with their own type is associated with higher wages. Viewed differently, the model predicts that male (white) workers earn less when working in female (black)-dominated occupations/firms, while the reverse holds for females (blacks). The wages are lower for male workers in a setting dominated by female workers because of the stronger bargaining position that firms have in these settings. The wages are lower for female workers in male-dominated settings, because firms are more likely to be discriminatory.

The crowding theory by Bergman (1974) and the theory of employee taste for discrimination by Becker ([1957] 1971) also address the issue of wages and the composition of workers. The crowding theory is based on the assumption that one group (women or blacks) is excluded from some occupations. They therefore crowd into the remaining occupations and drive down marginal productivity and wages in these occupations. As in our model (but for a different reason), the crowding theory predicts that female-dominated occupations pay lower wages to men. It also implies that black workers or women who, for reasons such as specialized education, work in sectors dominated by men or whites (i.e., sectors where the discrimination is large) have a lower wage due to taste for discrimination compared to those in other sectors (see Bergman 1974). This effect is essentially the same as in the present model. In the coworker discrimination theory, workers who have to work in integrated firms demand higher wages for the disutility of working with the other sex or race, contradicting the predictions of this model (and those of the crowding theory).

Several empirical studies examine how wages are affected by the occupational or intrafirm sex or race composition. The evidence of the effect of the race composition is mixed, while the majority of the studies of sex

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composition find a negative effect on both men's and women's wages from working in female-dominated environments.[18] The reported lower wages of men in predominantly female environments is consistent with our theory as well as with the crowding theory. But neither of these theories predicts that women earn more when working with men.

One should, however, be cautious when comparing the theoretical wage predictions of this model (as well as others) directly to different empirical findings. First, the theoretical correlation between wages and composition of workers described above holds only if corrected for productivity differences. Second, the proportion of types of workers in a firm (for a given c) is affected by variables that also affect wages—for example, search frictions.

Wage Differentials within a Job Cell

As well as being a theory of wage differentials across firms and occupations, the present theory is also applicable to wage differentials within a job cell, that is, within a given occupation in a given firm. The empirical evidence on the extent of wage differentials within a job cell is inconclusive. Bayard et al. (1999) find that a substantial fraction of the wage differences within a job cell can be attributed to sex discrimination. In contrast, Groshen (1991) concludes that sex has little explanatory power for wage differentials within a job cell. Inexistent wage differentials within a job cell conflicts with the present theory, provided that one fully corrects for productivity differences. If productivity is, however, (partially) unobservable, equal pay within a job cell does not exclude wage discrimination.

Indeed, within the present model, one can construct such examples. Although f-workers have on average lower wages for a given productivity, their productivity in firms with a high discrimination coefficient is higher than those of m-workers. Hence, the average (productivity unadjusted) wage for f-workers may be equal or higher than the average (productivity unadjusted) wage for m-workers in such firms. Thus, the model illustrates that inexistent wage differentials within a job cell do not rule out wage discrimination per se, unless one corrects fully for productivity differences.

[18] Hirsch and Schumacher (1992) find that both blacks and whites earn lower wages if they work in occupations with more black workers. Sorensen (1989) reports a negative effect only on the wages of white male workers working in occupations dominated by black workers; Ragan and Tremblay (1988) report that both white and black workers earned more when working in an integrated firm. For the effect of sex composition on wages, see, e.g., Sorensen (1990), Blau (1977), and Ragan and Tremblay (1988).

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VI. Conclusion

Becker's original model of employer taste for discrimination predicts that discriminatory firms earn lower profits than nondiscriminatory ones, unless there is total segregation, in which case wage discrimination disappears. This article analyzes employer taste for discrimination in an extended framework where there are frictions in the labor market and wages are set by bargaining. The main findings are that discriminatory firms may have higher profits and that, under separation of ownership and management, employing a manager with a taste for discrimination may be profitable for the owners. This holds even if the manager is compensated for the disutility incurred from interacting with the disliked group. Because profits and utility may be higher for discriminatory firms, there is no tendency for them to be driven out of the of market.

Appendix A

Proportions of Unemployed and Distribution of Vacancies

Let u denote the proportion of workers that are unemployed and v the proportion of jobs that are vacant. The steady state unemployment condition implies that the flow out of unemployment equals the flow into unemployment. Hence,

$$\lambda_i u \phi z_i = s(\alpha_i - \lambda_i u). \tag{A1}$$

Rearranging (A1) and using that $\lambda_f + \lambda_m = 1$ gives

$$\lambda_f = \frac{\alpha_f(s+\phi z_m)}{\alpha_f(s+\phi z_m)+\alpha_m(s+\phi z_f)},\ \lambda_m = \frac{\alpha_m(s+\phi z_f)}{\alpha_m(s+\phi z_f)+\alpha_f(s+\phi z_m)}.$$

Analogously, the flow of vacancies filled in steady state should equal the flow of new vacancies. That is,

$$h(c)v = \frac{sg(c)}{s+\phi y(c)},$$

where

$$v = \int_0^{\bar{c}} \frac{s}{s+\phi y(c)} dG(c).$$

Appendix B

Effects of c on Profits through Hiring Standards

To derive explicit expressions for the last two terms in equation (14), it is useful to rewrite the profit function as

$$r\Pi(c) = rV(c) + Y(c), \tag{B1}$$

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where

$$Y(c) = \frac{c\phi\lambda_f[1 - F(\mu_f(c))]}{r + s + \phi y(c)}.$$

Using equations (B1), (8), $[\partial rV(c)]/[\partial\mu_i(c)] = 0$, and $-1 < [drV(c)]/(dc) < 0$, we find that the effect on profits from changed hiring standards is negative.

$$\frac{\partial r\Pi(c)}{\partial\mu_f(c)}\frac{d\mu_f(c)}{dc} = \frac{-c\phi\lambda_f f(\mu_f(c))\{r + s + \phi\lambda_m[1 - F(\mu_m(c))]\}}{[r + s + \phi y(c)]^2}\left[\frac{drV(c)}{dc} + 1\right] < 0,$$

$$\frac{\partial r\Pi(c)}{\partial\mu_m(c)}\frac{d\mu_m(c)}{dc} = \frac{c\phi\lambda_f[1 - F(\mu_f(c))]\phi\lambda_m f(\mu_m(c))}{[r + s + \phi y(c)]^2}\frac{drV(c)}{dc} < 0.$$

Appendix C

Proof of Proposition 2

Using equations (18), (19), (20), and (21) gives

$$rS(c) = \frac{\phi\{\lambda_f\int_{\mu_f(c)}^{\bar{x}}[x - w_f(c, x) - c]f(x)dx + \lambda_m\int_{\mu_m(c)}^{\bar{x}}[x - w_m(c, x)]f(x)dx\}}{r + s + \phi y(c)}. \tag{C1}$$

From $\partial rV^M(c)/\partial\mu_i(c) = \partial rV^O(c)/\partial\mu_i(c) = 0$ at $c = 0$, it follows that

$$\left.\frac{dS(c)}{dc}\right|_{c=0} > 0$$

$$\Leftrightarrow \lambda_f\int_{\mu_f(c)}^{\bar{x}}\left[-\frac{dw_f(c, x)}{dc} - 1\right]f(x)dx + \lambda_m\int_{\mu_m(c)}^{\bar{x}} - \frac{dw_m(c, x)}{dc}f(x)dx > 0. \tag{C2}$$

From the wage equation (23), we get

$$\frac{dw_f(c, x)}{dc} = -\frac{\beta}{t} - \frac{\beta}{t}\frac{drV^M(c)}{dc}, \tag{C3}$$

and

$$\frac{dw_m(c, x)}{dc} = -\frac{\beta}{t}\frac{drV^M(c)}{dc}. \tag{C4}$$

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Using equations (18), (19), and (23) gives

$$rV^M(c) = a + \frac{(1-\beta)\phi\left\{\lambda_f \int_{\mu_f(c)}^{\bar{x}} \left[t(x - rU_f) - c\right] f(x)dx + \lambda_m \int_{\mu_m(c)}^{\bar{x}} t(x - rU_m) f(x)dx\right\}}{r + s + (1-\beta)\phi y(c)} \tag{C5}$$

and

$$\left.\frac{drV^M(c)}{dc}\right|_{c=0} = \frac{-(1-\beta)\phi\lambda_f[1 - F(\mu_f(c))]}{r + s + (1-\beta)\phi y(c)}. \tag{C6}$$

Using equations (C2), (C3), (C4), and (C6) gives

$$\begin{aligned}\left.\frac{dS(c)}{dc}\right|_{c=0} > 0 \Leftrightarrow\ & \lambda_f[1 - F(\mu_f(c))]\left[\frac{\beta}{t} + \frac{\beta}{t}\frac{drV^M(c)}{dc} - 1\right] \\ & + \lambda_m[1 - F(\mu_m(c))]\frac{\beta}{t}\frac{drV^M(c)}{dc} > 0 \\ & \Leftrightarrow y(c)\frac{\beta}{t}\frac{drV^M(c)}{dc} + \lambda_f[1 - F(\mu_f(c))]\left(\frac{\beta}{t} - 1\right) > 0 \\ & \Leftrightarrow \frac{-\beta(1-\beta)\phi y(c)}{r + s + (1-\beta)\phi y(c)} + (\beta - t) > 0 \\ & \Leftrightarrow t < \frac{\beta(r+s)}{r + s + (1-\beta)\phi y(c)}.\end{aligned} \tag{C7}$$

Hence, $S(c)$ is increasing in c at $c = 0$ if the last inequality holds. Q.E.D.

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