Economics Letters 141 (2016) 55–59

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Minority perception of exclusion and promotion hurdles

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HIGHLIGHTS

- Minority perception of social exclusion can lead to promotion hurdle.
- The principal can always elicit more effort from the majority candidate.
- Minority candidate is only promoted if she has a sufficiently superior track record.

ARTICLE INFO

Article history:
Received 4 November 2015
Received in revised form
28 January 2016
Accepted 5 February 2016
Available online 12 February 2016

JEL classification:
J71
D86

Keywords:
Social exclusion
Mentoring
Effort inducement
Promotion

ABSTRACT

This paper describes a model in which, due to social exclusion, a minority candidate perceives her track record to be a less precise indicator of her suitability for promotion. These beliefs imply that the minority candidate is disadvantaged in providing effort and can only be promoted if she can make up for the effort gap with a sufficiently superior track record than the majority candidate.

1. Introduction

The severe underrepresentation of women and minorities at top level positions in corporations and other workplace environments remains a persisting phenomenon.[1] A study in 2005 by Novations, a professional-skills training and consulting firm, concludes that there is a general feeling among women and people of color that (i) unless they possess undeniably superior track records, their chances of advancement to top positions are rather slim, and (ii) they are excluded from social networks within the organization with little access to personal connections and mentoring.[2]

The observation that minority employees and women are at a disadvantage when it comes to networking is supported by a variety of sources in the sociology and psychology literatures that cite mentoring within an organization as a key source of information for the challenges in upper level positions.[3] The common theme in these studies is that the structure of social networks within the organization does depend on gender and race, and hence minority and women employees do feel as "outsiders" without much access to information on the "real rules for promotion".[4]

This paper offers a simple theoretical model to show that the minority feeling of social exclusion might itself be a reason why minority candidates with superior track records are passed over during promotion. Simply put, perception of exclusion alone can make promotion more difficult for minorities. The model features a

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[1] A 2013 biennial survey from Columbia Business School and the Women's Executive Circle of New York, found that women held 40 of 367 executive positions in the state's top 100 public companies by revenue in 2012, or 10.9%—down from 11.7% in 2010 and 11.9% in 2006, when the survey began. Of the 100 companies, 68 had no women serving in top executive roles. See the Wall Street Journal article "Women See Slow Progress In Leadership" by Mara Gay on November 14, 2013.

[2] See the report "The State of the Organization: Diversity and Inclusion in the New Millennium" in 2005 by Boston-based consulting firm Novations.

[3] See Noe (1988), Morrison and Von Glinow (1990) and Ibarra (1992).

[4] Athey et al. (2000) also argue that mentoring may be more natural and effective when people share common interests, cultural experiences or when employees have significant social interactions outside the workplace.

http://dx.doi.org/10.1016/j.econlet.2016.02.006
0165-1765/

principal who belongs to a majority group. The principal considers two candidates, one from the majority group and the other from a minority group, for promotion to an upper level position. The performance in the upper level task depends on (i) the promoted candidate's unobservable effort, (ii) a common technology shock, and (iii) the candidate's unknown ability for the upper level task that I refer to as the candidate's *suitability for promotion*. All parties initially have the same common prior beliefs on each candidate's unknown suitability for promotion.

Before the promotion decision, all parties publicly observe the candidates' past track records in the organization, which serve as an information signals on candidates' suitability for promotion. The innovation in the model is that, depending on their group identities, the three parties have heterogeneous beliefs about the informativeness of the respective track records. The minority candidate perceives her track record to be less informative, capturing the idea that the minority candidate's social exclusion results in her perceiving available information as noisier.[5]

The analysis illustrates that when the minority candidate treats her track record as less informative on her suitability for promotion, the principal can always elicit more post-promotion effort from the majority candidate. This "effort gap" between the candidates arises solely due to the minority candidate's *belief* of having less precise information. The minority candidate can only be promoted if she can make up for this effort gap by having a sufficiently superior track record than the majority candidate. The novel contribution of this paper is to emphasize how poor access to social networks within the organization can make it harder for minority candidates to filter out available information and how, as a result of this perception of having less precise information, minority candidates face a track record hurdle in job advancement. The paper also relates the extent of the hurdle to the severity of the underlying agency problem, and shows that the hurdle is decreasing in the degree of technological uncertainty common to both candidates.

My main focus is to provide a rationale on why minority candidates with superior track records may end up not being promoted. This focus relates the paper to the *statistical discrimination literature*, but there are important differences. As Moro (2009) describes in an excellent short survey, the standard statistical discrimination framework starting with Phelps (1972) and Arrow (1973) has a decision maker/principal who (i) has incomplete information about some outcome-relevant individual characteristic, and (ii) has asymmetric beliefs regarding the average values of relevant variables across groups. The principal using asymmetric beliefs on group averages for statistical inference seem to be a less relevant assumption when an employee has been with the firm for a long period of time. What seems rather more relevant for promotion decisions is the asymmetric access of employees from different groups to social networks and mentoring and hence their consequent asymmetric abilities to filter out the information available to them, which is my focus.

The model has the following specific differences from the statistical discrimination framework. First, the principal here perceives the track records of both candidates as equally informative on the candidates' suitability for promotion. Second, it is the candidates who have asymmetric beliefs about the precision of available information due to their asymmetric access to social networks and mentoring, an issue that largely remains unaddressed in the literature.[6] This novelty alone, however, is not sufficient to generate a hurdle against the minority candidate. The third departure is the principal's effort inducement problem, a feature also not considered in the statistical discrimination literature. The hurdle arises due to the impact of the two candidates' asymmetric beliefs on the principal's effort inducement problem.[7]

2. The model

The model features a principal who considers two candidates (Candidates A and B) for promotion to an upper level position. Only one of the two candidates can be promoted. The principal and Candidate A are both members of the majority group, whereas Candidate B is a minority.[8]

Technology: The output technology is adopted from the additive-normal framework of Holmstrom (1999). If promoted, candidate $j \in \{A, B\}$ expends costly effort $e_j \geq 0$ to produce an observable stochastic output $\tilde{x}_j$ described by

$$\tilde{x}_j = e_j + \tilde{\theta}_j + \tilde{\varepsilon}. \tag{1}$$

In this specification, $\tilde{\varepsilon}$ is a common technology shock and $\tilde{\theta}_j$ is the suitability of candidate j's skill set for the upper level position. Depending on the particular context, different interpretations for $\tilde{\theta}_j$ are possible. For example, if the upper level position involves a managerial task to organize a new department within the organization, then $\tilde{\theta}_j$ can be interpreted as the candidate's organizational skills to perform this task. If the promotion is for an executive position, then $\tilde{\theta}_j$ can be thought of as the candidate's leadership skills, etc. In what follows, for the sake of concreteness I simply refer to $\tilde{\theta}_j$ as the candidate j's suitability for promotion. I employ the standard normality assumptions and assume that

$$\tilde{\varepsilon} \sim N(0, \Sigma) \quad \text{and} \quad \tilde{\theta}_j \sim N(\bar{\theta}, \kappa^{-1}). \tag{2}$$

Hence, the prior distribution of $\tilde{\theta}_j$ is the same for both candidates. For simplicity, I set the prior mean $\bar{\theta} = 0$. A candidate's suitability for promotion $\tilde{\theta}_j$ is unknown by all parties, including candidate $j \in \{A, B\}$. Furthermore, the random variables $\tilde{\varepsilon}$ and $\tilde{\theta}_j$ are assumed to be independent. Both candidates have the same cost of effort described by the functional form $c(e_j) = e_j^2/2$ for $j \in \{A, B\}$. Since the effort choice e_j is not observable, the principal can only provide effort incentives by tying the promoted candidate's compensation to the observable output.

Compensation Contract: I follow the standard CARA-normal agency model and restrict attention to linear compensation schemes. If candidate $j \in \{A, B\}$ is promoted, the principal offers that candidate a linear contract $f_j + q_j x_j$ where f_j is a fixed payment and q_j is the candidate's share of output. Both candidates have the same CARA preferences described by $U(\tilde{w}_j) \equiv -\exp(-a\tilde{w}_j)$ over

[5] It is entirely valid to argue that the minority candidate's lack of social access is typically the result of explicit biases and discriminatory behavior that also affect the promotion decisions in favor of majority candidates. In this paper, my focus is the effect of social exclusion on the beliefs of minority candidates and how these beliefs affect the promotion decision in an agency framework *in the absence of such explicit biases*.

[6] To the best of my knowledge, the only other paper that addresses the impact of mentoring on promotion policies and diversity is the work by Athey et al. (2000). Their model and the issues they focus, however, are quite different from this paper. While they consider human capital investment decisions of employees given the quality of mentoring they receive, this paper focuses on how social exclusion determines beliefs for different groups on the quality of available information and how these heterogeneous beliefs have an impact on the promotion decision.

[7] In other related work, Fryer (2007) and Bjerk (2008) present dynamic models of statistical discrimination in promotion, but do not consider the implications of minority social exclusion in an agency framework.

[8] These groups can be related to ethnic, cultural or gender differences. For ease of reference, I refer to the majority candidate as "he" and the minority candidate as "she".

final wealth $\tilde{w}_j$ with the common CARA coefficient $a > 0$ where $\tilde{w}_j$ is given by

$$\tilde{w}_j = f_j + q_j\tilde{x}_j - c(e_j). \tag{3}$$

Both candidates also have the same certainty equivalent outside option normalized to zero. Given the normality assumptions and the CARA preferences, if promoted, candidate $j \in \{A, B\}$ chooses e_j to maximize the mean–variance objective function

$$E[\tilde{w}_j] - \frac{a}{2}Var[\tilde{w}_j]. \tag{4}$$

Information Signals: The key ingredient of the model are the information signals on the two candidates' suitability for promotion. These signals can be thought of as the candidates' track records within the organization before they are considered for a promotion.[9] I assume that a candidate's prior service in the organization generates a *publicly observable* and noisy information signal $\tilde{s}_j$ on each candidate's suitability for promotion $\tilde{\theta}_j$ where

$$\tilde{s}_j = \tilde{\theta}_j + \tilde{\delta}_j \quad \text{for } j \in \{A, B\}. \tag{5}$$

In what follows, I sometimes refer to the realization s_j as the candidate j's track record. Crucially, I depart from the standard statistical discrimination framework and assume that, *depending on their group identities*, the parties have heterogeneous beliefs about the informativeness of the respective signals on a candidate's suitability for promotion.

- (i) For the principal and Candidate A, who share the same group identity, the signal realizations s_A and s_B are equally informative with precision τ. Formally, for both the principal and Candidate A, the noise term $\tilde{\delta}_j$ in (5) is distributed with $\tilde{\delta}_j \sim N(0, \tau^{-1})$ for $j \in \{A, B\}$.
- (ii) Candidate B (minority candidate), however, believes that the signal technology $\tilde{s}_B$ is less informative than $\tilde{s}_A$. Formally, for Candidate B the noise term $\tilde{\delta}_B$ is distributed with $\tilde{\delta}_B \sim N(0, \phi^{-1})$ where $\phi < \tau$. In other words, Candidate B perceives her track record s_B to be a less precise signal on her suitability for promotion compared to the precision τ that the principal and Candidate A assign to s_A and s_B. Candidate B's perceived precision ϕ is common knowledge.

The above key assumption aims to capture the idea that as outsiders, minorities might feel that the existing social networks are better suited for allowing majority group employees to more precisely evaluate their suitability for upper level positions.[10] Hence, the minority candidate's feeling of social exclusion might result in perceiving available information as noisier.

Posterior Beliefs on Suitability for Promotion: One can compute the posterior beliefs of the parties as follows. After observing track record s_A, the principal and Candidate A have the common posterior belief on $\tilde{\theta}_A$ given by

$$(\tilde{\theta}_A \mid s_A) \sim N\left(\left(\frac{\tau}{\tau+\kappa}\right)s_A, (\tau+\kappa)^{-1}\right). \tag{6}$$

After observing s_B, the principal's posterior on $\tilde{\theta}_B$ is given by

$$(\tilde{\theta}_B \mid s_B) \sim N\left(\left(\frac{\tau}{\tau+\kappa}\right)s_B, (\tau+\kappa)^{-1}\right), \tag{7}$$

whereas Candidate B's posterior on $\tilde{\theta}_B$ takes the form

$$(\tilde{\theta}_B \mid s_B) \sim N\left(\left(\frac{\phi}{\phi+\kappa}\right)s_B, (\phi+\kappa)^{-1}\right). \tag{8}$$

From (6)–(8), one can verify that the assumption $\tau > \phi$ implies the minority candidate has a noisier posterior belief about her suitability for promotion.

The sequence of events is as follows. At date 0, the public signals (track records) are realized. At date 1, the principal decides which candidate to promote and sets a compensation contract. At date 2, the candidate promoted privately chooses effort. At date 3, output is realized.

3. Analysis

Benchmark with Observable Effort: Consider first the benchmark case when the promoted candidate's effort is observable. In this case, the principal can prescribe an effort level in the contract and pay the promoted candidate a fixed wage w based on this effort. The first best effort e_j^{FB} that the principal specifies for candidate $j \in \{A, B\}$ is given by

$$e_j^{FB} \arg\max E[\tilde{x}_j(e_j) \mid s_j] - c(e_j) = E[\tilde{\theta}_j \mid s_j] + e_j - e_j^2/2. \tag{9}$$

Hence, regardless of the candidate promoted, under observable effort the principal specifies the same first best effort level

$$e_A^{FB} = e_B^{FB} = 1 \tag{10}$$

and pays the promoted candidate a fixed wage $w = \left(e^{FB}\right)^2/2 = 1/2$. Since both candidates expend the same effort if promoted, when the effort choice is observable the principal always promotes the candidate with a better track record. This observation follows because (i) the candidates' beliefs on $\tilde{\theta}_j$ has no bearing on the first best effort level implemented, (ii) for the principal, both signal technologies $\tilde{s}_A$ and $\tilde{s}_B$ have the same precision.

Unobservable Effort: I first describe the principal's optimal contract problem to determine the effort levels that the principal can optimally elicit from each candidate. Given s_j for candidate $j \in \{A, B\}$, the principal sets a compensation contract (f_j, q_j) to maximize the expected output net of the promoted candidate's compensation. Using w_j in (3), one can formally state the principal's problem as choosing (f_j, q_j) to maximize

$$V_j(s_j) \equiv E[(1-q_j)\tilde{x}_j(e_j^*) \mid s_j] - f_j \tag{11}$$

subject to

$$E[q_j\tilde{x}_j(e_j^*) \mid s_j] + f_j - \frac{a}{2}Var[q_j\tilde{x}_j(e_j^*) \mid s_j] - c(e_j^*) \geq 0 \tag{12}$$

$$e_j^* \in \arg\max E[q_j\tilde{x}_j(e_j^*) \mid s_j] + f_j - \frac{a}{2}Var[q_j\tilde{x}_j(e_j^*) \mid s_j] - c(e_j^*). \tag{13}$$

In the above formulation, the inequality in (12) stands for the promoted candidates's participation constraint and (13) describes that candidate's optimal effort.

Given the technology $\tilde{x}_j$ in (1) and using each candidate's posterior beliefs in (6) and (8), the optimal effort problems in (13) can be rewritten as

$$e_A^* \in \arg\max q_A\left(e_A + \left(\frac{\tau}{\tau+\kappa}\right)s_A\right) + f_A - \frac{e_A^2}{2} - \frac{a}{2}q_A^2[(\tau+\kappa)^{-1} + \Sigma] \tag{14}$$

$$e_B^* \in \arg\max q_B\left(e_B + \left(\frac{\phi}{\phi+\kappa}\right)s_B\right) + f_B - \frac{e_B^2}{2} - \frac{a}{2}q_B^2[(\phi+\kappa)^{-1} + \Sigma]. \tag{15}$$

[9] For example, these signals could be the past sales figures of the candidates when working as sales agents, and the upper level position might involve serving as a sales manager.

[10] For example, Chima and Wharton (1999) convincingly argue that minorities often have difficulty in becoming full participants of the "old boy" network. They point out that the power elite in work organizations, mostly Caucasian males, simply prefer to mentor other Caucasian males.

Straightforward maximization yields

$$e_j^* = q_j \quad \text{for } j \in \{A, B\}. \tag{16}$$

If promoted, each candidate responds to the contract by choosing an effort level equal to their share of output q_j. As the effort decision does not affect the variance of the output $\tilde{x}_j$, the effort choices do not directly depend on the candidates' beliefs on their suitability for promotion. However, the optimal output share q_j that the principal offers to each candidate does depend on their beliefs on $\tilde{\theta}_j$ as shown next.

To characterize the optimal output share q_j to be offered to a promoted candidate, consider the participation constraint in (12). In equilibrium, this constraint holds as an equality. Using $e_j^* = q_j$ and solving for the fixed fees f_A and f_B yields

$$f_A = \frac{aq_A^2}{2}\underbrace{[(\tau+\kappa)^{-1}+\Sigma]}_{\text{variance of } \tilde{x}_A \text{ for A}} - \frac{q_A^2}{2} - q_A\left(\frac{\tau}{\tau+\kappa}\right)s_A \tag{17}$$

$$f_B = \frac{aq_B^2}{2}\underbrace{[(\phi+\kappa)^{-1}+\Sigma]}_{\text{variance of } \tilde{x}_B \text{ for B}} - \frac{q_B^2}{2} - q_B\left(\frac{\phi}{\phi+\kappa}\right)s_B. \tag{18}$$

The above expressions reveal that, to elicit an effort level $e_j^* = q_j$, the riskiness of the output technology $\tilde{x}_j$ is higher from the perspective of the minority candidate (Candidate B). Given the posterior beliefs of Candidate A in (6), one has

$$Var[\tilde{x}_A \mid s_A] = Var[\tilde{\theta}_A + \tilde{\varepsilon} \mid s_A] = [(\tau+\kappa)^{-1}+\Sigma] \tag{19}$$

whereas Candidate B's posterior beliefs on $\tilde{\theta}_B$ described in (8) implies

$$\begin{aligned} Var[\tilde{x}_B \mid s_B] &= Var[\tilde{\theta}_B + \tilde{\varepsilon} \mid s_B] = [(\phi+\kappa)^{-1}+\Sigma] \\ &> Var[\tilde{x}_A \mid s_A] \end{aligned} \tag{20}$$

since $\phi < \tau$. When offered an output share q_j that elicits an effort $e_j^* = q_j$, Candidate B hence believes to have a riskier wealth distribution than Candidate A.

This last observation indicates that it is more costly for the principal to elicit a given effort level e_j^* by offering q_j to Candidate B. The intuition is that Candidate's B's "perceived" lack of precise information on her suitability for promotion $\tilde{\theta}_B$ gives rise to a more uncertain output technology in Candidate B's point of view. As a result, providing effort incentives to the minority candidate by tying compensation to output becomes more costly than the majority candidate. This can be directly seen by comparing f_A and f_B in (17)–(18). To elicit the same effort level by setting $q_A = q_B$, the principal has to pay $f_B > f_A$ since $\tau > \phi$. Therefore, we have

Proposition 1. *For $\tau > \phi$, the principal can always elicit more effort from the majority candidate A after promotion, that is, $e_A^* > e_B^*$. For $\tau = \phi$, we have $e_A^* = e_B^*$.*

Proof. See the Appendix.

Optimal Promotion Decision: Consider the principal's maximized expected payoff $V_j^*(s_j)$ from promoting candidate $j \in \{A, B\}$ as described in (11). The principal promotes the minority candidate B if and only if $V_B^*(s_B) > V_A^*(s_A)$. It can be shown (see the Appendix) that this condition requires

$$\begin{aligned} V_B^*(s_B) > V_A^*(s_A) &\iff (s_B - s_A) \\ &> \left(\frac{\tau+\kappa}{2\tau}\right)\left[\underbrace{(e_A^* - e_B^*)}_{>0} + \underbrace{\left(\frac{(\tau-\phi)\,\kappa}{(\tau+\kappa)\,(\phi+\kappa)}\right)e_B^*}_{>0}\right]. \end{aligned} \tag{21}$$

Both terms on the right hand side of the expression in (21) are strictly positive. For the first term, we have $e_A^* - e_B^* > 0$ from Proposition 2 and the second term is also strictly positive since $\tau > \phi$. This observation implies that the minority candidate B can only be promoted if her track record s_B is sufficiently superior than the majority candidate A's track record s_A. The following result verifies this intuition.

Proposition 2. *There exists a threshold $\Delta_s > 0$ such that the principal promotes the minority candidate B if and only if*

$$s_B - s_A > \Delta_s. \tag{22}$$

The minority candidate is promoted only if her track record beats the majority candidate's track record by at least Δ_s.

Proof. See the Appendix.

I refer to the minimum required superiority Δ_s of the minority candidate's track record to get promoted as the 'track record hurdle'. The key channel that generates the hurdle is the differential effort levels (effort gap) between the two candidates. In the observable effort benchmark, there is no hurdle: the candidate with a better track record gets the promotion. The mechanism that gives rise to the hurdle is the principal's effort inducement problem.[11] As Proposition 1 illustrates, the less informative the minority candidate perceives her track record on her suitability for promotion, the more advantage the majority candidate gains in this effort problem. Therefore, the track record hurdle arises in this model because (i) post-promotion effort is hard to monitor hence the principal needs to overcome a moral hazard problem and, (ii) the minority candidate's perception of having less precise information implies she is disadvantaged in the effort inducement problem. She has to make up for this gap by having a sufficiently superior track record. The determinants of Δ_s are described below.

Proposition 3. *The hurdle Δ_s is* (i) *increasing in $\tau - \phi$.* (ii) *decreasing in the degree of common technological uncertainty Σ.* (iii) *decreasing in the candidates' coefficient of risk aversion a.*

Proof. The comparative statics results all follow from the expression (A.9) for Δ_s derived in the Appendix.

As $\tau - \phi$ increases, the effort gap $e_A^* - e_B^*$ in favor of the majority candidate becomes larger. Hence, the minority candidate needs to overcome a larger hurdle Δ_s. This result implies that the more socially excluded the minority candidate "feels", the more superior her track record needs to be to get promoted. Similarly, as the degree of common technological uncertainty Σ increases, the effort gap $e_A^* - e_B^*$ becomes smaller and hence the hurdle Δ_s decreases. Therefore, the track record hurdle is more likely to emerge in promotions where the post promotion performance is subject to less technological uncertainty.

4. Conclusion

The paper emphasizes how social exclusion within the organization can make it harder for minority candidates to filter out available information and how this perception of having less precise

[11] Since the participation constraint is always binding, the principal extracts all the surplus by choice of the fixed fee component. In that respect, the promoted candidate receives the same equilibrium utility as the one who is not promoted. Since the mechanism for the result relies on the effect of the candidates' beliefs on the principal's effort inducement problem, the same result would continue to hold when the promoted candidate received a private non-pecuniary benefit from being promoted.

information can alone create a track record hurdle in job advancement. In the model, this minority perception of having less precise information implies that the principal can always elicit more effort from a majority candidate. As a result, minority candidates are promoted only if they have sufficiently superior track records to make up for the effort gap. Their disadvantage in the principal's effort inducement problem thus translates into a track record hurdle in the promotion decision. This mechanism that generates the hurdle is quite distinct from the one in the statistical discrimination literature which relies purely on principal's problem of statistical inference.

Appendix

Proof of Proposition 2. Using (11) and (17) one can rewrite the principal's maximization problem for Candidate A as

$$q_A^* \in \arg\max V_A(s_A) \equiv E[(1-q_A)\tilde{x}_A(e_A^*) \mid s_A] - f_A$$
$$= q_A + \left(\frac{\tau}{\tau+\kappa}\right) s_A - \frac{q_A^2}{2} - \frac{a}{2} q_A^2[(\tau+\kappa)^{-1} + \Sigma].$$

Maximizing the above expression with respect to q_A and using $e_A^* = q_A^*$, one obtains

$$e_A^* = q_A^* = \frac{1}{1 + a[(\tau+\kappa)^{-1} + \Sigma]}. \tag{A.1}$$

Similarly, given (11) and (18), one can rewrite the principal's maximization problem for Candidate B as

$$q_B^* \in \arg\max V_B(s_B) \equiv E[(1-q_B)\tilde{x}_B(e_B^*) \mid s_B] - f_B$$
$$= \left(1 - \frac{(\tau-\phi)\,\kappa}{(\tau+\kappa)\,(\phi+\kappa)}\right) q_B + \left(\frac{\tau}{\tau+\kappa}\right) s_B$$
$$- \frac{a}{2} q_B^2[(\phi+\kappa)^{-1} + \Sigma] - \frac{q_B^2}{2}.$$

Maximizing the above expression with respect to q_B and using $e_B^* = q_B^*$, one obtains

$$e_B^* = q_B^* = \frac{1-z}{1 + a[(\phi+\kappa)^{-1} + \Sigma]}$$
$$\text{where } z \equiv \frac{(\tau-\phi)\,\kappa}{(\tau+\kappa)\,(\phi+\kappa)}. \tag{A.2}$$

For $\tau > \phi$, we have $e_A^* > e_B^*$, and for $\tau = \phi$ we have $e_A^* = e_B^*$.

Proof of Proposition 3. To derive (21), consider the principal's maximized expected payoff $V_A^*(s_A)$ from promoting Candidate A. Using f_A in (17), one can write

$$V_A^*(s_A) \equiv q_A^* + \left(\frac{\tau}{\tau+\kappa}\right) s_A - \frac{q_A^{2*}}{2}\left[1 + a((\tau+\kappa)^{-1} + \Sigma)\right]. \tag{A.3}$$

Given the optimal q_A^* in (A.1) and recalling that $e_A^* = q_A^*$, the expression in (A.3) can simplified to obtain

$$V_A^*(s_A) = \left(\frac{\tau}{\tau+\kappa}\right) s_A + \frac{1}{2} e_A^*. \tag{A.4}$$

Consider now the principal's maximized expected payoff from promoting Candidate B. Given f_B in (18), this payoff can be written as

$$V_B^*(s_B) \equiv (1-z)\, q_B^* + \left(\frac{\tau}{\tau+\kappa}\right) s_B$$
$$- \frac{q_B^{2*}}{2}\left[1 + a((\phi+\kappa)^{-1} + \Sigma)\right]. \tag{A.5}$$

Using the optimal q_B^* in (A.2) and recalling that $e_B^* = q_B^*$, the expression in (A.5) can be simplified to obtain

$$V_B^*(s_B) = \left(\frac{\tau}{\tau+\kappa}\right) s_B + \frac{1}{2}(1-z)\, e_B^*. \tag{A.6}$$

The principal promotes the minority candidate B if and only if $V_B^*(s_B) > V_A^*(s_A)$. Using (A.4) and (A.6), this condition requires

$$\left(\frac{\tau}{\tau+\kappa}\right) s_B + \frac{1}{2}(1-z)\, e_B^* > \left(\frac{\tau}{\tau+\kappa}\right) s_A + \frac{1}{2} e_A^*. \tag{A.7}$$

Reorganizing and using the definition of z in (A.2), one obtains

$$s_B - s_A > \left(\frac{\tau+\kappa}{2\tau}\right)\left[(e_A^* - e_B^*) + \left(\frac{(\tau-\phi)\,\kappa}{(\tau+\kappa)\,(\phi+\kappa)}\right) e_B^*\right] \tag{A.8}$$

as stated in (21) in the text.

Using (A.1) and (A.2), and given the definition of z in (A.2), the above condition in (A.8) yields $s_B - s_A > \Delta_s$ where

$$\Delta_s \equiv \left(\frac{\tau+\kappa}{2\tau}\right)\left[\left(\frac{1}{1 + a[(\tau+\kappa)^{-1} + \Sigma]}\right)\right.$$
$$\left. - \left(\frac{(1-z)^2}{1 + a[(\phi+\kappa)^{-1} + \Sigma]}\right)\right]. \tag{A.9}$$

Note from this last expression that we have $\Delta_s = 0$ when $\tau = \phi$ since in that case $z = 0$.

References

Arrow, K., 1973. The theory of discrimination. In: Ashenfelter, Orley, Rees, Albert (Eds.), Discrimination in Labor Markets. Princeton University Press, pp. 3–33.

Athey, S., Avery, C., Zemsky, P., 2000. Mentoring and diversity. Amer. Econ. Rev. 90 (4), 765–786.

Bjerk, D., 2008. Glass ceilings or sticky floors? Statistical discrimination in a dynamic model of hiring an promotion. Econ. J. 118, 961–982.

Chima, Felix O., Wharton, William D., 1999. African Americans and the workplace: Overview of persistent discrimination. J. Intergr. Relat. 26, 18–34.

Fryer, R.G., 2007. Belief flipping in a dynamic model of statistical discrimination. J. Public Econ. 91, 1151–1166.

Holmstrom, B., 1999. Managerial incentive problems: A dynamic perspective. Rev. Econom. Stud. 66 (1), 169–182.

Ibarra, H., 1992. Homophily and differential returns: Sex differences in network structure and access in an advertising firm. Adm. Sci. Q. 37 (3), 422–447.

Moro, A., 2009. Statistical discrimination. In: Durlauf, Steven N., Blume., Lawrence E. (Eds.), The New Palgrave Dictionary of Economics. Palgrave Macmillan.

Morrison, A., Von Glinow, M.A., 1990. Women and minorities in management. Am. Psychol. 45 (2), 200–208.

Noe, R., 1988. Women and mentoring: A review and research agenda. Acad. Manag. Rev. 13 (1), 65–78.

Phelps, E.S., 1972. The statistical theory of racism and sexism. Amer. Econ. Rev. 62 (4), 659–661.