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Wage discrimination and population composition in the long run

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HIGHLIGHTS

- When labor supply varies, increasing the proportion of a population group may increase or decrease its wage.
- The direction of this effect depends on the relative employment rate of the group.
- The effect on relative wages has the same direction as in the case of fixed labor supplies.
- With variable preferences, the effect on relative wages cannot be signed without additional information.

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ABSTRACT

We derive the conditions that sign the effects of changing population composition on wage levels and ratios, when labor supply and discrimination preferences vary. The overall effect depends on an aggregate market, a relative market, and a preference distribution effect.

1. Introduction

In the presence of labor market discrimination, wage differentials are a function of population composition. With employer discrimination, Becker (1971a) showed that as the supply of the discriminated group increases, its wage falls and the wage of the non-discriminated group increases, resulting in a larger relative wage differential. Becker's analysis relied on perfectly inelastic labor supplies and constant discrimination preferences. In the long run labor supplies may not be fixed and discrimination preferences may change in response to a changing population composition. How does the changing population composition affect wages of discriminated and non-discriminated groups when labor supplies and preferences vary? This question bears directly on any analysis of the effects of the changing racial and ethnic composition in the US in the past 30 years which saw the proportion of non-Hispanic white population falling from 80% in 1980 to 64% in 2010 (US Census Bureau, 1995, 2011). This paper shows that a changing population composition has three distinct effects on wages and derives the conditions determining the direction of each effect.

Initially Becker's taste-based discrimination models were viewed as plausible only in the short run. Subsequent theoretical work by Goldberg (1982) and Charles and Guryan (2007) showed how employer discrimination may endure in the long run and Charles and Guryan (2008) found empirical support for Becker's model for the period 1972–2004.

In this paper, we follow Goldberg's (1982) articulation of Becker's (1971a) employer discrimination model and allow for labor supply to vary at the extensive margin and preferences to change with population composition. The focus on the extensive margin is empirically relevant and theoretically convenient. Unlike its effect on hours, the effect of wages on participation can be assumed monotonic. Moreover it is widely accepted that the labor supply responsiveness at the extensive margin dominates that of the intensive margin (Heckman, 1993).

2. The model

Consider two types of workers, M and F, with identical productive capacity. Employers dislike employing workers of type F, with this distaste expressed in a discrimination coefficient d_F. When the market wage for the F workers is w_F, employers value it as $(1 + d_F)w_F$ with $d_F \geq 0$. Following Becker (1971b), employers'

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preferences are expressed as

$$U = \Pi - d_F w_F L_F, \quad (1)$$

where Π denotes profits and L_F the employment of F workers. An employer's problem is to maximize utility subject to

$$Q = f(L) = f(L_M + L_F) \quad (2)$$
$$\Pi = Q - (w_F L_F + w_M L_M), \quad (3)$$

where the price of output is taken as the numeraire and $f' > 0, f'' < 0$. From the first order conditions we have

$$f' = w_M \quad \text{if } L_M > 0, \text{ and}$$
$$f' < w_M \quad \text{if } L_M = 0 \quad (4)$$
$$f' = w_F(1 + d_F) \quad \text{if } L_F > 0, \text{ and}$$
$$f' < w_F(1 + d_F) \quad \text{if } L_F = 0. \quad (5)$$

Conditions (4) and (5) imply that in a competitive labor market with a continuous distribution of d_F across employers and for given wages for M and F, a firm hires either only M or only F workers. If an employer's d_F is such that $w_M > w_F(1+d_F)$, the relative market wage differential between M and F is higher than this employer's discrimination coefficient, and therefore only F are employed. For such a firm the marginal cost of hiring F workers is always below the marginal cost of hiring M workers. Similarly, if an employer's d_F is such that $w_M < w_F(1 + d_F)$, only M workers are hired.

If d_F has a density $h(d_F; p_M)$, then $x = \frac{1}{d_F+1}$ has a density $g(x; p_M)$ which, in principle, can be derived from $h(d_F; p_M)$ (see Goldberg, 1982). The distribution of discrimination coefficients depends on the parameter p_M, the proportion of the non-discriminated group. We have no strong priors on how population composition affects discriminatory preferences. In the sociology and psychology literature the inter-group threat theory suggests that discrimination increases as the proportion of the discriminated group increases while the inter-group contact theory points to conditions that generate the opposite effect (Dixon, 2006; Pettigrew, 1998). In terms of $x = \frac{1}{d_F+1}$, inter-group threat theory implies that the distribution of x for higher p_M first-order stochastically dominates that for lower p_M. Inter-group contact theory implies the reverse.

Individuals either work for a fixed number of hours or not at all. If the cumulative distribution function of reservation wages of group k is given by $S_k(w_k)$, $k = F, M$, then $S_k(w_k)$ is the employment rate of group k at wage w_k. The equilibrium wages of groups F, M are determined by

$$p_M S_M(w_M) = \int_0^{w_F/w_M} R(w_M) g(x; p_M) dx \quad (6)$$

$$p_F S_F(w_F) = \int_{w_F/w_M}^1 R\left(\frac{w_F}{x}\right) g(x; p_M) dx, \quad (7)$$

where p_k is the population proportion of group $k = F, M$, $R(\cdot) = [f']^{-1}(\cdot)$ is a firm's labor demand, and population size is normalized to one.

Eqs. (6) and (7) indicate that the F/M wage ratio regulates the clearing of the markets for each group. In equilibrium the aggregate supply of M workers equals the sum of the demands of those firms with $x < \frac{w_F}{w_M}$. The aggregate supply of the F workers equals the sum of the demands of those firms with $x > \frac{w_F}{w_M}$. The general economic problem is the simultaneous clearing of the markets for two inputs which are imperfect substitutes, with the degree of substitutability variable and endogenous at the firm level.

Goldberg (1982) discusses how firm size varies with (constant) discrimination preferences, and Becker (1971a) analyzes how shifts of the perfectly inelastic supplies of the two groups affect equilibrium wages.

3. Analysis

To analyze the effects of a changing population composition on equilibrium wages, we derive $\frac{dw_M}{dp_M}$ and $\frac{dw_F}{dp_M}$ from equilibrium Eqs. (6) and (7). We obtain

$$\frac{dw_F}{dp_M} = \Delta^{-1} \cdot \left[E_3 \frac{w_F}{w_M^2}(S_M - S_F) + S_F(E_1 - p_M S'_M) - E_3 \frac{w_F}{w_M^2} D_1 + \left(E_1 - p_M S'_M - E_3 \frac{w_F}{w_M^2}\right) D_2 \right] \quad (8a)$$

$$\frac{dw_M}{dp_M} = \Delta^{-1} \cdot \left[\frac{E_3}{w_M}(S_M - S_F) - S_M(E_2 - p_F S'_F) + \left(E_2 - p_F S'_F - \frac{E_3}{w_M}\right) D_1 - \frac{E_3}{w_M} D_2 \right], \quad (8b)$$

where

$$E_1 = R'(w_M) \cdot \int_0^{w_F/w_M} g(x; p_M) dx < 0$$

$$E_2 = \int_{w_F/w_M}^1 R'\left(\frac{w_F}{x}\right) \frac{1}{x} g(x; p_M) dx < 0$$

$$E_3 = R(w_M) g\left(\frac{w_F}{w_M}; p_M\right) > 0$$

$$D_1 = R(w_M) \int_0^{w_F/w_M} g_M(x; p_M) dx = \frac{\partial}{\partial p_M}\left[\int_0^{w_F/w_M} R(w_M) g(x; p_M) dx\right]$$

$$D_2 = \int_{w_F/w_M}^1 R\left(\frac{w_F}{x}\right) g_M(x; p_M) dx = \frac{\partial}{\partial p_M}\left[\int_{w_F/w_M}^1 R\left(\frac{w_F}{x}\right) g(x; p_M) dx\right]$$

$$\Delta = -(E_1 - p_M S'_M)\left(E_2 - p_F S'_F - \frac{E_3}{w_M}\right) + (E_2 - p_F S'_F) E_3 \frac{w_F}{w_M^2} < 0$$

$$p_F = 1 - p_M.$$

E_1 (E_2) is the rate of change in the demand for M (F) workers as their wage changes, keeping the equilibrium wage ratio – and therefore the density mass of M employers – fixed. These are negative as long as $R'(\cdot) < 0$. Δ is signed using $R'(\cdot) < 0$ and $S'(\cdot) \geq 0$.

D_1 (D_2) is the effect of the changing population composition on the labor demand of the M (F) workers, through its effect on the distribution of preferences, keeping the equilibrium wage ratio fixed. The signs of the D terms depend on the way the preference distribution changes as p_M changes and are always opposite. If $d'_F(p_M) \leq 0$ for all p_M, then because $g(x; p'_M)$ first-order stochastically dominates $g(x; p''_M)$ for $p' \geq p''_M$, we have $D_1 \leq 0$ and $D_2 \geq 0$. If on the other hand $d'_F(p_M) \geq 0$ for all p_M, then the signs of D_1 and D_2 are reversed.

Eqs. (8a) and (8b) show that a changing population composition has three effects on wage levels.

The aggregate market effect:

The sign of the aggregate market effect depends on the difference in employment rates between the two groups, $S_M - S_F$. For example, if $S_M \geq S_F$ and p_M increases, aggregate labor supply increases, putting downward pressure on the wages of both groups, and the aggregate market effect on both $\frac{dw_M}{dp_M}$ and $\frac{dw_F}{dp_M}$ is negative.

The relative market effect:

The sign of the relative market effect is always negative for the group whose population proportion increases and is the effect analyzed by Becker (1971a).