Monopsonistic wage discrimination and employment effect under conditions of constant labor supply elasticity

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Abstract

This note exploits an alternative but simple way to examine the employment effect of wage discrimination when the constant elasticity labor supply curves are strictly concave. The Bernoulli inequality applied in this paper allows us to show that wage discrimination increases total employment in a relative simple way, without resorting to complicated manipulations as were used by Formby, Layson and Smith (1983) and Shieh (2001).

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1. Introduction

Formby, Layson and Smith (henceforth FLS) in their well-known 1983 paper utilized Lagrangean techniques to examine the output effect of monopolistic third degree price discrimination under constant demand elasticity conditions. They also examined the employment effect of monopsonistic third degree wage discrimination under constant labor supply elasticity conditions. Recently, in this journal, Aguirre (2006) provided a much simple approach, the Bernoulli inequality, to show FLS's result that monopolistic price discrimination increases total output under constant demand elasticity if the demand curves are strictly concave. However, Aguirre didn't consider the impact of wage discrimination on total employment. It would be interesting and important to apply the Bernoulli inequality to investigate the employment effect of wage discrimination.

The purpose of this paper is to fill this gap. We will set up a monopsony model with *n* labor markets and examine the effect of wage discrimination on total employment by using the Bernoulli inequality. It will be shown that monopsonistic wage discrimination increases total employment if the labor supply curves belong to the class of strictly concave and constant elasticity.

2. Analysis

Consider a monopsonistic firm which uses a single input, labor, to produce a product that was sold in a perfectly competitive market, e.g., FLS (1982, 1983) and Sandmo (1994). Assume also that the firm hires workers from all n segregated markets. The labor supply function in market i (i = 1, 2, 3,..., n) has constant elasticity and is given by $L_i(w_i) = a_i w_i^{e_i}$ where w_i = wage rate, e_i = constant elasticity, $a_i > 0$ and $e_i > 1$. If the third degree wage discrimination is allowed, the firm's problem in market i is: max $\pi_i = pq - w_iL_i$ where $q = f(L) = \Sigma L_i$, p is determined at the perfectly competitive product market $\Sigma L_i = L$ (total employment) and $\Sigma \equiv \sum_{i=1}^{n}$. For simplicity, we drop the index throughout the paper. It should be noted that the perfectly competitive output market and the fixed coefficient production function assumptions are not too restrictive. Ekelund, Higgins and Smithson pointed out that marginal revenue product is independent of monopsony's ability to discriminate, (1981, 665). FLS maintained that "the slope of MRP curve is directly pertinent only to the magnitude of the employment change but not to the direction of that change." (1982, footnote 1, 551). Shieh (1995) showed Ekelund, Higgins and Smithson's (1981) and FLS's (1982) assertion mathematically.

Following Boal and Ransom (1997, p. 87), via the first order condition, we obtain the Pigou index in market i is inversely proportional to e_i, i.e.,

$$[(p - w_i^*)/w_i^*] = (1/e_i),\ i = 1, 2, 3, \dots, n \tag{1}$$

Solving (1), we obtain the optimal wage in market i

$$w_i^* = p/[1 + (1/e_i)],\ i = 1, 2, 3, \dots, n \tag{2}$$

Thus, the monopsonistic firm will offer a higher wage in the market with the higher elasticity of labor supply. The employment in market i will be

$$L_i^* = a_i[pe_i/(1 + e_i)]^{e_i}, \; i = 1, 2, 3, \ldots, n \tag{3}$$

and total employment under wage discrimination would be

$$L^* = \Sigma L_i^* = \Sigma\, a_i[pe_i/(1 + e_i)]^{e_i} \tag{4}$$

Under simple monopsony, the firm's problem is: max $\pi = pL - wL$. Via the first order condition, the Pigou index is

$$[(p - w^o)/w^o] = [1/e(w^o)] \tag{5}$$

where $e(w^o)$ = the elasticity of the aggregate supply of labor at w^o. Since $L = \Sigma\, L_i$, the weighted average of the elasticities of individual markets, $e(w^o)$, can be written as:

$$e(w^o) = [\Sigma\, L_i'(w^o)][w^o/\Sigma L_i(w^o)] = \Sigma e_i a_i (w^o)^{e_i} / \Sigma a_i (w^o)^{e_i} = \Sigma \omega_i (w^o) e_i \tag{6}$$

where $L_i'(w^o)$ is $dL(w)/dw$ at $w = w^o$ and $\omega_i(w^o) = L_i(w^o)/\, \Sigma L_i(w^o)$ is the share of market i in total employment at the optimal uniform wage (w^o). For convenience and without loss of generality, following FLS (1983), we assume that the units of employment (L) are defined so that $w^o = 1$ and $p = 1 + (1/e)$. With this convention, (6) can be rewritten as:

$$e(1) = \Sigma e_i a_i / \Sigma a_i \tag{7}$$

Substituting (7) into $p = 1 + [1/e(1)]$, we obtain

$$p = \Sigma a_i (1 + e_i) / \, \Sigma a_i e_i \tag{8}$$

Further, we can obtain employment in market i, $L_i^o = a_i$ and total employment $L^o = \Sigma L_i^o = \Sigma a_i$.

The effect of wage discrimination on total employment can be obtained by comparing L^* and L^o. If $L^* > L^o$, we can conclude that wage discrimination increases total employment. Following Aguirre (2006) and Galera and Zaratiegui (2006), we will use the Bernoulli inequality to show that $L^* > L^o$. According to the Bernoulli inequality, " if $-1 < x \neq 0$ and $a > 1$ are real values, then $(1 + x)^a > 1 + ax$", Mitrinovic (1970, p. 34). Let $(1 + x) = w_i^* = [pe_i/(1 + e_i)]$ and $a = e_i > 1$. The Bernoulli inequality implies that

$$[pe_i/(1 + e_i)]^{e_i} > 1 + e_i\{[pe_i/(1 + e_i)] - 1\} \tag{9}$$

Given (8) we have

$$[pe_i/(1 + e_i)] - 1 = (e_i \Sigma a_i - \Sigma a_i e_i)/(1+e_i)\Sigma a_i e_i \tag{10}$$

Substituting (10) into (9), we obtain

$$[pe_i/(1 + e_i)]^{e_i} > 1 + e_i[(e_i\Sigma a_i - \Sigma a_ie_i)/(1+e_i)\Sigma a_ie_i] \tag{11}$$

Multiplying both side of (11) by a_i and then summing i from 1 to n, we obtain

$$L^* = \Sigma L_i^* = \Sigma a_i[pe_i/(1 + e_i)]^{e_i} > L^o + \Sigma a_ie_i[(e_i\Sigma a_i - \Sigma a_ie_i)/(1+e_i)\Sigma a_ie_i] \tag{12}$$

where $L^o = \Sigma a_i$. It is clear that $L^* > L^o$ if the last term in (12) is non-negative, i.e.,

$$\begin{aligned}\Sigma\{[a_ie_i/(1 + e_i)](e_i\Sigma a_i - \Sigma a_ie_i)\}/\Sigma a_ie_i] = (1/\Sigma a_ie_i)\{&\Sigma[a_ie_i^2/(1 + e_i)]\Sigma a_i \\ &- \Sigma[a_ie_i/(1 + e_i)]\ \Sigma a_ie_i)\} > 0\end{aligned} \tag{13}$$

Since $(\Sigma a_ie_i) > 0$, we have to check whether $A = \{\Sigma[a_ie_i^2/(1 + e_i)]\Sigma a_i - \Sigma[a_ie_i/(1 + e_i)]\ \Sigma a_ie_i)\}$, $i = 1, 2, 3,\ldots, n$ is non-negative or not.

By using the mathematical induction method, we first obtain

$$A(n = 2) = [1/(1 + e_1)(1 + e_2)]a_1a_2(e_1 - e_2)^2 > 0 \tag{14}$$

Next, we have

$$A(n + 1) = A(n) + a_{n+1}\{\Sigma[a_i(e_i - e_{n+1})^2/(1 + e_{n+1})(1 + e_i)]\} \tag{15}$$

Since the last term in (15) is positive, it is easy to see that if $A(n) > 0$ then $A(n + 1) > 0$. This shows that the sign of A is positive for any $n \geq 2$. Thus $L^* > L^o$, i.e., wage discrimination increases total employment if the labor supply curves belong to the class of strictly concave and constant labor supply elasticity. This result is consistent with FLS (1983, p. 896 and p. 898) and Shieh (2001, p. 186).

3. Concluding remarks

We have attempted to exploit an alternative but much simple way to examine the effect of wage discrimination on total employment. Following Aguirre (2006) and Galera and Zaratiegui (2006), we utilize the Bernoulli inequality to show that the wage discrimination always increases total employment if the labor supply curves are strictly concave and have constant supply elasticity. We obtain this result with a much simple way without resorting to complicated manipulations as were used by FLS (1983) and Shieh (2001).

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