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Asymmetric Information and Wage Differences Across Groups: Labor Market Discrimination or Nondiscriminatory Market Outcome

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"ASYMMETRIC INFORMATION AND WAGE DIFFERENCES ACROSS GROUPS: LABOR MARKET DISCRIMINATION OR NONDISCRIMINATORY MARKET OUTCOME?"

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Introduction:

Labor market discrimination is defined as a failure to receive compensation equivalent to workers' productivity. In an efficient labor market, a worker's productivity attributes—labor force experience, education, tenure, etc.—and innate ability will be duly rewarded regardless of race, gender, ethnicity, or other individual characteristics. Workers receive pay commensurate with individual productivity. Employers do discriminate in pay and employment between individual productivity characteristics and ability. This is not labor market discrimination. It reflects market efficiency, since workers with productivity attributes and abilities that are highly demanded by employers receive the highest wage rates.

It is also well known that females and minorities consistently have lower earnings than white male workers.[1] This implies that females and minorities either have lower productivity than white males or there is labor market discrimination. It is generally accepted that females and minorities as a group have lower mean education and labor force experience as well as other measurable productivity attributes.[2] To the degree that women and minorities are prevented from acquiring the high paying productivity attributes, the outcome reflects pre-labor market discrimination rather than labor market discrimination. After adjusting for measurable productivity difference between racial and gender groups, about 13% of the 30% difference between white and black male earnings is attributed to

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[1]For full time, year around workers, the white, black, and Hispanic female earnings ratios are .67, .57, and .53, respectfully; and the black and Hispanic male earnings ratios are .70 and .65, respectfully (U.S. Department of the Commerce, 1992).

[2]80.1% of white males have high school diplomas and 25.2% have college diplomas. For females, the percentages having high school and college degrees are 80.7% and 19.1% for whites; 68.2% and 12% for blacks; and 51.5% and 8.5% for Hispanics. For males, 67% of blacks and 53.7% of Hispanics have high school degrees, and 11.9% of blacks and 10.2% of Hispanics have college degrees (U.S. Bureau of the Census, 1992).

differences in productivity characteristics and about 17% of the earnings differential is potentially discrimination. When comparing white women to white men, about 25% of the 33% difference in male and female pay is due to potential discrimination while 8% of the pay differential is due to productivity differences.[3] The discrimination component in the wage decomposition may or may not measure market discrimination. The difference in the rate of return for productivity variables (i.e., regression parameter estimates) may reflect differences in quality. For example, blacks may receive less education due to lower quality schools even though they may have the same number of years of education as whites. Women may have different quality labor force experience because they may plan to exit the labor force to raise children.[4] The difference between constant terms in the wage decomposition, or the unexplained residual, may estimate labor market discrimination or it may reflect unobservable productivity characteristic differences between the groups.[5] Again, the discrimination component of the wage decomposition may measure labor market discrimination, but it also may reflect pre-market discrimination or decisions with respect to specific groups to invest in different productivity factors.

Labor market discrimination has been explained by a number of theoretical models. Employer

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[3]Results are based on the Oaxaca wage decomposition: $\overline{w}_w - \overline{w}_m = [\sum\beta_{wi}(\overline{X}_{wi} - \overline{X}_{mi})] + [(\alpha_w - \alpha_m) + \sum(\beta_{wi} - \beta_{mi})\overline{X}_{mi}]$. $\overline{w}_w$ and $\overline{w}_m$ are average wages for white males and a minority (gender) group, respectively; β_{wi} and β_{mi} are wage equation parameter estimates for white males and a minority (gender) group; $\overline{X}_{wi}$ and $\overline{X}_{mi}$ are the average productivity characteristics for white males and a minority (gender) group; and α_w are α_m are the intercept terms of the white male and a minority (gender) group (Oaxaca (1973), and Oaxaca and Ransom (1994)).

[4]Differences in the return to productivity characteristics are measured by: $\sum(\beta_{wi} - \beta_{bi})\overline{X}_{bi}$. If the measured years of education or labor force experience for white males is of higher quality than for minorities or women, then the estimated market return for these characteristics will be greater (i.e., $\beta_{wi} > \beta_{bi}$). Technically, this is a market premium for a higher quality flow of labor factor services and not discrimination.

[5]If $(\alpha_w > \alpha_m)$, then white males benefit from a wage differential that is not explained by measured productivity variables. This certainly implies discrimination against minority or gender groups, but it could reflect group differences in unobservable or unmeasured productivity variables. For example, white males may have a higher proportion of technical college degrees. By reporting only years of education in the wage regression, the higher market premium on technical degrees will be absorbed by the intercept.

discrimination developed by Becker (1971) argues that an employer who has a distaste for a specific group will only hire these workers at a discriminatory wage discount even though the workers have identical productivity as the preferred employees.[6] Becker freely admits that employer discrimination is not sustainable in a competitive market environment. Nonprejudicial employers can hire the discriminated group at a wage that is slightly higher than the discriminatory wage. Thus, nondiscriminating employer earns higher profits due to lower labor costs and will eventually drive discriminatory employers out of the market.

An employee discrimination model developed by Arrow (1973) shows that majority workers require a compensating wage differential to work with minorities or females. In a competitive market, employers would not be able to sustain majority employee wages above their marginal productivity. To avoid noncompetitive production costs, employers would reduce nonmajority groups' pay by the compensating differential demanded by the majority workers. As in the employer discrimination model, employee discrimination is not stable in a competitive environment since employers could utilize segregated plants to take advantage of lower cost minority or female workers. Arrow's model allows sustainable discrimination only in the special case of prejudicial customers refusing to purchase goods or services from minorities or females. This form of discrimination, however, could only explain pay differentials in the retail or service sector.

Statistical discrimination occurs in the absence of prejudice and arises when an individual's potential productivity is judged on the basis of the individual's group average. The statistical discrimination models developed by Phelps (1972) and Aigner and Cain (1977) are based on a test as an indicator of true skill. Employers observe the test score which is used as a predicted or expected

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[6]Employer discrimination against a particular minority or gender group is measured by a discrimination coefficient, $d = (w/w_m) - 1$. The larger is d, the greater is the employer's prejudice and hence the greater is the discount on female or minority wages (i.e., the smaller is w_m)

value of the individual's actual ability. If the potential employee's racial or gender groups perform differently than white males on the same test, employers will have disparate expectations about group productivity levels. If minorities or females either have greater variances in group abilities or in group test scores (assuming identical mean abilities and test performance for racial and gender groups), then the pre-employment test will be a better predictor of white male productivity. Due to greater information uncertainty, employers will find it more risky to hire minorities or females (i.e., they are more likely to hire a worker that does not meet minimum ability standards). Risk-adverse, profit-maximizing employers assess a risk premium when hiring minorities or females. They pay these workers less even though their expected productivity is equal to white male workers. Since all workers have equal expected productivity, minorities and women incur statistical discrimination because they are paid less than their actual productive ability.[7] Furthermore, Aigner and Cain freely admit that pay differentials due to statistical discrimination are not sustainable in the long-run. Risk-neutral employers would hire minority and female workers at the discriminatory pay differential, realizing that on average their marginal productivity exceeds their wages. Risk-neutral employers would then earn economic profits until the risk-averse employers are driven from the market.

Baldwin (1991) develops an uncertainty model of wage discrimination based on the work of Ratti and Ullah (1976). Baldwin argues that due to asymmetric information over the flow of factor services, "the employer has greater difficulty predicting the productivity of minority workers than predicting the productivity of majority workers." Thus, within the framework of Baldwin's model,

[7]Aigner and Cain argue that Phelps' model is not a statistical discrimination model because minority (female) expected productivity is explicitly less than white male expected productivity. In fact, Phelps makes an explicit assumption that the average ability of blacks is lower than whites. Aigner and Cain conclusively argue that when competitive employers pay workers on the basis of expected productivity (even if average group productivity is equal), they are reacting to competitive market forces and are behaving without bias. If employers did not pay at the expected productivity level, they would, on average, pay wages greater than the labor's marginal value product. In a competitive environment, this would lead to loss that would drive the firm out of business.

"discriminatory wage and hiring differentials arise between minority and majority workers even though the employer recognizes that the two groups have equal average productivity." The problem that the employer faces with asymmetric information is the inability to identify the specific minority workers whose abilities equal the majority workers. Since asymmetric information causes uncertainty about a group of workers, discrimination based on asymmetric information would be a form of statistical discrimination.

Baldwin's equilibrium and comparative static results of wage and employment differentials are the result of incorporating uncertainty over the flow of labor services into a model of the firm in a competitive environment. Baldwin's model is a potentially convenient explanation of discrimination since it offers a rationale on why labor market discrimination could persist in a competitive environment. We, however, will demonstrate that uncertainty over the flow of labor services invalidates Baldwin's assumption of "the two groups have equal average productivity." It is the assumption of "equal average productivity" which allows Baldwin to assert that wage and employment differentials are discriminatory. Aigner and Cain (1977) point out that group discrimination is absent when the *expected* productivity of majority workers is greater than the *expected* productivity of minority workers, even when minority and majority groups have the same mean productivity. Employers are responding to competitive forces when they pay workers in relation to their expected productivity.

We show that it is inappropriate to call the wage and hiring differentials generated by Baldwin's model discriminatory. Rather, the wage and hiring disparities reflect the competitive outcome due to a greater variability in the flow of factor services of minority workers. As we demonstrate, a greater variability in factor service flows lowers the level of *expected* marginal and average productivity for minority workers relative to majority workers (who have a smaller variability in factor service flows), even though both groups have the same expected level of factor service flows in the production process. Thus, it is the reduction in *expected* marginal and average productivity via asymmetric information that determines the lower wages and employment levels for minority workers. Since the lower wage and employment levels are due to lower *expected* productivity, the minority disparities are due to a competitive labor market outcome rather than discriminatory behavior by the employer. As opposed to discrimination, the wage disparities are a market outcome and will be persistent in the long-run. The only efficient solution to minority disparities is to reduce the variance in the factors that determine their productivity.

In the next section, we develop a multi-plant competitive model of the firm which incorporates Baldwin's assumptions concerning minority and majority labor pools. The third section will derive the first and second order conditions of the multi-plant model. The fourth section will discuss the economic implications of the model's equilibrium conditions and the validity of Baldwin's assumption of equal average productivity across minority and majority workers when it is assumed that there is greater uncertainty over the flow of minority labor services relative to majority workers. We then extend Baldwin's paper by incorporating risk aversion into the model.

I. Assumptions and the Model:

The analysis assumes a short-run time frame for the firm. The firm operates two plants. Each plant independently draws labor from a separate labor pool. Assume plant 1 hires its workers from a labor pool consisting of minority workers only. Assume plant 2 draws its labor from a labor pool consisting of majority workers only. Assume each plant is identical and all other factor inputs purchased by plants 1 and 2 are identical except for labor. The firm operates in a competitive setting in both the output and factor markets. All inputs are assumed to be fixed except one. The one variable input, labor, is purchased independently by each plant: 1) plant 1 hires minority workers, and 2) plant 2 hires majority workers.

Define L to be the quantity of labor acquired for current use by each plant. Define L_1 and L_2 to be the quantity of labor services actually supplied by minority and majority workers, respectively. It is assumed that L is a decision variable for each plant and L_1, L_2 are random variables. This assumption is based on arguments presented in Walter's (1960, p.325) explanation of why labor supplied is a random variable: " ...although the number of workers on the payroll is fixed, the flow of labor services does not stay at one value. It varies from day to day according to weather, sickness, whim, and other accidental influences."

We are interested in the variability in the flow of labor services of minority and majority workers. We will assume that Walter's "accidental influences," on average, are identical for both types of labor, $E[L_1]=E[L_2]$. However, incorporating Baldwin's assumption, we assume that the variability in the flow of labor services is higher for minority workers, $VAR[L_1]>VAR[L_2]$.[8] For simplicity in modeling it is now assumed that the flow of labor services from majority workers is known with certainty and the flow of labor services of minority workers is variable. Under this set of assumptions $L=L_2$.

Following the modeling procedure developed by Ratti and Ullah, L and L_1 are linked in the following way:

$$vL = L_1, \tag{1}$$

where v is a strictly positive random variable with the variable's density function defined as $f(v)$ with a unit mean, i.e., $E[v] = 1$.[9] Following Baldwin, this assumption implies that average flow of labor services for minority and majority workers are equal.

Each plant's short-run production function when it hires labor is defined as:

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[8] $E[\bullet]$ denotes the expectations operator and VAR denotes the variance operator.

[9] Ratti and Ullah give credit to Walters (1960), and Roodman (1972) for the method of specification of the input variables. In our model L denotes the number of minority workers hired by plant 1 and L_1 denotes the flow of labor services from those minority workers hired. In the certainty case, plant 2 hires L workers and the flow of factor services it receives is equal to L.

$$q_2 = h(L) \text{ and } q_1 = h(L_1),\ h'(\bullet) > 0,\ h''(\bullet) < 0. \tag{2}$$

The third derivative of the production function is assumed to exist, and the marginal product of labor is positive but declining.

It is assumed the competitive firm's goal is to maximize short-run profits $\prod$. In the two-plant case, the competitive firm maximizes profits by equalizing marginal factor cost across plants. Let us begin with deriving the profit maximization conditions for plant 2, the certainty case. The variables p, w, and C are defined respectively as the output price of final goods and the input price of labor services and the fixed cost. Plant 2's profit function is defined as:

$$\prod = p\cdot h(L) - w\cdot L - C. \tag{3}$$

The first order condition for profit maximization is:

$$d\prod/dL = p\cdot h' - w = 0. \tag{4}$$

The second order condition for profit maximization is:

$$d^2\prod/dL^2 = p\cdot h'' < 0. \tag{5}$$

Rearranging the equation 4, the following equilibrium condition is arrived at:

$$p\cdot h' = w \text{ or } p = w/h'. \tag{6}$$

Equilibrium condition (6) is the standard result. Plant 2 will pay majority workers their marginal value product (MVP), i.e., their marginal contribution to the production of output.

In the case of plant 1, the firm hires minority workers, and there is uncertainty over the quality of the flow of factor services. Profits for plant 1 are now defined in terms of utility. Assuming that the firm's utility function conforms to characteristics of a von Neumann-Morgenstern utility function and its third derivative exist, the firm's expect utility from plant 1's profits can be written as:

$$E[U(\prod)] = E[U(p\cdot h(L_1) - w\cdot L - C)]. \tag{7}$$

It is assumed that the marginal utility of profit is positive $U'(\prod) > 0$, and the value of $U''(\prod)$ being negative if the firm is risk averse, 0 if the firm is risk neutral, and positive if the firm is risk preferring.

The first order condition for maximizing expected utility of profits is:

$$dE[U(\prod)]/dL = E[U'(\prod)\cdot (p\cdot v\cdot h'(L_1) - w)] = 0. \tag{8}$$

The second order condition is:

$$d^2E[U(\prod)]/dL^2 = E[U''(\prod)\cdot (p\cdot v\cdot h'(L_1) - w)^2 + p\cdot v^{2}\cdot h''(L_1)\cdot U'(\prod)] < 0. \tag{9}$$

Rewriting equation (8) in the following manner:

$$E[U'(\prod)\cdot (p\cdot v\cdot h'(L_1))] = E[U'(\prod)]\cdot w. \tag{10}$$

allows the adoption of Horowitz's (1970) alternative way of expressing equation (10),

$$p\cdot E[v\cdot h'(L_1)] = w - \{p\cdot Cov(U', v\cdot h') / E[U'(\prod)]\}. \tag{11}$$

From above it is clear that the MPP and MVP of minority workers are now random variables given by $v\cdot h'$ and $p\cdot v\cdot h'$ respectively. Examining the covariance term in equation (11), it is clear that when $U''(\prod) = 0$, the covariance term is also equal to zero. The implication of equation (11) is that the risk neutral firm hiring minority workers for plant 1 sets wages equal to $w = E[MVP]$.

II. The Effect of Risk Preference on Wages Paid.

In the paper by Ratti and Ullah, when $U''(\prod) \neq 0$, the sign of the covariance term cannot be ascertained. However, Ratti and Ullah demonstrate that when it is assumed that the input elasticity of the marginal product curve has an absolute value of less than one, then sign Cov = sign $U''(\prod)$:

$$\mathscr{E} = dh'(L_1)/dL_1 \cdot L_1/h'(L_1) = L_1\cdot h''(L_1)/h'(L_1) > -1. \tag{12}$$

If equation (12) is true, then examining the derivatives of the two components of the covariance term with respect to v,

$$d[v\cdot h'(L_1)]/dv = h'(L_1)\cdot [1 + \mathscr{E}] > 0, \tag{13}$$

and

$$dU'(\prod)/dv = U''(\prod)\cdot p\cdot L\cdot h'(L_1), \tag{14}$$

verifies that sign Cov = sign $U''(\prod)$. That is, since the sign of equation (14) is dependent on $U''(\prod)$, and equation (13) is positive, sign Cov must equal sign $U''(\prod)$.

Applying this result to equation (11), the following condition is arrived at:

$$p \cdot E[v \cdot h'(L_1)] \gtrless w, \tag{15}$$

depending on whether $U''(\prod) \lesseqgtr 0$.

Following Ratti and Ullah's interpretation of these results, at the margin and assuming: 1) risk neutrality, plant 2 will hire L at a price equal to its E[MVP]; 2) risk aversion, plant 2 will hire L at a price less than its E[MVP]; and 3) risk preferring, plant 2 will hire L at a price greater than its E[MVP]. The implication of these results is that plant 2's demand for labor is dependent on its attitude toward risk. Baldwin's paper did not explore the implications of non-risk-neutrality. The issue of how risk aversion affects wage differentials will be explored in section 5.

III. The Effect of Production Uncertainty on Output and the Average Product.

In this section the analysis assumes that the firm is risk neutral. As stated above, the firm is assumed to operate two identical plants. Each plant, however, hires labor from a different labor pool. The first question to be addressed in this section is, "how does uncertainty over the flow of labor services effects plant 1's level of production as compared to plant 2, the certainty case?"[10] This question leads to the first proposition:

PROPOSITION I: *Plant 1's expected output when employing L_1 minority workers, ceteris paribus, is less than plant 2's output when employing L majority workers.*

To establish the above proposition, Jensen's inequality and the definitions of expected value and certainty equivalent are applied to the production functions of the two plants. The certainty equivalent of (L_1) is its expected value, L: $E(L_1) = L$. Then by the Jensen inequality,

$$E[h(L_1)] < h(L), \tag{16}$$

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[10] Under the assumptions of the model, the certainty case is when plant 2 hires majority workers. The uncertainty case is when plant 1 hires minority workers.

and proposition I is established.[11] Thus, the implication of the mere presence of production uncertainty is that, ceteris paribus, plant 1's level of output is less than plant 2's for a given fixed level of labor hired.

The corollary to Proposition I is:

COROLLARY I: *Even though the average flow of labor factor services are equal, the average productivity of minority workers is less than majority workers when there is greater uncertainty over the flow of factor services for minority workers, ceteris paribus.*

To establish Corollary I, all one has to do is divide each side of equation 16 by L. Baldwin assumes that, on average, the flow of factor services of minority and majority workers are equal before production begins and continues to make this assumption for *ex ante* average productivity. However, this assumption is not valid for average productivity of labor across both groups. Average productivity is determined by the technological transformation of labor's contribution to production which in this model is affected by uncertainty. Walters' (1960) discussion of "flow of factor services" does not support Baldwin's assumption that an equal flow of factor services from minority and majority workers is simultaneously transformed into equal average productivity for minority and majority workers.[12] Under production uncertainty, the greater the variance in the flow of factor services the smaller the level of output produced from a given factor service flow. Therefore, Corollary I refutes Baldwin's assumption of equal average productivity between minority and majority workers.

IV. Wage Discrimination or Wage Disparity?

The next issue to be addressed is the effect of uncertainty over the flow of factor services on wages. The firm will maximize profit by setting MVP=MC in both plants 1 and 2. Rearranging

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[11] The Jensen inequality states that if a function is strictly concave the following is true: $E[h(X)] < h[E(X)]$. See Rao (1973), page 58 for an explanation of Jensen's inequality. Proposition 1 is an established result in the economics of uncertainty literature.

[12] The only condition where an equal flow of factor services has equal average productivity is when the variability in the flow of factor services is identical between the minority and majority workers.

equations (6) and (11),

$$p = w/h', \tag{6a}$$

and

$$p = [w - \{p\cdot \mathrm{Cov}(U', v\cdot h')/E[U'(\textstyle\prod)]\}] \;/\; E[v\cdot h'(L_1)]. \tag{11a}$$

To simplify the analysis, let w represent majority workers' wages and w^* represent minority worker wages. Given that output price p is the same regardless of which plant produces the output and replacing w in equation (11a) with w^* to represent minority wages, the following equilibrium condition is derived from equations (6a) and (11a),

$$w/h' = [w^* - \{p\cdot \mathrm{Cov}(U', v\cdot h')/E[U'(\textstyle\prod)]\}] \;/\; E[v\cdot h'(L_1)]. \tag{17}$$

Equation (17) allows us to compare the market determination of w and w^* based on a prevailing competitive market price, p, for both plant 1 and plant 2's output. Equation 17 leads to the next proposition in the paper:

PROPOSITION ■. *A risk neutral firm's two plants purchase labor from separate labor pools. The two independent labor pools differ only in degree of variability over the flow of labor services. The firm will pay those workers from the group with greater uncertainty a lower wage than workers from the group with less uncertainty over the flow of labor services.*

To establish the above proposition, it is assumed that the third derivative of the production functions of the two plants are negative. This implies that the marginal physical product of labor functions for the two plants, $h'(\bullet)$, are strictly concave functions. This assumption is consistent with equation 12 and implies that $d\mathcal{E}/dL_1 < 0$. Ratti and Ullah note that this assumption is consistent with many of the common forms of production functions in the economics literature. The implication of $h'''(L_1) < 0$ is that the MPP of L_1 is a non-increasing function of L_1. Under the assumption that $h'''(L_1) < 0$, and employing Jensen's inequality the following result is attained,

$$E[h'(vL)] < h'(L). \tag{18}$$

Equation (18) implies that under the assumption of risk neutrality, the expected marginal product of minority workers working in plant 1 is less than the marginal product of majority workers working in plant 2, given equal employment levels. Applying the result derived in equation (18) to equation (17) implies that under the assumption of risk neutrality, majority worker wages (w) must be greater than minority worker wages (w^*), and thus Proposition II is established.

Proposition II demonstrates that a perfectly competitive firm operating two identical plants and hiring workers from two separate labor pools, where the only difference between the two groups of workers is the variability over the flow of labor services, will pay higher *(lower)* wages to the group that can be identified as having greater *(less)* certainty with respect to the flow of labor services. That is, all workers are paid their *expected* marginal value product and the wage differential between the two groups is the result of the different degree of variability in the flow of their respective labor services.

Baldwin derived a similar "wage differential" result and argued that since "...all workers are paid the expected value of their marginal product, the firm is discriminatory in the sense that the two groups with equal average productivity receive unequal average wage." Corollary I, however, demonstrates that the average productivity of minority workers is also *lower* than majority workers. Therefore, we argue that it is inappropriate to call the wage differentials derived in Baldwin's model discriminatory. Rather we argue that the wage differentials are more appropriately referred to as wage disparity. The wage disparity reflects a market "penalty" accessed to labor groups with characteristics associated with greater variability in factor services. Disparity characteristics could include factors such as greater turnover, less effective education, etc. Wage disparity of the type generated in this and Baldwin's paper is consistent with the "Theory of Factor Price Disparity" discussed in Fausti and Feuz (1995).

Up to this point it has been assumed that the firm has been operating in a competitive labor market and paying its workers a wage equal to their marginal value product. Let us now assume that the wage rate is fixed at *w* (the wage paid to majority workers) and is paid to all of the firm's workers.

In this case, equation 17 implies that the firm will reduce the employment of minority workers in order to raise the marginal value product of minority workers to a level equal to majority workers. A hiring differential arises as in Baldwin's paper. However, the hiring differential is due to minority workers having greater variability in their flow of factor services and therefore does not constitute discriminatory hiring practices. The hiring differential is the result of a competitive market outcome.

V. The Effect of Risk Aversion on Wage and Hiring Differentials

If it is assumed that the firm is risk averse, then equation (17) demonstrates that the wage differential will increase. This last statement leads to the third proposition of the paper;

PROPOSITION III. *The wage differential between minority and majority workers will vary positively with the degree of firm risk aversion.*

To establish Proposition III, Proposition II is reasserted. Proposition II established that w is greater than w^* for the risk neutral firm. Equation 15 establishes that a risk averse firm will pay its workers a wage that is less than E[MVP]. Therefore by equation 17 there is a wage, w^{**}, that a risk averse firm pays its workers which must be lower than w^*, the wage a risk neutral firm would pay its workers. Thus, Proposition III is established. If one again assumes that the wage rate is fixed at w, then the hiring differential will increase relative to the risk neutral firm. The introduction of risk aversion and the effect risk aversion has on wage and hiring differentials represent an extension of Baldwin's paper.[13]

VI. Labor Market Implications

Uncertainty over factor service flows may potentially impact any group of workers that have characteristics associated with increased uncertainty of labor quality. These workers will incur lower

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[13]With respect to comparative static analysis, a mean preserving increase in the distribution of v will increase the wage and hiring differential. This result was not presented because it is consistent with Baldwin's comparative static results. However, we again argue that these differentials are not discriminatory outcomes because average productivity between majority and minority workers is not equal.

wage and employment levels based on the uncertainty attributed to a given group. Unlike discrimination, wage and employment differentials based on asymmetric information are persistent in the long-run until the greater uncertainty over employment of certain groups is eliminated. For example, AFDC recipients may be perceived by employers as having a high portion of individuals that are unskilled, apathetic, and unreliable. Therefore, this group is perceived as having greater uncertainty in the flow of factor services by employers. Similarly, employers may perceive felons, inter-city minorities, structurally unemployed workers, and new labor force entrants as having greater uncertainty of factor service quality, which in turn results in wage and employment disparities for these groups. Disabled groups may be viewed as having greater uncertainty in performing physical activities.

Government policy toward resolving wage and employment disparities experienced by disadvantaged groups due to greater uncertainty over the flow of factor services has focused on education/training programs that reduce the quality uncertainty of the group or a wage subsidy. Education and training programs both enhance worker skills and differentiate an individual worker from the disparate group. To the employer, an accredited educational or training program acts to eliminate factor service uncertainty, which in turn offsets the wage and employment disparities. As Spence (1971) argues, the educational and training programs will also function as a signal to employers of the most able disadvantaged workers. Wage subsidies provide an incentive for firms to hire workers from disadvantaged groups. The wage subsidy acts as a risk premium payment to compensate the firm when it hires workers from a disadvantaged group. These types of government programs are consistent with the model developed in this paper.

The model presented in this paper also provides additional theoretical support for a number of work and training programs. Currently the Job Training Partnership Act (JTPA) subsidizes wages and training for disadvantaged individuals. The Temporary Assistance for Needy Families (TANF) provides wage subsidies to firms hiring welfare recipients. The job opportunities and basic skills training (JOBS) program under the Family Support Act requires AFDC recipients to enroll in a training or educational program. Labor market outcomes due to production uncertainty suggest that wage subsidies, training, and education programs will be essential to the success of the welfare-to-work policies under the current welfare reform programs. Furthermore, the education-to-work programs being undertaken by numerous states will also require wage subsidies, training, and educational programs to successfully integrate disadvantaged workers into the labor force.

VI. Summary

In this paper, we attempt to show that wage and hiring differentials arising from uncertainty about the productivity of distinct groups of workers is not labor discrimination. As we demonstrate above, greater uncertainty over the flow of labor factor services directly affect the production technology of the firm, which in turn lowers the both the marginal and average productivity of an identifiable group of workers associated with greater uncertainty. Consequently, in response to lower expected productivity, the less certain employees receive lower pay or employment level. We argue that the wage or employment differentials are a disparity based on a market outcome rather than labor market discrimination as asserted by Baldwin (1991).

Production uncertainty also provides additional theoretical support for government education, training, and work programs. Educational and training programs provide workers with skills that help reduce employer uncertainty over worker quality. Work programs that subsidize wages provide firms with the incentive to hire workers from disadvantaged groups. Employment allows the disadvantaged worker to acquire on-the-job training and enhance their marketability in the future.

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