Robert Cherry*

Minimum Wage and Pure Discrimination: A Note

For the first time in a number of years, there is strong interest in raising the minimum wage. One can expect that among the criticisms of this policy initiative, many economists will argue that the minimum wage harms black workers disproportionately.1 Some economists (Byrnes and Stone 1982; Gwartney and Stroup 1982; Sowell 1981; Williams 1977) assert that the minimum wage makes pure discrimination less costly, which exacerbates discrimination against black applicants. This note demonstrates that this proposition is not necessarily true, even in competitive models.

Competitive models generally assume that workers have the same exact productive in each labor market and hence, are perfect substitutes for each other. In this situation, black workers find employment in markets where all employers have a “preference for white workers” only if they will work for lower wages. As a result, each employer takes as given the differential wages between equally productive black and white workers. Employers hire each additional white worker as long as psychic benefits derived outweigh the wage differential. In Arrow’s (1972) model, owing to the law of diminishing marginal utility, optimal employment occurs when the psychic benefits from the last white worker hired just equal the wage differential.

Labor market equilibrium is generated when racial wage differentials are sufficient to balance supply and demand in both black and white labor markets. Within this framework, a decrease in the racial wage differential employers face increases their willingness to hire more expensive white workers.2 Since the minimum wage reduces the ability of black workers to lower their wages to compensate for employer preferences, it follows that the minimum wage increases discriminatory hiring practices.3

While Gary Becker generally discussed pure discrimination in markets with perfect substitutability, he did address the impact of pure discrimination when black and white workers are not perfect substitutes.4 In this alternative model, we will find that the cost of discrimination is measured by productivity losses rather than higher labor costs. Figure 1 is a reproduction of Becker’s (1971, p. 42) analysis where XW represents all of the combinations of black and white workers capable of producing the same level of output. The price line CC reflects the differential wages which would exist in society. Thus any nondiscriminatory firm would face w, > w, where these represent the market wages for white and black workers respectively. An employer with a taste for discrimination would adjust upward his/her “cost” of employing a black worker by a discrimination coefficient, d, which shifts the price line to DD. As a result, black employment declines from B to B while white employment increases from W to W.

While it was not his intention, Becker’s framework could be used to analyze the effects of pure discrimination even if firms were forced to pay the same wage to black and white workers; i.e. even if the slope of CC was – 1. In particular, we could assume that firms are required to

*Brooklyn College of the City University of New York 11210 would like to acknowledge the important suggestions of Yehi Avnberg.
hypothesis. Suppose Figure 1 represents a firm hiring low-wage workers. As a result of discrimination in other labor markets, more skilled black workers will not be available. Also, some of its better skilled white workers quit because they can now obtain employment in the higher-paying labor markets.

This changes the rate of substitution between black and white applicants, rotating the isoquant inwards to YY'. Continuing to face relative prices reflected by price line DD', the firm would now hire more than B' black workers. In Figure 1, the increase is to B' so that the firm hires more black workers than it would have in the absence of discrimination. Thus, full employment of black and white workers is reestablished where higher-paying firms hire more white workers while low-paying firms hire more black workers.

Becker's model assumes that the labor market decision reflects a desire to minimize the cost of producing a given level of output. Alternatively, we could look at the labor market decision as a maximization problem—maximizing profits subject to a given level of labor expenditures. Suppose a competitive firm, facing market price p and a nonracially-differentiated wage rate w, has decided to hire 2N workers from black and white applicant pools. Having a taste for discrimination, the firm seeks to maximize U(ε, W) where ε equals profits and W the number of white workers hired.

Let us assume that individuals in both the black and white applicant pool can be ordered according to their productivity. Let P(m) be the marginal productivity of the mth most productive worker in the applicant pool. Let Q(m) and Q(m) be the cumulative distribution for the white and black applicant pools respectively so that Q(m) is the total production of the m most skilled workers in the applicant pool; i.e. Q(m) = P(m). Since \( \sigma = p - w(2N) \) where Q = Q(2N - W) + Q(W), U(ε, W) is maximized when

\[
\frac{dU}{dW} - \frac{dU}{dW} \frac{dQ}{dW} + \frac{dU}{dW} = 0
\]

(1.1)

Since \( dQ/dW = p \) and the marginal rate of substitution, \( -(dU/dW)/(dU/dW) \) equals Becker's coefficient of discrimination, d, (1.1) reduces to

\[
p(dQ/dW) = d
\]

(1.2)

To isolate the impact of discrimination on employment decisions, let us assume that the productivity functions for each applicant pool are identical so that single functions—Q(m) and P(m)—reflect total production and marginal productivity schedules respectively in both the black and white applicant pools. As a result,

\[
Q = Q(W) + Q(2N - W)
\]

(1.3)

\[
\frac{dQ}{dW} = Q(W) - Q(2N - W) = P(W) - P(2N - W)
\]

(1.4)

Substituting into (1.2), U(ε, W) is maximized when

\[
p[P(2N - W) - P(W)] = d
\]

(1.5)

This outcome is illustrated in Figure 2. The feasibility set AFCE in Figure 2 represents all of the possible outputs depending upon the distribution of black and white workers hired, given that only 2N workers would be employed. The firm would maximize profits if it hired N white workers. The slope of the feasibility set,

\[
\sigma = (dQ/dW) - (dQ/dW) + p(W) - P(2N - W)
\]

(1.6)
This reflects the lost sales revenue when the firm hires an additional white worker beyond N. With P(m) < 0, the feasibility set is concave since the productivity loss increases with each additional less productive worker hired.

U'U is a representative indifference curve. It reflects the willingness of an employer with a taste for discrimination to trade-off profits for additional white workers. Its slope, \(-\frac{dU}{dW}\)/\(\frac{dU}{d\text{Disc}}\), equals Becker's coefficient of discrimination, d. The employer will move down the feasibility set from F until the last sales revenue on the last white worker employed just equals the employer's coefficient of discrimination. In this case, the black employment loss from pure discrimination is equal to W* - N.

This is the framework which most clearly underlies claims that discrimination is costly to competitive firms when they do not hire the most productive workers available. It presents the framework most consistent with claims that white workers benefit from discrimination by obtaining jobs that should go to more qualified black applicants. Let us now analyze the impact a minimum wage increase would have on the size of employment losses resulting from pure discrimination.

In Figure 3, one possible marginal productivity schedule, P(m), is depicted. Points a and b reflect the employment optimization decision in Figure 2. They indicate that at the optimal employment combination, the productivity of the last white worker hired (W*) is d/p less than the productivity of the last black worker hired (2N - W*).

With a rise in the minimum wage rate, the firm would choose to hire somewhat less workers, say 2M. The discriminatory firm would not choose to hire M white workers but move down the white applicant list until the productivity difference between the last white and last black applicant hired just equals d/p. This occurs when W' white workers and 2M - W' black workers are hired. Employment losses from pure discrimination increase only if (W' - M) > (W* - N).

In Figure 3, P(m) is a straight line—\(P(m) = 0\). This indicates that the productivity differences between applicants remains the same throughout the entire applicant pool. In this case, W' - M = W* - N so that there is no change in employment losses as a result of the minimum wage increase.

In Figure 4a, productivity differentials lessen when we look further down the list—\(P(m) < 0\). When hiring a large number of applicants, the productivity of the more qualified black applicants is relatively closer to the productivity of the less qualified white workers. However when hiring only a few workers, the productivity differentials and hence profit losses will be larger. Thus when P(m) < 0, a minimum wage increase reduces black employment losses, i.e. W' - M < W* - N.

In Figure 4b, productivity differentials between less qualified white applicants and their black competitors increase when we look further down the applicant list. Since these
productivity differentials lessen when hiring fewer workers, it is only in this case—$P'(m) > 0$—that a minimum wage increase would increase black employment losses; i.e. $W^* - M > W^* - N$.

There is no a priori reason to believe that $P'(m) > 0$ is the typical situation. Therefore, there is no reason to believe that an increase in the minimum wage necessarily increases the degree of pure discrimination if competitive labor markets are typified by firms hiring at a nonracially-differentiated market wage rate from an applicant pool with varied productivity.

FOOTNOTES
1. This criticism has weak empirical support. For a review of empirical studies see Brown, Gilroy, and Koben (1982).
2. Many economists have claimed that the minimum wage harms black youth disproportionately because they are allegedly the least productive members of the low wage workforce. Whatever the merits of these claims, it is not relevant to the issues discussed in this paper. For an evaluation of these claims, see Clary (1963).
3. For evidence that discrimination may decrease when wage differentials are narrowed, see Trznanos (1987).
4. Kaufman (1983) applies this to the case where pure discrimination takes the form of nepotism. However since he makes special assumptions concerning nepotism, his model cannot be generalized from.
5. Becker assumes a constant elasticity from the hiring of each additional black worker—his discrimination coefficient—so that only by dropping the assumption of perfect substitutability can he analyze the possibility that employers with a taste for discrimination could hire both black and white workers.
6. The Appendix determines employment decisions when the firm maximizes profits with the constraint of fixed labor expenditures.

APPENDIX
With no constraint on the total number of workers to be hired, a firm would maximize profits by hiring from each labor pool as long as the marginal revenue product is greater than the "cost" of each worker employed. Let $P(m)$ equal the productivity distribution within both the white and black applicant pools. Given a market price, $p$, a uniform wage rate, $w$, and Becker's coefficient of discrimination, $d$, the firm would hire white workers until $P(m) - w/p$ and black workers until $P(m) - (w + d)/p$. Figure A1 indicates that the resulting black employment loss equals $W^* - B$. If the uniform wage rate rises to $w'$, Figure A1 indicates black employment losses would be $W'' - B''$. If we assume that this uniform wage rate equals the minimum wage then a minimum wage increase increases employment losses from pure discrimination only if $W^* - B^* > W^* - B$. When $P(m)$ is a straight line—$P'(m) = 0$—which is the case in Figure A1, $W^* - B = W^* - B$. Similar to Figure 4, we would find that when $P'(m) > 0, W'' - B'' < W^* - B$ and when $P'(m) < 0, W'' - B'' > W^* - B$.

BIBLIOGRAPHY
"Human Logic" and Keynes's Economics: A Comment

B.W. Bateman*

E.G. Winslow's recent essay (1986) points to the important fact that the influence of John Maynard Keynes's early work in philosophy on his later work in economics is not clearly understood. Winslow's approach to this problem is to argue not only that the early work in philosophy is important to the later work in economics, but that Keynes's philosophical ideas continued to grow and change and that these changes are reflected in his economics. Using a reference to "human logic" in a 1931 review by Keynes, Winslow argues that Keynes changed from an atomist to an organismist view of the world and that the General Theory reflects this organic vision. Thus, Winslow argues that "Keynes's own use of human logic . . . led to his rejection of an 'atomistic' in favour of an 'organismic' metaphysical description." (p. 413)

The purpose of this comment is to point out that Winslow's argument is based on at least two incorrect interpretations and that without these there is no reason to suppose that Keynes was an organismist. There is clear evidence that Keynes's beliefs about probability changed later in his life, but these changes are more correctly explained without reference to organismism.

KEYNES AND RAMSEY

As the title of Winslow's essay indicates, his argument depends heavily on a comment that Keynes made in a book review concerning "human logic." But while this review of Frank Ramsey's Foundations of Mathematics is an important document in understanding the changes in Keynes's thinking about probability, the reference to "human logic" has different meaning that Winslow attaches to it when it is taken in its full context. For Winslow, this reference is a door into the question of "metaphysical premises" (Winslow [1986], p. 413) which leads him to his assertion that Keynes became an organismist later in his life. Taken in its full context, the reference to "human logic" does have philosophical implications, but these are subsidiary to the main point of Keynes's review.

The main point of the part of Keynes's review which contains this reference is to attack, in a fundamental sense, the nature of probability. In A Treatise on Probability Keynes had argued that probabilities are objective relations which exist between propositions. The prevailing opinion when Keynes wrote Probability (as it is today) was that a probability was a relative frequency or the proportion of times that something occurs in repeated trials. Keynes's book was meant to refute this conception and replace it with a definition of probabilities as degrees of belief.

An example, which clearly differentiates Keynes's conception of probability from relative frequency, is the Presidential re-election. One could speak in 1980 of the probability that Jimmy Carter would be re-elected, but this clearly did not refer to the number of times that Carter

*Department of Economics, Grinnell College, Grinnell, Iowa 50112. I wish to thank John Smith for helpful comments on an earlier draft of this essay. The responsibility for any errors is mine alone.