A VOUCHER SUPPLEMENT TO EXISTING ANTI-DISCRIMINATION PROGRAMS IN THE JOB MARKET

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INTRODUCTION

In recent years the trend in policymaking in the U.S. and in the world at large has been toward market-based tools. Lately, in many cases, this involves recommending the use of "vouchers," especially in education and housing. Further, beginning in the late 1960s the federal government implemented several wage subsidy programs, including JOBS (Job Opportunities in the Business Sector), WIN (Work Incentive), and TJTC (Targeted Jobs Tax Credit), to improve employment opportunities for targeted groups [Bartik, 2001; Burtless, 1985]. This study examines the possibility of using a similar voucher as a supplement to the existing anti-discrimination policies in the job market.

Affirmative action and laws prohibiting discriminatory acts have a common problem. With a view to promoting equity, they both involve the state ordering people to do things they do not wish to do, or forbidding them to do things they wish to do. From a classical liberal perspective, these are infringements on individual freedom. Further, it is usually relatively costly to force people to do things they consider contrary to their interests or preferences. The advantage of well-designed market based tools, including vouchers, is that they induce people to prefer the actions that are the goals of a policy. Supplementing the current anti-discrimination policies with market-based vouchers may therefore improve overall efficiency without reducing (and perhaps increasing) the level of equity already achieved.

Current anti-discrimination laws and policies came out of non-market oriented social-democratic ideas that dominated intellectual and political circles from the 1940s

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through the 1960s. These policies are motivated by equity considerations only, though equity and efficiency are both necessary for attaining optimum social welfare. Introducing new market-based policies, such as vouchers, while continuing with existing programs may therefore offer an improved solution to the problem of discrimination in the labor market. This paper extends the logic of market-based policy and examines how, whether, and to what extent vouchers could supplement existing policies in fighting against labor market discrimination.

While the issue of *political* feasibility is no more part of this paper than it was of Friedman's negative income tax proposal [Friedman, 1962], a discussion of relative costs, cost distribution, and transparency of costs, is included in a later section. This discussion would allow readers to draw conclusions with respect to the feasibility of implementing the proposed voucher. In the first section below, we examine the nature and degree of success of the current programs. In the next section, we present a simple voucher system designed to accomplish the same ends as the present programs. An empirical model to illustrate the estimability of a static one-time voucher is presented in the following section. In the section after that, we discuss the issue of financing such a voucher and the impact of different financing methods on the distribution of costs and benefits. Then there is a section which discusses more complex voucher systems that would be needed in any practical application. The final section summarizes the overall message of this paper.

CURRENT PROGRAMS

Anti-discrimination laws and programs have changed over the decades since the Civil Rights Act of 1964, but some generalizations can be made. First, general anti-discrimination laws make it illegal to treat members of protected groups unequally with respect to wages, hiring, and conditions of employment. This legal obligation applies (with some exceptions, such as religious organizations and very small firms) to all employers.

Affirmative action mostly involves government-related employment.[1] Government agencies, recipients of federal funding, and most companies doing business with the government are obliged to do more than passively await applications from members of protected groups. They are obliged to encourage applications and take positive actions to attain labor forces more closely resembling the population's proportions. Private employers with a (pre-1964) history of discrimination may approach "quotas" voluntarily; others (e.g., AT&T) may be directed to do so by court order.

Both general obligations under the 1964 Civil Rights Act (as amended) and affirmative action deal with two different but related matters. One is equal work. The other is equal pay for equal work. In some parts of the economy, particularly government employment, significant gains have been made in both respects. The gains have involved costs, some administrative and some in efficiency.[2] However, under current policies there may be a trade-off between wage and employment equalization. Current programs designed to achieve equal wages may raise the unemployment rate for blacks since equality of wages implies prejudiced employers only hire black members with productivity above that of marginal white hires.

Efficiency costs for current programs depend on whether workers hired due to anti-discrimination policies are equal in productivity to those who would have been hired without these policies. If they have lower productivity, efficiency costs could be high. If they are superior, but would not have been hired [because of an incorrect perception of lower productivity or a taste for discrimination] there would be net social benefits from greater efficiency.[3]

Programs requiring non-discriminatory hiring have enforcement problems. For example, it is difficult to tell whether hiring is non-discriminatory, so strict enforcement virtually requires a "quota" system, which is intrinsically inefficient. In addition to direct enforcement costs, inefficiency is implied since quotas force employers who may not want to discriminate to make hiring choices based on non-efficiency considerations.

In judging the success of current programs major considerations are: (a) how much convergence in wages and occupational distributions has there been; (b) how much of the convergence is due to government policies; and (c) how much convergence (or divergence) in unemployment rates has there been, and why. With respect to (a), convergence since 1964 has been real, though incomplete. With respect to (b), there is disagreement. Some of the literature ascribes much of the convergence in wages to supply side changes. That is, improvements in the social safety net and improvements in educational opportunities for blacks reduced the supply of unskilled black labor, raising its price relative to the white wage.[4] The portion of the wage convergence ascribed to anti-discrimination policies ranges from near zero for affirmative action [Smith and Welch, 1989; Butler and Heckman, 1977; Heckman and Wolpin, 1976; Heckman and Payner, 1989], to high for anti-bias policies in general.[5] With respect to (c), after allowing for the effects of the recent long cyclical peak, since 1964 black unemployment rates have tended to rise, relative to white unemployment rates [Mohanty, 2000].[6]

The evidence on the success of existing programs is mixed. It is not clear what their costs have been, partly because much of the cost is administrative costs for firms and organizations. It does not seem that the current system is optimal or nearly so, and a voucher supplement to that system could reduce inefficiencies while improving the overall impact on those subject to discrimination.

AN OPTIMAL VOUCHER

Following Becker and Arrow, we assume a taste for discrimination by employers,[7] with white employees preferred over blacks. With discrimination, there are separate demand functions for blacks and whites. Since some employers prefer not to hire blacks, demand for blacks is less and their equilibrium market wage is lower than that for whites. We assume the goal of anti-discrimination policy is elimination of income inequality, and income equality in this context refers to achieving equal wages *and* equal probability of employment for blacks (given equivalent qualifications).

A voucher (V) would represent a right to a payment for hiring a person and would be distributed to blacks.[8] If a firm hires blacks it pays a *net* wage of W_b-V. To hire whites, it pays wage W_w. If the V is set correctly, its value compensates enough em-

ployers for the psychic cost of hiring a less preferred person, or one presumed less productive despite equal qualifications. (Or it may compensate employers for the costs of integration noted by Arrow [1985].) As a result, including the voucher amount, equilibrium values of W_w and W_b are equal. An optimal voucher equalizes the marginal desirability of hiring from the two groups and equalizes unemployment rates, adjusted for qualifications, while equalizing wages.

To make this point clear, suppose the probability of a white being hired is $P_w(E)$, and the probability of an equally qualified black getting hired (with an equal wage) is $P_b(E)$ and, in the absence of vouchers, $P_w(E) > P_b(E)$. The probabilities depend on the relative costs (including psychic costs) of hiring the two.[9] An optimal voucher V^* is the value for which, when market wages *as received by workers* are equalized at $W_w = W_b = W^*$, the following equality holds:

$$P_w(W_w) = P_w(W^*) = P_b(W^* - V^*) = P_b(W_b).$$

This is optimal since individuals with equal qualifications are equally likely to be employed, with equal earnings, and the effects of discrimination on hiring and wage rates are eliminated. This outcome meets standard efficiency conditions and eliminates job discrimination.

The value of vouchers issued does not measure the social cost of the program. The social cost of the program is the administrative cost (government and private) plus net efficiency cost.[10] If these costs are sufficiently large they could exceed the social gain from increased efficiency, but this is true for all anti-discrimination programs. Income redistribution due to the voucher depends on how taxes are levied to pay for them—voucher amount plus government administrative cost. Leaving the tax issue to the section on financing the voucher system, we consider other redistributive effects of the voucher.

If the voucher is set at the optimum there will be income redistribution among *employers*. The most discriminatory employers would refuse to hire blacks at V^*, and receive only the psychic income of not hiring blacks (absent more stringent enforcement of existing policies). Employers with infra-marginal (or no) taste for discrimination receive net benefits. The less the preference for discrimination, the greater the net benefit.[11] Equally, of course, this would also imply that some firms would be very eager to get the vouchers, and would hire only blacks. Some would find the vouchers insufficient to motivate them to hire any blacks. Workplace segregation could rise as a result.[12]

Obviously, recipients of vouchers gain from the program, with higher average incomes and more employment. Whether other workers gain or lose (displacement effects) depends on a good many things, including those discussed in the section on the empirical illustration of the proposed system. If jobs are homogeneous, there is only one V^* to determine, if they are heterogeneous, a set of values is required (see the section on financing the voucher system).[13]

The discussion above assumes a one shot voucher (one per person, per employer), with the amount paid (at the end of a year, or over a year) for a period of employ-

ment.[14] As noted above, there have been a number of wage subsidy programs which could be considered structurally equivalent to voucher programs. We choose to concentrate on one to illustrate the potential effectiveness of such a program. In 1984-85 the Illinois Unemployment Insurance experiment looked into means to reduce the duration of unemployment in sample groups.[15] One version, which used a payment that amounted to a voucher, caused a significant difference in the duration of unemployment for beneficiaries.

Bartik [2001] provides substantial discussion of a large number of such programs, including a discussion of the program featured in Burtless' [1985] article. Bartik makes it clear that possible effects can vary considerably depending on both the exact provisions of a program and on its scope. Most such programs have been small relative even to regional labor markets, and all have been small relative to national markets. As a result, a program of the type discussed in this paper cannot be fully judged based on his work, suggestive as it is in some respects. (See also Katz [1998] for a positive empirical evaluation of some small-scale programs, despite stigma effects.)

In particular, the type of voucher program discussed in this paper would differ in many respects from all prior wage subsidy programs with respect to breadth, objectives, targeted persons, and potential costs and benefits.[16] Some of these differences are closely related, but the breadth issue is most obviously important, since a voucher targeted to those of African American heritage would involve over ten percent of the population and of the national labor market, and a majority of the population in some major local markets. No previous program came anywhere close to such coverage, and potential costs and benefits to so large a program may differ in kind as well as in degree from smaller programs (macroeconomic considerations would become relevant). The objectives of prior programs involved mostly aiding persons in relatively unskilled portions of the labor market who, either due to their own past history or to local labor market conditions, were likely to be considered poor job candidates. This proposed program would not just involve low wage or unskilled jobs, and is not dependent for eligibility on personal histories or local conditions. (This is relevant to the discussion of "stigma effects" later.) In fact, unlike the earlier studies, this program would target not only unemployed blacks, but also employed blacks.[17]

The analysis above does not indicate the redistributive effects between black and white workers. To address this issue, we start with a deterministic model, in which the equilibrium is defined as a zero unemployment rate. Define the following variables: S_t = total labor supply; D_t = total labor demand; S_w = supply of white workers; D_w = demand for white workers; W = white population; S_b = supply of black workers; D_b = demand for black workers; B = black population; W_w = wage for white workers; W_b = wage for black workers; d = discrimination variable, to be defined later. Equilibrium in the market for White workers requires

(1) $$S_w = S_w(W_w, W) = D_w(W_w) = D_w.$$

Equilibrium in the market for Black workers requires

(2) $S_b = S_b(W_b, B) = D_b(W_b, d) = D_b.$

Equilibrium in the overall labor market requires

(3) $S_t = S_w + S_b = D_w + D_b = D_t.$

If black and white labor supply preferences and demographics are identical, at a given (equal) wage the proportion of the white and black forces in the labor supply are identical to their proportions in the population. We define $S_b(W_b, B) = s_b(W_b)*B$ and $S_w(W_w, W) = s_w(W_w)*W$, where s_w and s_b are proportions of the given population in the labor force. For any given wage, $s_w = s_b$.

   Assuming that employers prefer white workers to black ones, we define the discrimination variable d as the proportion of the white wage at which the black wage makes a black worker as acceptable for hiring as a white worker. The demand for black workers is

(4) $D_b = D_b(d*W_w)$ with $d < 1$.

In the absence of any rules about discrimination, at full equilibrium the markets find a wage W_w for which

(5) $S_t = D_t; s_w*W = D_w; s_b*B = D_b.$

Equation (5) consists of two conditions, not three, since the first is satisfied if the others are. If d were an exogenous constant, such an equilibrium might not exist. For a given d (given all other parameters of S and D functions) there could be a wage W_w such that $s_w*W = D_w$, but not $s_b*B = D_b$.

   Suppose at the current W_w (with equilibrium in the white market) $s_b*B > D_b$, then W_b should decline, but $W_b = d*W_w$. If W_b declines for given W_w, that implies a decline in d. The value of d is an outcome which measures the wage ratio required, given discriminatory views of employers for full employment in both markets (and in the combined market) when there are no anti-discrimination rules.

   Starting from the equilibrium above, we introduce a well-enforced rule: wages for black and white workers must be equal, $W_b = W_w$ (this is not a law but a rule for which strict enforcement means strict determination of the proper voucher). Assume no change in W_w (and neither supply nor demand are perfectly inelastic), the rise in W_b means: $S_b(W_w) > S_b(d*W_w)$ and $D_b(W_w) < D_b(d*W_w)$. Since initially $s_b(d*W_w)*B = D_b(d*W_w)$, now $S_b(W_w)*B > D_b(W_w)$. Unemployment results due to the equalization of wages in the presence of discriminating employers. In the model, whites have zero unemployment, and blacks have a positive unemployment rate. The real world equivalent is a higher measured unemployment rate for blacks than for whites.

   An optimal voucher restores equality of unemployment rates, that is the voucher ensures that $D_b = s_b*B$ when $D_w = s_w*W$, even though the wage rate received by black workers equals the wage received by white workers. If W_{bR} is the wage *received* by black workers, and W_{bP} is the (net) wage *paid* by employers to black workers, a voucher

means that: $W_{bR} = W_{bP} + V$, where V is the amount of the voucher. The voucher is a wedge between amounts received by workers and amounts paid by employers. If wages received by workers are equalized, $W_{bR} = W_w = W_{bP} + V$. If $W_{bP} = d*W_w$, as was true before the introduction of an equal pay rule, $W_{bR} = W_w = d*W_w + V$. Solving this equation for the voucher, we have

(6) $$V = (1 - d)*W_w.$$

Assume the white wage is at the original (no rule, no voucher) level, so $s_w*W = D_w$. If the supply of labor from blacks is completely inelastic, S_b is constant. In that case, with W_w at the original value the total supply of labor, as well as the supply of black labor, is unchanged, $D_b(W_{bP}) = D_b(d*W_w) = S_b(W_{bR})$, and the voucher has equalized unemployment rates at zero. In this case the whole amount of the voucher shows up as a higher wage for black workers. If the issue of financing of vouchers is ignored there is no effect (compared to no rule, no voucher) on output, white wages or employment, black employment, or employers.

Perfect inelasticity of black labor supply is improbable. Assume black labor supply is positively related to W_{bR}. At the original white wage, introduction of the voucher increases black labor supply with no change in the demand for black labor. In the market for black labor and in the combined market there is an excess supply of labor. The initial effect should be a decline in black wages (both W_{bR} and W_{bP}). If there is initially a constant value for d, black labor is now a cheaper substitute for white labor. This implies a downward shift in demand for white labor. The assumption that all differences other than measurable characteristics are due to discrimination implies the two are, absent discrimination, perfect substitutes. A lower black wage (W_{bP}) means $W_b/W_w < d_0$ (where d_0 is the original value of d). This lower value causes discriminatory employers to switch to black workers, since the new proportion more than makes up for their discriminatory preferences. The result of the downward shift in D_w is a decline in the equilibrium value of W_w. The new joint equilibrium will have a different value for d as well. A change in the value of d is the result of the process that caused a decline in W_w so it is not possible to produce a new equilibrium with no change in W_w, only a decline in d.

The effect on output of the (equal wage) voucher is indeterminate when black labor supply is not perfectly inelastic. More black workers will be employed, given the greater supply in equilibrium, but fewer white workers will be employed (displacement) (given the decline in D_w and therefore in W_w). Employer costs are lower since both black and white wages paid by employers are lower. Lower employer costs could mean larger total production but such a conclusion has no firm foundation, absent a general equilibrium analysis including the method of financing the voucher, and all redistribution effects (from changes in wages versus profits, from changes in white versus black income—if their spending preferences differ, and from the financing scheme) on demand for final goods and services. (However, see Bartik [2001, 107] and O'Neill [1982] for discussions of the possible positive net employment effects of broad wage subsidies.)

AN EMPIRICAL ILLUSTRATION OF THE PROPOSED VOUCHER

In order to show that, *in principle,* it is possible to estimate an optimal voucher we present a simple model that outlines the estimation of a one-shot voucher. It is important to note that the voucher estimate shown in this section has illustrative implications only. It should not therefore be confused with an actual voucher recommended for the U.S. labor market. Estimation of actual vouchers for different groups would, in a dynamic framework, require econometric modeling that is beyond the scope of this paper. Such estimation is, therefore, left as a topic for future research.

Estimating Equations

An optimal voucher is the amount, which, if paid to the employer for hiring a black worker, would completely eliminate the *unexplained* unemployment rate differential. Estimation of this differential requires modeling the unemployment rate (UR) as a function of the worker's wage (w). The unemployment rate is inversely related to the individual employment probability P, which in turn depends on the wage the worker would be paid if hired, so that:

$$(7) \qquad\qquad\qquad UR = 1 - P(EMP)$$

A worker in the labor force is employed ($EMP_i = 1$) only if the employer's preference function for that worker (y_i) is positive. Thus,

$$(8) \qquad\qquad EMP_i = 1, \text{ if } y_i > 0, \text{ and } = 0, \text{ otherwise.}$$

The unobserved y_i depends on worker characteristics (X_i) and the log wage rate ($\ln w_i$). Thus,

$$(9) \qquad\qquad y_i = X_i\beta + \gamma \ln w_i \ + \ u_i.$$

The employment probability of the ith worker, therefore, can be written as

$$(10) \qquad\qquad P(EMP_i = 1) = P(u_i > -X_i\beta - \gamma \ln w_i).$$

Estimation of equation (10) requires prior estimation of the wage equation, since the wage rate is available only for employed workers. Defining Z_i as the vector of worker characteristics that influence wages, the semi-log wage equation for the ith worker can be written as

$$(11) \qquad\qquad \ln w_i = Z_i\delta + v_i.$$

Assuming normal error terms in equations (9) and (11), the structural employment probability in equation (10) can be estimated by a two-stage probit [Lee, 1979]. Stage 1

estimates the reduced form employment probability equation and generates the appropriate selectivity variable, which enters the wage equation as a regressor [Heckman, 1979]. The two-step estimate of ln $w_i = Z_i\delta$, corrected for selectivity bias, enters the structural employment probability equation as an explanatory variable. Equation (10) then is estimated by a second stage probit. The estimated employment probability for the ith worker is

$$(12) \qquad\qquad P(EMP_i = 1) = \Phi(X_i\beta + \gamma(Z_i\delta)).$$

The employment probabilities following equation (12) are estimated for all workers in the sample and are used in equation (7) to estimate the unemployment rate as follows:

$$(13) \qquad\qquad UR = 1 - P(EMP_i = 1) = 1 - \bar{\Phi}(X_i\beta + \gamma(Z_i\delta)),$$

where $\bar{\Phi}$ denotes the average of workers' employment probabilities.

Estimation of the voucher requires estimating either equation (12) or equation (13) for blacks and whites separately, and then finding through a simulation the optimum black wage (w^*) that would eliminate the *unexplained* differential between black and white unemployment rates (or employment probabilities). The difference between the current black wage and w^* provides a measure of the voucher.

The Data

A sample of 53,235 workers was drawn from the 2003 Current Population Survey (CPS) annual demographic file. It includes only blacks and non-Hispanic white males: 42,746 white males, 4,645 black males, and 5,844 black females, all employed or seeking employment. Those employed consist of 39,900 white males, 4,064 black males, and 5,265 black females. White females are not included in the sample because estimation of the voucher requires comparing blacks with white workers who are free from employer's discrimination in the labor market, and traditionally white males, and not white females, are known to satisfy this condition. To compare the results from the 2003 sample with those from another year, we drew another sample of 34,502 workers from the 2000 CPS annual demographic file. This year was chosen because it exhibits the lowest civilian unemployment rate (4 percent) during the last decade. The 2000 sample consists of 28,648 white males, 2,603 black males, and 3,251 black females in the labor force: employed or seeking employment. The employed sample includes of 27,378 white males, 2,397 black males, and 3,006 black females.

The variables that influence the employer's hiring decision are: worker's education (*HSDGRE, ASSCDGRE, BACHDGRE, MSTRDGRE, PROFDGRE, DCTRDGRE*), age (*AGE, AGESQ*), marital status (*MARRIED*), region of residence (*NEAST, MWEST, SOUTH*), place of residence (*CENTCITY, SMSBLNS*), whether the worker is born in the United States (*USBORN*), family income (*FAMINC*), and the predicted wage the employer would pay if the worker is hired (*PREDWAGE*).

All variables mentioned above except the family income are used in the wage equation. Higher family income through better networking facilities may help a worker get a job, but the employer would find it hard to pay this worker a wage higher than wages of similar employees with identical characteristics. Consequently, this variable is excluded from the wage equation. This exclusion allows identification of the wage and employment equations. In addition to the variables just mentioned, the wage also depends on the worker's occupation (*MANG, PROF, SERV, SALE, ADMN, OPRTV, MOVE*), industry affiliation (*MANF, TRAD, TRNS, INFO, FINC, SRVC*), government employment status (*GOVT*), and fulltime status (*FULLTIME*). Thus, both employment and wage equations are identified. Note that the first stage reduced form probit also includes all variables included in the wage equation. Since government employment status, occupation and industry variables are not available for unemployed workers, they are collected from their response to longest occupation, industry and employment status. Thus the first stage probit and the wage equation are identified by two variables: family income included only in the former and fulltime status included in the later only. All these variables are defined in the appendix.

An Estimate of the Voucher

The Heckman-Lee two-step procedure is used to estimate wage equations in three relevant demographic sub-samples (white males, black males, and black females). The wage coefficients are used to obtain predicted log wages (*PREDWAGE*) for all workers—employed and unemployed. This variable enters the structural hiring equation as an explanatory variable. Coefficients from the structural equation (second stage probit) are reported in Table 1. (First stage reduced from probit and wage estimates may be obtained from the authors on request.) The coefficients in all three equations assume expected signs and significance levels. Importantly, the sign and significance of *PREDWAGE* in all three equations (except in the 2000 black samples) confirm that with other characteristics held constant, the worker's employment probability in most cases declines as the wage rate rises. The positive sign of *PREDWAGE* in the black female equation of the 2000 sample suggests that employers in some cases may consider higher estimated wages as indicators of greater productivity, and thus may hire those workers. Lack of significance of *PREDWAGE* in the 2000 black-male sample results clearly from high degree of collinearity between *PREDWAGE* and other explanatory variables.[18] Despite this problem, we retain the current specification because the estimation of employment probabilities requires coefficients only and are unaffected by the significance levels of the coefficients.

The two-stage probit coefficients are used to estimate employment probabilities for all three demographic groups at their current wage rates. First, second and fourth rows of Table 2 report the average hourly wages and the associated employment probabilities. Clearly, the white males have the lowest unemployment rate (for example, 6.7 percent in the 2003 sample), and the black males have the highest (12.5 percent in 2003). Although the unemployment rates are lower in the 2000 sample, the ordering among the three groups remains the same. To measure the unexplained unemployment rate differential between blacks and white males, we estimated the

black employment probabilities when they are treated as white males (i.e., with white-male coefficients). The third and fifth rows, and second and fifth columns of Table 2 report these probabilities. In the 2003 sample, the employment probabilities of black males and females rise from .875 and .901 to .913 and .925, respectively. These differentials do not result from measured characteristics, and therefore are unexplained. As explained earlier, these unexplained unemployment rate differentials may arise because black workers are paid wages higher than what the employers would be willing to pay them, and consequently they can be eliminated by payment of a voucher.

The results in the 2000 sample, however, are quite different. Since *PREDWAGE* is statistically insignificant in the black-male sample and has a positive coefficient in the black-female sample, no voucher can be estimated for this year using the procedure outlined in this study. This does not, of course, mean that there is no hiring discrimination against blacks in the year 2000. It may reflect the fact that, during a period in which cyclical unemployment is essentially zero, even those generally discriminated against are hired. After all, those who would be preferred (white male workers) are not available.

In order to obtain the wage that would completely eliminate the unexplained employment probability differential (or unemployment rate differential) in the 2003 sample, we did simulations in both black samples. The predicted wages of all workers were gradually lowered by small amounts, holding all other characteristics constant. Successive iterations resulted in a rise in the average black employment probability, reducing the unemployment rate gap. Iterations continued till the unexplained differential was reduced to zero. We found in the 2003 sample that a reduction of the average black-male wage rate from $13.40 to $12.48 an hour and a cut in the average black-female wage rate from $12.23 to $10.88 an hour would eliminate the unexplained unemployment rate differentials between blacks and white males. With these lower wages, the employment probabilities of black males and black females would rise to .913 and .925 respectively, completely eliminating the unexplained part of the black-white unemployment rate differential. The extent of these wage cuts measures the hourly voucher for an average black worker. In the 2003 sample, the average hourly voucher for a black male is $0.92 and for a black female it is $1.35. In other words, if the employer pays the average black male worker $13.40 an hour but is paid a subsidy of $0.92 by the government for hiring the worker, the unexplained gap between black and white unemployment rates can be eliminated without lowering the already-low wages of black males. This, of course, would not eliminate the gap due to differences in measured characteristics. The voucher is designed to eliminate only the unexplained differential, assumed to be the result of discrimination.

Using estimates of the hourly vouchers reported in the above paragraph, we can obtain an estimate of the total dollar amount that the federal government would allocate for vouchers during a given year.[19] In our example, the total voucher cost for the year 1999 is zero.[20] This is the lower bound of the total annual voucher outlay that is likely to be incurred during a period of full employment. During a period of widespread unemployment, however, the federal outlay on the proposed voucher schemes is expected to be positive. Using the results from our 2003 sample, we estimated

TABLE 1
Structural Employment Probability Equations for Different Demographic Groups (Two-Stage Probit Estimates).[a]

Variables	White-Male	Black-Male	Black-Female
A. 2003 Sample			
Constant	8.5669**	10.166**	59.715**
	(46.801)	(19.326)	(7.042)
AGE	0.7723**	0.5195**	2.2732**
	(59.067)	(21.289)	(7.005)
AGESQ	-0.0079**	-0.0053**	-0.0229**
	(57.071)	(19.656)	(6.769)
CENTCITY	1.2684**	0.6312**	5.9407**
	(24.930)	(5.476)	(6.460)
SMSBLNS	1.8412**	1.7616**	8.8250**
	(38.827)	(12.310)	(7.268)
NEAST	0.4757**	0.6197**	2.9629**
	(9.097)	(5.028)	(4.868)
MWEST	-.2968**	0.0109	-0.7642
	(6.084)	(0.100)	(1.300)
WEST	0.0303	0.3108**	0.3169
	(0.624)	(2.142)	(0.504)
HSDGRE	0.3994**	0.1930**	-0.4404
	(9.961)	(2.074)	(1.058)
ASSCDGRE	2.0850**	2.0507**	4.9086**
	(27.058)	(10.346)	(5.457)
BACHDGRE	4.8238**	3.4078**	23.111**
	(55.179)	(19.142)	(6.943)
MSTRDGRE	5.7238**	4.9094**	29.854**
	(42.295)	(13.559)	(6.664)
PROFDGRE	10.095**	7.2228**	30.985
	(30.838)	(8.157)	(0.544)
DCTRDGRE	8.2533**	6.9746**	40.757
	(25.710)	(9.086)	(0.442)
MARRIED	2.5271**	1.5135**	2.2685**
	(47.339)	(14.006)	(3.328)
USBORN	2.7786**	0.6182**	1.8140*
	(43.332)	(4.449)	(1.760)
FAMINC	-0.0001	0.0001	0.0009
	(1.195)	(0.860)	(0.325)
PREDWAGE	-10.438**	-8.4928**	-43.649**
	(65.815)	(26.940)	(7.334)
Sample	42,746	4,645	5,844

the voucher outlay for the year 2002 to be $3,396,034,200.[21] Note that the year 2002 belongs to a period of significant wide-spread unemployment, and moreover, our estimated hourly vouchers, which use white male coefficients as the no-discrimination coefficients, act as the upper bounds on actual vouchers to be implemented in the real world. Consequently, the estimated voucher outlay just reported for the year 2002 may be considered as the upper bound for the total annual expenditure that the federal government would incur during a given year. In other words, the annual cost of the voucher during a year with average level of unemployment would be much less than 3,396 million dollars, the amount estimated for 2002.

TABLE 1—*Continued*
Structural Employment Probability Equations for Different
Demographic Groups (Two-Stage Probit Estimates).[a]

Variables	White-Male	Black-Male	Black-Female
B. 2000 Sample			
Constant	8.5106**	22.105	-5.8575**
	(26.244)	(0.043)	(10.918)
AGE	0.7962**	1.0881	-0.2832**
	(33.715)	(0.036)	(10.664)
AGESQ	-0.0081**	-0.0115	0.0033**
	(32.570)	(0.025)	(10.187)
CENTCITY	1.6892**	2.0165	-0.8265**
	(16.920)	(0.014)	(5.606)
SMSBLNS	2.4186**	2.3360	-1.2212**
	(24.317)	(0.102)	(7.305)
NEAST	0.9509**	-0.0424	-0.6126**
	(8.932)	(0.001)	(4.356)
MWEST	0.2386**	-0.3125	-0.5385**
	(2.470)	(0.003)	(3.850)
WEST	0.0800	1.4540	-0.2509
	(0.911)	(0.007)	(0.912)
HSDGRE	0.5959**	-1.5776	-0.0953
	(7.706)	(0.012)	(0.831)
ASSCDGRE	2.2301**	0.2510	-1.4710**
	(12.536)	(0.001)	(6.276)
BACHDGRE	5.0976**	4.7315	-2.7665**
	(29.435)	(0.028)	(10.182)
MSTRDGRE	5.6818**	5.1599	-5.9841**
	(23.426)	(0.013)	(13.880)
PROFDGRE	9.2851**	8.1582	-2.7963
	(16.306)	(0.008)	(0.051)
DCTRDGRE	9.9119**	3.2702	-3.9474
	(4.272)	(0.003)	(0.053)
MARRIED	2.4525**	2.0002	-0.3205**
	(24.864)	(0.013)	(2.310)
USBORN	2.8578**	2.2447	-0.3547**
	(22.365)	(0.008)	(1.981)
FAMINC	-0.0001**	-0.0001	0.0001
	(4.313)	(0.002)	(0.824)
PREDWAGE	-10.836**	-15.251	7.3246**
	(37.433)	(0.120)	(19.579)
Sample	28,648	2,603	3,251

a   The numbers in parentheses are absolute t-ratios.
** (*) Significant at 5 percent (10 percent) level.

It is important to note that despite being the upper bound, the annual voucher cost for the year 2002 remains only .03 percent of the 2002 gross domestic product (GDP) and .17 percent of the 2002 total federal outlay.[22] In other words, the cost of the proposed voucher plan is certainly not overwhelming even during a period of the worst economic recession. In fact, when compared to other existing social programs funded by the federal government, the cost of the proposed voucher plan is simply negligible.[23] This program therefore is financially viable, and it has the capability of

achieving the desired goal of equity in employment without burdening the federal treasury significantly. Moreover, to the extent the vouchers are paid off by the methods outlined in the next section, the burden of this proposed program on the federal budget is quite small and so is not prohibitive.

TABLE 2
Average Wages and Employment Probabilities

Demographic Group	2003 Sample					2000 Sample	
	Hourly Wage ($)	P(EMP=1)	Hourly Voucher ($)	Hourly Wage ($)	P(EMP =1)	Hourly Voucher ($)
White Males	16.16	0.933	—.—	14.11	0.956	—.—
Black Males	13.40	0.875	0.92	13.34	0.921	0.00
Black Males Treated as White Males in Employment	12.48*	0.913**			0.913**	
Black Females	12.23	0.901	1.35	9.77	0.924	0.00
Black Females Treated as White Males in Employment	10.88*	0.925**			0.997**	

*   The wage rate that would eliminate the unexplained part of the black-white employment probability differential (w*).

** Employment probabilities of blacks when they are treated as whites in the hiring process (allowing for the difference in observed characteristics).

The voucher estimated above has limitations. An accurate measurement of voucher requires that all relevant explanatory variables are included in the hiring equation, because a part of the unexplained differential may be attributed to unmeasured characteristics [Blau and Beller, 1988]. Second, the size of the voucher may differ by occupation and industry. If, in an occupation, the unexplained differential is zero or negative, no voucher is necessary in such an occupation. Third, the size of the voucher may differ from year to year. During a period of prosperity (for instance, in the 2000 sample), the vouchers for black workers would be smaller and could even equal zero.

Fourth, the white male coefficient vector is not necessarily the best no-discrimination coefficient vector. In measuring wage discrimination, several authors have suggested different no-discrimination coefficient vectors [Oaxaca and Ransom, 1994]. Fifth, the residual decomposition approach followed in this appendix may suffer from the non-linearity inherent in the Probit model. Despite this limitation, previous authors [Johnson 1983; Abowd and Killingsworth, 1984] have used this approach to estimate the magnitude and impact of labor market discrimination. Using this approach increases the comparability between this paper and past literature, and is harmless as long as it is only used for illustrative purposes.

Finally, estimation of the unexplained differential from cross section data ignores unobserved heterogeneity among workers, which may be resolved using appropriate

panel data. Reliable estimation of vouchers for actual implementation would require a great deal of additional work. The results discussed here simply show that it is possible to estimate voucher values for a program of this type. The estimates presented in this section should not therefore be confused with actual voucher amounts recommended for implementation in this country.

FINANCING A VOUCHER SYSTEM

Before considering financing, it is clear that most of the benefits of a voucher program would go to those found eligible to receive a voucher. Employers who accept vouchers gain financially. The less discriminatory their preferences, the more vouchers they accept and the more they gain.[24] In psychic terms, vouchers barely compensate marginal employers for their loss of pleasure in discriminating. (Alternatively, it compensates for the extra costs they face if preferences of other workers or customers are the source of the behavior). Infra-marginal employers have net psychic gains plus financial gains, while those who refuse to hire blacks, even with vouchers, neither gain nor lose.[25] Disregarding possible net employment effects, white workers face greater job competition and lower wages, as in traditional programs.

When financing is considered, distribution effects depend on the alternative chosen. For example, assume the direct costs of the voucher program were covered by a tax on employers. Abstracting from administrative costs, the average employer would receive as much in voucher money as had been paid in taxes so, on average, employers break even. Infra-marginal employers receive more voucher funds than average and would be net financial gainers, while those who insist on discriminating receive less than average (down to zero) funds, while paying taxes to support the program. This means an increased incentive for non-discrimination over the whole range of behavior, making the achievement of income equality more likely.

Assume the current burden of taxation to support those unemployed or underemployed due to discrimination rests, in part, on white workers. To the extent this burden is reduced, the impact on white workers depends on the net impact of lower wages and lower tax burdens. The total effect is ambiguous, and it is possible that there will be no negative net impact on white workers. If aggregate output and demand for labor rise, this reduces the potential negative impact on white workers.

Alternatively, assume the vouchers are financed by a general income tax. Taxes on workers who get vouchers pay for some of the program. If W is the wage for both groups after equalization, then $W - W_b$ is the gain for blacks when neither financing nor the probability of employment are considered. If these elements are included in the analysis, and TV is the added tax rate on income due to the vouchers,[26] their net gains are

$$(14) \qquad (P_b(V))W^*(1 - TV) - (P_b(NV))W_b \, ,$$

$P_b(V)$ is the probability of employment for blacks with a voucher, $P_b(NV)$ is the probability with no voucher. If administrative costs approach zero, this is guaranteed to be positive. It would reach zero if, and only if, all voucher funds were paid by this group *and* the voucher program failed to raise the probability of employment.

Ignoring reductions in the burden of other social programs (and assuming no change in the probability of employment for whites), white workers would have a change in income of

(15) $W^*(1 - TV) - W_w < 0.$

Under the given assumptions, this is negative, since $W^* < W_w$ and $(1 - TV) < 1$. For this to be positive, the impact of the voucher on tax burdens has to be negative—savings on social programs have to be large compared to voucher outlays. In that case, TV is negative (W_w measured net of taxes), and net effects positive if,

(16) $TV > 1 - W_w/W^*.$

The impact on employers is naturally more favorable than if all financing were through a tax on them. Marginal employer participants get financial returns of

(17) $[\Pi(V^*) + nV^*](1 - TV),$

where $\Pi(V^*)$ is the operating profit realized under the voucher system, and n is the number of vouchers "cashed." The tax rate TV due to the voucher system is assumed to be the same for profit and wage income. Non-participants get lower profits, since the above expression applies, with n at zero. Infra-marginal participants get more, since they average higher values for n.[27]

MORE COMPLEX VOUCHER SCHEMES

A Dynamic Voucher

One plausible reason for "discrimination" is employer's erroneous estimation of the productivity of black workers. If that causes the differential treatment of black workers, the time path of an optimal voucher can be described by a simple dynamic model. Assume discrimination is the reason for differential treatment, and it is due to incorrect estimation of the individual productivity of blacks. After hiring, employers accumulate information about the abilities of the individual hired, as well as fixed investments in training.[28] [If the voucher causes an increase in segregation, the opportunity for learning would be limited.] For both reasons, the optimal voucher amount required to keep individuals employed, avoiding excessive and inefficient job turn-over, would be less than the value required for initial hiring. A *dynamic* optimal voucher would be declining for any individual working in a given firm. If highly successful, the improvement in information regarding the actual productivities of blacks could make the value of initial optimal vouchers decline over time.[29]

For a dynamic optimal voucher scheme, consider the following model: Define $K_B(0)$ as an employer's estimate of a black worker's productivity before the worker is hired, while $K_W(0)$ is the equivalent estimate for a white worker, and assume $K_W(0) > K_B(0)$. If actual productivities are equal the difference is due to employer error. As-

sume the hiring process adds information about black and white workers and reduces employer error.

Define $K'_W(0) = K_W(0) + h_W$, where h_W is result of the incremental information from the hiring process for white workers. Define $K'_B(0) = K_B(0) + h_B$, where h_B is the result of incremental information from the hiring process for black workers. We assume $h_B > h_W$, since employers are presumed to have less accurate information about black workers. The optimal voucher before hiring would need to compensate for the pre-hiring gap $[K_W(0) - K_B(0)]$. To maintain employment right after hiring, the voucher would need to compensate for the gap $[K'_W(0) - K'_B(0)]$, which is smaller than the initial gap by the difference $[h_W - h_B]$.

After the discrete change resulting from the hiring process, assume there would be a smooth change in the knowledge gap. Employers know their white workers better than their black workers, but learn more about the black workers at each moment of time. If DK is the time rate of change in knowledge, we assume

$$(18) \qquad DK_B(t) = k[K_W(t) - K_B(t)],$$

where $k>0$ is a constant rate of adjustment parameter, and equation (18) is defined only for values such that $K_W(t) - K_B(t) \geq 0$.

For simplicity, assume $K_W(t)$ is constant ($= K_W$) after the hiring process. The results obtained below would still follow if $K_W(t)$ rose as the employer learned more about the white worker, as long as *correct* knowledge about the black worker rose faster. Over time, as $[K_W - K_B(t)]$ approaches zero, the size of the optimal voucher would be affected as well. Let the optimal voucher be determined by the knowledge gap so that

$$(19) \qquad V^*(t) = v[K_W - K_B(t)] + A$$

where $v > 0$ is another parameter rate of adjustment and A is the amount needed to cover firm administrative costs. Combining equations (18) and (19) and differentiating (given $DK_W=0$):

$$(20) \qquad DV^*(t) = -vk[K_W - K_B(t)].$$

As $[K_W - K_B(t)]$ approaches zero (as it will, given equation (11)) the size of the optimal voucher declines toward zero. If the optimal voucher covers firm administrative costs, the voucher program would end with V^* still a positive number, just covering those costs (A).

How long this would take cannot be estimated without experimental data. However, some idea of the time required can be obtained by considering the learning curve for workers. Employers, by observation, may reach as full a knowledge of their employees' abilities at around the same time that the employees, following a standard learning curve, approach maximum productivity. The time period required varies by industry and type of job, and an aggregate measure, even if available, would mean little.

The learning curve provides an estimate of the time required for V^* to approximate zero (net of administrative costs). The parameter v, measured at time zero (prevoucher) can be set at unity—so $V^*(0)$ is the gap between the productivity estimates. The slope of the learning curve provides an estimate of k, allowing the rate of change in the optimal voucher to be calculated.

Non-homogeneous Vouchers

Even the dynamic analysis above assumes a single voucher for the whole economy. Clearly this would not be the best system in any real application. In some labor markets there are wider divergences between black and white wages and employment probabilities than in others. In some the divergence may not exist. A single voucher value for all markets would be too high in markets with little current discrimination, so high as to foster an inefficiently high demand for black workers. In other markets with high current levels of discrimination the overall voucher would be too low for efficiency. Clearly this is a limitation of a uniform voucher system. A true optimal voucher system would require differential voucher values for different markets.

It is certainly reasonable to anticipate different voucher values for skilled and unskilled labor. Since there are gender differences in the practice of discrimination, there might be separate male and female vouchers (as shown in Section 4). The vouchers may also be extended to other racial groups.[30] Considering white males as the reference group, vouchers for workers of other race/gender groups can be estimated following the analysis developed in this study for blacks only. Discussion of all these different types of voucher is beyond the scope of this study.

SUMMARY AND CONCLUSION

Current anti-discrimination programs resemble many other traditional governmental interventions in social and market phenomena. They attempt to regulate behavior via rules and penalties, the effects they are intended to foster are not their only effects, and those whose behavior they intend to control are motivated to subvert and disobey them. They no doubt have significant positive effects on bridging racial and gender income disparities. But they have never been fully successful in equalizing incomes, unemployment rates, and job market opportunities. In the face of these limitations of the traditional anti-discrimination programs, a voucher scheme, an incentive based method to fight job market discrimination, is proposed in this study to supplement existing programs. The primary goal of the proposed voucher program is to reduce the inefficiencies associated with the current programs, while improving the results.

A number of advantages of the voucher system have been discussed along the way, positive effects on employment and wages, lower enforcement and welfare costs, improved efficiency, and gains for minority owned firms. An additional point with respect to the last: there should be a rise in entrepreneurship for minorities with less desire to discriminate and therefore a higher rate of return. This might mitigate the current relatively low rate of such activity in the African-American population.

An advantage not yet discussed is one common to market incentive programs in general and vouchers in particular, i.e., transparency. In command type programs costs are distributed in obscure ways, seldom explicitly discussed as part of the program, and often difficult or impossible to measure. In voucher systems costs and the distribution of costs and benefits are more explicit, more readily measured. In one sense this is a disadvantage, costs that are visible are more easily attacked. On the other hand, such costs are more easily controlled and may therefore be lower overall (combined private and governmental) and they may also be more fairly distributed.

This type of voucher could also have certain disadvantages. We mentioned the potential rise in work place segregation and the possible decline in white wages. Another disadvantage is the likelihood of an initial displacement of currently employed white workers in favor of blacks. Since job loss is not costless this would put an unfair burden on some white workers, which should be compensated for as part of the program, as workers displaced by free trade agreements can be. It is important to note that the proposed voucher is designed not to replace the existing programs, but to supplement them when they fail to achieve their desired social goals. This program should not therefore be applied universally to all situations, because such an approach would add unnecessary costs to already existing costly programs.

A program as novel as the one suggested in this paper could hardly be implemented without further studies, theoretical and otherwise. Obviously, an experimental program, along the general lines of the Illinois Unemployment Insurance experiments would be useful, though small-scale experiments cannot be expected to faithfully mimic ones that would dramatically change the national labor market.

DATA APPENDIX
Definition of Variables Used in Different Equations[a]

Variable	Definition	Equation in which it is used		
		Probit (Stage 1)	Wage	Probit (Stage 2)
AGE	Age in years	y	y	y
AGESQ	Age squared	y	y	y
CENTCITY	= 1, if lives in central city area	y	y	y
SMSBLNS	= 1, if lives in the balance of the MSA	y	y	y
NEAST	= 1, if lives in the North-Eastern region	y	y	y
MWEST	= 1, if lives in the Mid-West region	y	y	y
WEST	= 1, if lives in the West	y	y	y
HSDGRE	= 1, if he/she is a high school graduate	y	y	y
ASSCDGRE	= 1, if he/she has an associate degree	y	y	y
BACHDGRE	= 1, if he/she has a bachelors degree	y	y	y
MSTRDGRE	= 1, if he/she has a masters degree	y	y	y
PROFDGRE	= 1, if he/she has a professional degree	y	y	y
DCTRDGRE	= 1, if he/she has a doctorate degree	y	y	y
MARRIED	= 1, if married with spouse present	y	y	y
USBORN	= 1, if born in the United States	y	y	y
FAMINC	= Income of other family members (in thousands)	y	n	y
FULLTIME	= 1, if the worker works full time	n	y	n
GOVEMP	= 1, if the longest employment is in public sector	y	y	n
MANG	= 1, if the longest occupation is as a manager	y	y	n
PROF	= 1, if the longest occupation is as a professional	y	y	n

DATA APPENDIX—*Continued*
Definition of Variables Used in Different Equations[a]

Variable	Definition	Probit (Stage 1)	Wage	Probit (Stage 2)
		Equation in which it is used		
SERV	= 1, if the longest occupation is in service	y	y	n
SALE	= 1, if the longest occupation is in sales	y	y	n
ADMN	= 1, if the longest occupation is in the administrative support field	y	y	n
OPRTV	= 1, if the longest occupation as an operative	y	y	n
MOVE	= 1, if the longest occupation as a mover or laborer	y	y	n
MANF	= 1, if the longest industry is manufacturing	y	y	n
TRAD	= 1, if the longest industry is trading	y	y	n
TRNS	= 1, if the longest industry is transport	y	y	n
INFO	= 1, if the longest industry information tech.	y	y	n
FINC	= 1, if the longest industry is finance sector	y	y	n
SRVC	= 1, if the longest industry is the service sector	y	y	n
PREDWAGE	= predicted log wage rate	n	n	y

a   The "y" denotes "YES" and "n" represents "NO."

NOTES

The authors wish to thank the seminar participants at California State University, Los Angeles, three anonymous referees and the editor for helpful comments. The usual disclaimer applies. Errors and omissions are our own.

1.   Affirmative action covers only government employment (about 22 percent of employment, Economic Report of the President, 1994), and jobs covered by contract compliance provisions. Its scope was narrowed by two 1995 Supreme Court decisions.

2.   One estimate for affirmative action is $1 billion per year, $50-80 per worker [Leonard, 1984; 1985]. For an analysis of existing programs that are most like vouchers, see Johnson and Welch [1976]. They assume a counter-factual strict quota, so their benefits and costs represent unrealistic extremes. Welch [1981] discusses efficiency costs if real productivity differences cause wage and employment differences. Arrow's [1985] discrimination with no efficiency costs assumes rigid conditions. Holzer and Neumark's [1999, 67] survey states "there is, at this juncture, very little compelling evidence of deleterious efficiency effects of Affirmative Action." They conclude there is evidence for efficiency gains, but not that gains outweigh enforcement costs.

3.   We assume differences in hiring and pay, after allowing for measured differences in education, experience and other observed characteristics, are due to discrimination so we will find the upper bound of possible effects.

4.   Mohanty [2002] shows the average labor force participation probability of black teenagers is far smaller than that of Whites and Latinos.

5.   Black Male income as a percent of White Male income rose from about 0.54 in 1964 to 0.60 in 1988 (1978 peak was 0.65) [U.S. Bureau of the Census], continuing a trend in evidence since at least 1940. Despite cyclical variations, post-1964 black relative unemployment rates have gone up [Economic Report of the President, 1994]. See Smith and Welch [1977] on occupational convergence. Brown [1984] ascribes half the wage convergence to supply side effects. Using employment rates Baldwin and Johnson [1996] find large differences in employment opportunities. Freeman [1973; 1981] finds changes in background (e.g., education) cause most of the improvement, but perhaps indirectly as a result of anti-discrimination policies.

6.   There are other explanations for changes in relative unemployment rates, including one most consistent with this paper [Fairlie and Sundstrom, 1997, 254].

7.   In Becker [1971] discrimination due to employer preferences disappears in the long run in competitive markets, so use of employer preferences implies market failure. However, this study

argues that if higher black unemployment rates are due to employers' preferences, this can be corrected more efficiently by supplementing existing programs with vouchers. The effects of vouchers on discrimination from other causes should be the subject of further research.

8. A principal objection to voucher programs in labor markets is the "stigma effect" [Burtless 1985] – eligibility marks you as less productive so employers are unwilling to hire and workers are unwilling to use the voucher. This effect is less important for this plan than for those in prior literature, aside from Bartik's [2001] criticism of Burtless. Most getting a voucher are already stigmatized— a voucher will not increase the stigma.

9. Assuming employers have identical preferences with respect to discrimination. Dropping this assumption implies different employers hire different racial proportions of workers at a given wage differential. Employers with the least taste for discrimination hire only blacks. Those with the most desire hire only whites.

10. To obtain equality of P_W and P_B, V^* must cover firms' costs of administering the program. For a discussion of the importance of administrative costs, see Ellwood [1988].

11. Presumably firms owned/managed by blacks have the greatest reduction in labor costs so the voucher program could substitute for "set aside" programs. Net benefits for firms with little or no desire to discriminate imply "windfall effects," payments for doing things that would be done anyway, raising the cost of the program. Bartik [2001] considers marginal approaches that restrict payment to firms based on hiring they would do without the plan. This raises administrative costs [Bartik, 2001, 205] and may cause "strange incentives" for employers. The total amount paid in vouchers is not a true measure of the cost of the program, so we have rejected the more complex marginal approach.

12. True segregation is plausible only in the long run, since few firms would find it desirable to replace many workers right away [Arrow, 1972].

13. Current programs may benefit educated, wealthy, blacks. With heterogeneous vouchers, if V^* for black neurosurgeons is zero (no discrimination in the market) no vouchers are issued, even if there are few such neurosurgeons due to discrimination in education or credit markets.

14. A black worker may have several employers so issues, such as "how many vouchers this worker qualifies for" and "which employer receives how much," must be resolved for implementation. We thank a reviewer for raising this important issue. The simplest solution is "one person, one voucher," the recipient choosing which employer to give it to.

15. See Speigelman and Woodbury [1990]. For an evaluation of the Illinois, New Jersey, Pennsylvania, and Washington experiments see Mayer [1995]. Dubin and Rivers [1993, 233] find utilization and effectiveness are positively related to the size of the voucher, relative to a productivity gap, and to the percentage of the work force eligible for vouchers.

16. We thank a referee for raising this issue that helped us to clarify the distinctive features of this study compared to earlier ones.

17. Targeting the unemployed encourages firms to fire current employees and hire new ones with vouchers, it encourages employees to quit and qualify for a voucher. Targeting all black workers would improve the retention rate of the employed, increase the employment probability of the unemployed, and raise aggregate black employment.

18. Our unreported results indicate that inclusion of other identifying variables improves the significance levels of the parameter estimates considerably.

19. We thank a reviewer for raising this interesting issue.

20. Note that the annual CPS demographic file provides the actual data for the previous year, and consequently our 2000 sample, in fact, represents the 1999 statistics.

21. Our 2003 sample, in fact, contains 2002 data. (See footnote 20). To compute the magnitude of the annual voucher, we obtained from the Economic Report of the President [February, 2004] the average weekly hours of employment [Table B-47, 340] and the number of unemployed black workers in the labor force [Table B-38, 330]. The annual vouchers (AV) were then obtained separately for men and women by using the following formula:

AV = (Hourly Voucher) × (Weekly Hours) × (52 Weeks) ×
           (Number of Unemployed Blacks in the Labor Force).

For men, AV = ($.92)×(33.9)×(52)×(835,000) = $1,354,182,960, and for women, it is ($1.35) ×(33.9)×(52)×(858,000) = $2,041,851,240. Thus the total estimated voucher outlay for the year 2002 is $3,396,034,200.

22. The GDP for the year 2002 was $10,480.8 billions [Economic Report of the President, 2004, Table B-1, 284), and the total federal outlay in that year was $2,010,970 millions [ERP, 2004, Table B-81, 380). The total voucher outlay estimated in footnote 21 thus represents .03 percent of the GDP and .17 percent of the total federal outlay.

23. The 2002 total annual spending on Unemployment Insurance, a social program complementary to our proposed voucher was $42,798 millions [Economic Report of the President, 2004, Table B-45, 337]. The 2002 federal spending on other complementary social programs (in millions) are as follows: "Education, training, employment and social services" = $70,544, "Veteran benefits and services" = $50,984, "Administration of justice" = $35,171, "Health" = $196,544 and "Medicare" = $230,855 [Economic Report of the President, 2004, Table B-81, 380]. The maximum cost of the proposed voucher as shown in footnote 21, on the other hand, is only $3,396 millions, and so it is financially viable.

24. Although all employers in a given market receive vouchers by employing blacks, those who hire more receive more vouchers. Employers operating in a more discriminatory market are expected, ceteris paribus, to receive more vouchers than those in a less discriminatory one. This does not mean highly discriminating employers receive more vouchers than less discriminating ones. In a given market with a given level of discrimination, an employer who discriminates more receives less in voucher funds. We thank a referee for making this clarification possible.

25. They may gain — they do not hire people they hate, or go to court. Note we assume a voucher is not marketable, that alternative has interesting efficiency and distribution effects, but they are off the main line of this paper.

26. For simplicity a flat tax (single rate) is used for the calculation.

27. Employers' first order conditions for utility maximization require the marginal disutility of hiring the next black to equal the marginal loss in utility from profit foregone due to not hiring the next black. If there is no desire to discriminate, the result is the profit maximizing solution. If there is a marginal desire to discriminate, employers with different preferences discriminate to different degrees. The voucher changes the optimal number of blacks for some employers, for some the utility maximizing value can be zero.

28. With respect to the dynamic declining voucher model, Bartik [2001, 241] notes considerable persistence of higher earnings after wage subsidies are eliminated, i.e., employers realized those hired were productive enough to keep even when firms pay the full costs. This supports the supposition of the dynamic model that voucher levels fall over time as learning occurs. If discrimination is not due to employer ignorance the result might still apply, workers and/or customers might become used to integration.

29. If there is a desire to discriminate, not underestimation of black productivity, this model does not apply. Instead, the required number of vouchers declines as the share of employment controlled by bigots approaches zero. The voucher increases the advantage of not discriminating, reduces the time needed to eliminate discrimination and the amount of discrimination during the process. If the bias arises from other employees, the voucher compensates for costs from that source.

30. The racial and ethnic classification in the 2000 census means identification of workers into different racial groups may cause estimation problems. This issue, however, cannot be solved in a single article and is recognized as a limitation of this study. Proper precautions should therefore be taken while collecting data to estimate the actual voucher. We thank a reviewer for bringing this empirical problem to our notice.

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