

NBER WORKING PAPER SERIES

RACIAL DISCRIMINATION AND COMPETITION

Ross Levine  
Alexey Levkov  
Yona Rubinstein

Working Paper 14273  
<http://www.nber.org/papers/w14273>

NATIONAL BUREAU OF ECONOMIC RESEARCH  
1050 Massachusetts Avenue  
Cambridge, MA 02138  
August 2008

We thank seminar participants at Brown University, the Bank of Israel, and the NBER Workshop on "Income Distribution and Macroeconomics" for helpful comments, Daron Acemoglu, Roland Benabou, Ken Chay, Raquel Fernandez, Mark Rosenzweig, and Glenn Loury for very useful discussions, Lindsay Mollineaux for excellent research assistance, and the Watson Institute for financial support. The views expressed herein are those of the author(s) and do not necessarily reflect the views of the National Bureau of Economic Research.

© 2008 by Ross Levine, Alexey Levkov, and Yona Rubinstein. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that full credit, including © notice, is given to the source.

Racial Discrimination and Competition  
Ross Levine, Alexey Levkov, and Yona Rubinstein  
NBER Working Paper No. 14273  
August 2008  
JEL No. D3,D43,G21,G28,J31,J7

**ABSTRACT**

This paper assesses the impact of competition on racial discrimination. The dismantling of inter- and intrastate bank restrictions by U.S. states from the mid-1970s to the mid-1990s reduced financial market imperfections and lowered entry barriers facing nonfinancial firms. We use bank deregulation to identify an exogenous intensification of competition in the nonfinancial sector, and evaluate its impact on the racial wage gap, which is that component of the black-white wage differential unexplained by Mincerian characteristics. We find that bank deregulation reduced the racial wage gap by spurring the entry of nonfinancial firms. Consistent with theory, the impact of competition on the wage gap is particularly large in states with a comparatively high degree of racial bias, where competition-enhancing bank deregulation eliminated between 20 and 30 percent of the racial wage gap.

Ross Levine  
Department of Economics  
Brown University  
64 Waterman Street  
Providence, RI 02912  
and NBER  
ross\_levine@brown.edu

Yona Rubinstein  
Brown University  
Department of Economics  
Box B  
Providence, RI 02912  
yona\_rubinstein@brown.edu

Alexey Levkov  
Department of Economics  
Brown University  
64 Waterman Street  
Providence, RI 02912  
Alexey\_Levkov@brown.edu

# 1 Introduction

Attitudes toward race have exerted a defining influence on the United States, producing slavery, shaping the Constitution, and yielding an array of statutes restricting the economic opportunities of blacks. Today, more than four decades after the Civil Rights Act, large disparities between black and white Americans persist along many dimensions, including in wage rates (Smith and Welch, 1989, Donohue and Heckman, 1991, Bound and Freeman, 1992, Altonji and Blank, 1999, and Neal, 2006). Yet, the underlying sources of these differences remain unclear. Researchers have not fully determined the degree to which blacks earn less than whites because of gaps in productive characteristics or because of racial discrimination, whereby blacks are paid less than identically productive whites.

Becker (1957) argues that taste-based discrimination, the disutility that white employers attach to hiring black workers, can produce an equilibrium racial wage gap in an imperfectly competitive economy. With perfect competition, any wage gap between black and white workers with identical skills would be competed away – like any inefficiency – by the entry of new firms with less of a taste for discrimination. From this perspective, the combination of the racist attitudes of employers and inadequate competition helps explain the racial wage gap.

In contrast, rather than emphasizing racial biases and imperfect competition, Arrow (1972, 1973) and Phelps (1972) stress that a gap in skills and imperfect information can explain racial wage differentials. If black workers are on average less productive than white workers due to characteristics that are unobserved by employers, those employers will use the observable characteristic – race – as a signal of productivity. In turn, employers will pay blacks a lower wage rate than whites with identical observable skills. Indeed, Neal and Johnson (1996) account for a large proportion of the black-white wage differential using a measure of cognitive achievement. Heckman, Stixrud, and Urzua (2006), however, note that cognitive achievement measures themselves could reflect discrimination and racial wage differentials.

We assess the central prediction emerging from Becker’s (1957) theory of discrimination: Intensified competition reduces racial wage gaps in economies where the marginal employer has a taste for discrimination. Indeed, we provide the first test of whether the impact of competition on the racial wage gap depends on the marginal degree of racial bias in the economy.

Specifically, we use inter- and intrastate bank deregulation to identify an exogenous intensification of competition in the nonfinancial sector, and evaluate its impact on the

black-white wage gap. From the mid-1970s to 1994, states relaxed restrictions on both the entry of banks from other states and the branching of banks within states. The resultant intensification of competition among banks reduced financial market imperfections and lowered entry barriers facing nonfinancial firms. Indeed, Black and Strahan (2002) and Kerr and Nanda (2007) demonstrate that bank deregulation spurred the entry of new firms. We test whether the increase in competition from bank deregulation affected racial discrimination throughout each state's economy. Moreover, we differentiate states by the marginal degree of racial bias and test whether the effect of competition on the black-white wage gap varies with the degree of racial bias.

Our strategy requires that bank deregulation is exogenous to changes in competition and racial discrimination. For much of the history of the United States, geographic restrictions on banking protected local banks from competition (White, 1983). By the mid-1970s, however, technological innovations reduced the economic advantages of these restrictions, weakening the ability and desire of banks to fight deregulation and triggering the dismantling of these statutes over the next two decades. Kroszner and Strahan (1999) show that (1) the invention of automatic teller machines weakened the geographical bond between customers and banks; (2) checkable money market mutual funds facilitated banking by mail and telephone; and, (3) improvements in data processing, telecommunications, and credit scoring techniques weakened the informational advantages of local bankers. The timing of deregulation was neither affected by competition in the nonfinancial sector (Black and Strahan, 2002, Kerr and Nanda, 2007), nor, as we demonstrate below, by the black-white wage differential.

Employed with this framework, we turn to the data. Using micro-level data from the March Current Population Surveys (CPS) for survey years 1977 to 2007, aggregate state level data on new incorporations as a proxy for competition in the nonfinancial sector from Black and Strahan (2002), and the dating of bank deregulation from Kroszner and Strahan (1999) and Amel (2008), we evaluate the impact of bank deregulation and competition on blacks' relative wages.

We find that intensified competition substantively reduces racial discrimination. Reduced form estimates show that inter- and intrastate bank deregulation increases the relative wage rates of black workers. As for more direct evidence on the underlying mechanism, two-stage least squares results show that the exogenous component of new incorporations increases the relative wage rate of black workers, where the exogenous component of new incorporations is identified by inter- and intrastate bank deregulation. Bank deregulation reduces racial discrimination by intensifying competition.

Moreover, we show that the exogenous intensification of competition has a differential effect on the black-white wage gap depending on the degree of racial bias in the economy. According to Becker (1957), competition will not affect racial discrimination if the marginal employer does not receive disutility from hiring black workers. To conduct this additional test, we first compute the predicted rate of racial intermarriage based on individual characteristics and each state’s racial composition from the 1970 Census. Then, we interpret the difference between the predicted rate of intermarriage and the actual rate as positively related to the taste for discrimination at the margin. Although noisy and imperfect, this racial bias index is probably unaffected by expectations of future bank deregulation and provides a mechanism for assessing whether the impact of an exogenous change in competition on the black-white wage gap varies by the degree of racial bias in the economy.

Exogenous changes in competition only affect the black-white wage gap in states with a sufficiently high degree of racial bias. In states with above the median level of the racial bias index, deregulation eliminates between 20 and 30 percent of the initial wage gap. The results are robust to using alternative measures of racial bias discussed below. Critically, we are not examining whether states with a high degree of racial bias converge toward low racial bias states. Rather, we show that *among* high racial bias states, exogenous increases in competition reduce the black-white wage gap relative to other high racial bias states.

Furthermore, Becker’s (1957) theory predicts that competition increases the relative demand for black workers, suggesting that competition boosts both relative wage rates and working hours. We test and confirm this hypothesis. The intensification of competition enhances the relative working hours of blacks among high racial bias states, suggesting that competition shifts out the relative demand curve for black workers.

The results are robust to several potentially confounding influences. Our findings could be affected by compositional changes in the labor force (Butler and Heckman, 1977; Mulligan and Rubinstein, 2008), or by changes in the price of productive skills (Juhn, Murphy, and Pierce, 1991). The labor force could change due to the positive (or negative) selection of workers into the labor force, interstate migration, and changes in self-employment following deregulation. We find no evidence that bank deregulation increases self-employment among blacks. Consistent with theory, we do find that the intensification of competition increases the relative demand for black workers and attracts blacks from other states. The extensive margin effects are insufficiently large, however, to change the average value of skills among working blacks. In addition,

we find that deregulation tends to increase the returns to unobservable skills, which biases the results against our findings. These robustness tests indicate that we are not overestimating the beneficial effects of competition on blacks' relative wage rates. Furthermore, we show that competition boosts blacks' relative wages in particular, not the relative wages of comparatively low income workers in general.

We are not the first to examine competition and discrimination. Becker (1957), Shepard and Levin (1973), and Oster (1975), for example, compare market concentration and relative wage rates across industries, obtaining mixed results. Within the banking industry, Ashenfelter and Hannan (1986) find a negative association between market concentration and the share of female employees across several banking markets in Pennsylvania and New Jersey. Besides problems with interpreting market concentration as a proxy for competition, omitted industry or market characteristics could bias or conceal any links between competition and discrimination. Another approach traces the impact of a policy change in a single industry. Heywood and Peoples (1994) and Peoples and Talley (2001) find that the deregulation of trucking increased the relative wage rates of black workers. Within banking, Black and Strahan (2001) find that bank deregulation increased competition between banks and disproportionately helped women employees of banks, while Black and Brainerd (2004) find that globalization intensified competition in manufacturing, reducing the gender-wage gap. Focusing on racial prejudices rather than competition, Charles and Guryan (2007) demonstrate a close association between the racial wage gap and self-reported attitudes toward race.

We make four key contributions to this work. First, we follow Becker's (1957) theory very closely and provide the first examination of the hypothesis that the impact of competition on the black-white wage gap depends on the degree of racial bias in the economy. Second, rather than using market concentration as a proxy for competition, we use bank deregulation as an exogenous source of variation in competition in the non-financial sector, which we proxy with new firm entry. Bank deregulation is directly informative in reduced form assessments of racial discrimination because deregulation lowered barriers to the entry of new firms, enhancing contestability in the nonfinancial sector. Bank deregulation is indirectly informative in two-stage least squares assessments because it extracts the exogenous component of new firm entry. This is particularly useful since Becker (1957) identifies the entry of new firms as the mechanism through which lower entry barriers changes the demand for black workers. Third, the cross-state, cross-time variation of bank deregulation allows us to condition on state and year fixed effects and thereby control for all national influences, such as

changes in federal statutes and technological innovations, as well as state-specific factors that might affect the black-white wage differential. Finally, rather than examining a particular industry, which might not represent the relevant labor market, we examine the entire economy.

Our work complements research demonstrating that firms have a preference for interviewing white job applicants. Bertrand and Mullainathan (2004) find that resumes with traditionally white names receive 50 percent more calls for interviews than identical resumes with distinctively black names. This innovative line of research, however, does not assess the characteristics of actual job offers. We examine the impact of competition on both wage and employment rates, providing direct information on whether competition affects the relative demand for black workers.

This paper also relates to research on finance and institutions. There is a growing appreciation that the operation of the financial system affects economic growth and the distribution of income (Levine, 2005; Beck, Levine, and Levkov, 2008; Demirguc-Kunt and Levine, 2008). We show that improvements in the functioning of banks substantively enhanced the economic opportunities of an historically disadvantaged group. Specifically, technological innovations in banking reduced impediments to the creation of new firms, driving down racial discrimination. This advertises the central role of markets in endogenously altering the manifestation of racial bias in wage rates.

Our results link to statistical discrimination models. We find that competition reduces the black-white wage gap in states with a sufficiently high degree of racial bias. These results are consistent with the taste-based theory of discrimination. These findings, however, do not contradict statistical discrimination models. Statistical discrimination might play an additional, powerful role in explaining racial discrimination. The combination of racial bias and inadequate competition does not fully account for the black-white wage differential. Furthermore, competition that reduces racial discrimination may enhance incentives for blacks to invest in acquiring more skills. This would boost the average skill level of blacks and reduce statistical discrimination, potentially creating self-reinforcing dynamics that dramatically reduce racial discrimination (Coate and Loury, 1993; Benabou, 1996; Durlauf, 1996), along with racial disparities in educational attainment and health (Card and Krueger, 1992; Jencks and Phillips, 1998; Fryer and Levitt, 2004; Almond, Chay, and Greenstone, 2006).<sup>1</sup>

The remainder of the paper is organized as follows. Section 2 discusses the use

---

<sup>1</sup>Altonji and Pierret (2001) find that the coefficients on skills that are easily observed by employers, such as, education decrease over individuals' working cycles as firms learn about worker productivity. Yet, they find no evidence for statistical discrimination in wages on the basis of race.

of bank deregulation as an exogenous source of variation in competition. Section 3 outlines the theoretical and statistical framework. Section 4 describes the data and econometric design. Sections 5 and 6 present the main results and robustness tests respectively. Section 7 concludes.

## **2 Bank Deregulation and Competition**

### **2.1 A Brief History of Bank Branch Regulation**

Geographic restrictions on banks have their origins in the U.S. Constitution, which limited states from taxing interstate commerce and issuing fiat money. In turn, states raised revenues by chartering banks and taxing their profits. Since states received no charter fees from banks incorporated in other states, state legislatures prohibited the entry of out-of-state banks through interstate bank regulations. To maximize revenues from selling charters, states also effectively granted local monopolies to banks by restricting banks from branching within state borders. These intrastate branching restrictions frequently limited banks to operating in one city.

By protecting inefficient banks from competition, geographic restrictions created a powerful constituency for maintaining these regulations even after the original fiscal motivations receded. Indeed, banks protected by these regulations successfully lobbied both the federal government and state governments to prohibit interstate banking and intrastate branching (Southworth, 1928; White, 1983; Economides, Hubbard, and Palia, 1996).

In the last quarter of the 20th century, however, technological, legal, and financial innovations diminished the economic and political power of banks benefiting from geographic restrictions. In particular, a series of innovations lowered the costs of using distant banks. This reduced the monopoly power of local banks and weakened their ability and desire to lobby for geographic restrictions. For example, the invention of automatic teller machines (ATMs), in conjunction with court rulings that ATMs are not bank branches, weakened the geographical link between banks and their clientele. Furthermore, the creation of checkable money market mutual funds made banking by mail and telephone easier, thus further weakening the power of local bank monopolies. Finally, the increasing sophistication of credit scoring techniques, improvements in information processing, and the revolution in telecommunications reduced the informational advantages of local bankers, especially with regards to small and new firms.

These national developments interacted with preexisting state characteristics to



shape the timing of bank deregulation across the states. As shown by Kroszner and Strahan (1999), deregulation occurred later in states where potential losers from deregulation (small, monopolistic banks) were financially stronger and had a lot of political power. On the other hand, deregulation occurred earlier in states where potential winners of deregulation (small firms) were relatively numerous. Most states deregulated geographic restrictions on banking between the mid-1970s and 1994, when the Riegle-Neal Act effectively eliminated these restrictions.

The forces driving bank deregulation were exogenous to competition in the non-financial sector and the black-white wage gap. In particular, the timing of deregulation was not shaped by new firm formation (Black and Strahan, 2002, Kerr and Nanda, 2007), nor by the strength of labor unions (Black and Strahan, 2001), nor by the degree of earnings inequality (Beck, Levine, and Levkov, 2008) in each state. Moreover, we show below that the black-white wage gap does not explain the timing of bank deregulation.

## **2.2 Bank Deregulation and Competition in the Non-Financial Sector**

An extensive literature examines the ramifications of bank deregulation. For example, Jayaratne and Strahan (1998) find that removing geographic restrictions improved banking efficiency by reducing interest rates on loans, raising them on deposits, lowering overhead costs, and shrinking loan losses. Beyond banking, deregulation accelerated a state's rate of economic growth (Jayaratne and Strahan, 1996; and Huang, 2007), lowered economic volatility (Demyanyk, Ostergaard, and Sorensen, 2007), improved the self-employment opportunities of disadvantaged groups (Demyanyk, 2008), and reduced income inequality (Beck, Levine, and Levkov, 2008).

More specifically for the purposes of this paper, inter- and intrastate bank deregulation intensified competition among firms in the non-financial sector by reducing barriers to the entry of new firms. Black and Strahan (2002) find that deregulation helped entrepreneurs start new businesses, with the rate of new incorporations per capita in a state increasing by six percentage points following deregulation. Kerr and Nanda (2007) find that interstate deregulation increased the number of new start-ups by six percentage points and expanded the number of facilities of existing firms by four percentage points, with their findings holding across all sectors in the economy. Furthermore, they find a dramatic increase in both the entry and exit of firms, suggesting that deregulation increased contestability throughout the economy.<sup>2</sup> Below, we confirm

---

<sup>2</sup>Several interrelated factors explain the impact of deregulation on competition in the overall econ-

that inter- and intrastate bank deregulation boosted the rate of new incorporations per capita and we use this to identify an exogenous, positive shock to competition in our analysis of racial discrimination.

### 3 Conceptual Framework and Econometric Strategy

#### 3.1 Conceptual Framework

Becker's (1957) seminal analysis of racial discrimination and competition motivates our empirical analysis. In Becker's model, employers are heterogeneous in both quality and 'taste for discrimination,' which is defined as the degree to which they suffer "disutility" from employing minority workers. In equilibrium, minority workers must 'compensate' employers either by being more productive at a given wage or, equivalently, by accepting a lower wage for identical productivity. Market pressures cause blacks to be hired by the least racially biased employers, such that the black-white wage gap is determined by the racial bias of the marginal employer hiring black workers, rather than by the average level of racial bias among all employers.

In Becker's model, an equilibrium racial wage gap can only arise in an imperfectly competitive environment where the marginal employer receives disutility from hiring minorities. Clearly employers with no taste for discrimination earn extra monetary profits by hiring blacks. In a perfectly competitive setting with no entry barriers, employers with a taste for discrimination are ultimately driven from the market by the entry of new firms with less of a taste for discrimination. Yet, if there are enduring barriers to entry, racial biases can yield an equilibrium wage gap between identical black and white workers.

Becker's model also predicts that an increase in competition – a reduction in entry barriers – reduces the black-white wage rate differential. If the new marginal firm has less of a taste for discrimination than the old marginal firm, racial discrimination falls. Competition does not change any individual's preferences toward hiring minority

---

omy. First, deregulation fueled competition among banks and reduced lending rates. This facilitated the expansion of existing firms and the entry of new ones. Furthermore, the country's more innovative banks were developing better techniques for evaluating firms. Sophisticated credit-scoring techniques in conjunction with dramatic advances in information processing enhanced the ability of banks to evaluate and finance new and small businesses. By easing the acquisition of banks across and within state boundaries, deregulation helped spread these superior techniques for evaluating firms (Hubbard and Palia, 1995). Deregulation also permitted the formation of larger, more geographically diversified banks. Diamond's (1984) theory of intermediation suggests that greater diversification reduces the monitoring costs of lending to riskier, more opaque firms. Indeed, Berger et al. (1998) shows that small business lending increases after small banks are acquired.

workers. Rather, competition makes discrimination more costly by facilitating the entry of employers with less racial bias.

Along with competition, the racial wage gap naturally depends on the joint distribution of firm quality and employer taste for discrimination. In particular, the black-white wage differential will be larger when all employers have a greater taste for discrimination, so that the marginal firm has relatively strong racial biases. Similarly, the black-white wage differential vanishes if the marginal employer in the economy receives no disutility from hiring black workers.

More specifically, define racial discrimination as the percentage difference in the wage rates of identical black and white workers, so that, the log hourly wage rates of black workers  $W_{st}^B$  in economy  $s$  during period  $t$  differ from those of identical white workers  $W_{st}^W$  by a racial discrimination premium  $d_{st}$ :

$$W_{st}^B - W_{st}^W \equiv -d_{st}. \quad (1)$$

In anticipation of examining the states of the United States, we use the subscript  $s$  to designate an economy. Note, racial discrimination is not defined as an economy's attitude toward minorities, though these tastes influence the wage gap between identical black and white workers.

As noted, Becker's theory predicts that racial discrimination is a negative function of competition ( $C_{st}$ ) and is also shaped by the joint distribution of employer quality and taste for discrimination ( $Z_{st}$ )

$$W_{st}^B - W_{st}^W = -d_{st}(C_{st}, Z_{st}). \quad (2)$$

The model's key prediction is that an intensification of competition will reduce racial discrimination and increase the relative wages of black workers in an economy where the marginal firm has a taste for discrimination. If  $Z_{st}$  is such that the marginal firm receives no disutility from hiring minorities, then the marginal effect of increasing competition on the relative wages of blacks equals zero. The model also suggests that the marginal impact of competition on racial discrimination varies positively with the degree of racial bias in the economy holding other things constant.

In turning toward an empirical assessment of the relationship between competition and racial discrimination, we use the entry of new firms as a proxy measure of competition. One key advantage of new firm entry as a proxy for competition, rather than more traditional measures based on market share, is that Becker's (1957) theory fo-

cuses explicitly on the actual entry of new firms: The entry of new firms with different tastes toward hiring minorities from those of the existing marginal firm reduces racial discrimination.

Furthermore, we explicitly account for  $Z_{st}$ . Past work on the impact of competition on racial discrimination ignores  $Z_{st}$  and simply assesses the joint hypothesis that the marginal firm has a taste for discrimination and competition induces the entry of new firms with less racial bias. In contrast, we incorporate a state-level proxy of the degree of racial bias to assess this central element of the theory.

### 3.2 Statistical Model and Identification Strategy

Based on this framework, we develop our econometric strategy. The identifying strategy builds on the assumption that banking deregulation is exogenous to blacks' relative wages and on Becker's insight that competition should have a larger impact on blacks' relative wages in economies where employers receive greater disutility from hiring minorities all other things equal. We use the natural variation in the timing of bank deregulation to identify exogenous changes in competition and assess the impact on the racial wage gap. Moreover, we develop proxy measures of the taste for discrimination in each economy to evaluate the differential effect of competition on blacks' relative wages, which provides additional evidence on the underlying mechanisms running from bank deregulation to racial discrimination.

#### 3.2.1 *Statistical model*

Let  $W_{ist}^B$  equal the log hourly wage rate of black worker  $i$  in state  $s$  in time  $t$ . Further, as a proxy for the black-white wage gap, define  $R_{ist}$  as the relative wage rate of black worker  $i$  in state  $s$  in time  $t$ , which equals the difference between the log hourly wage rate of black worker  $i$  ( $W_{ist}^B$ ) with observables characteristics ( $X_{ist}^B$ ) and the wage rate of a white worker with identical observable traits  $\mu_{st}^W(X_{ist}^B)$ . We call  $\mu_{st}^W(X_{ist}^B)$  the conditional wage rate of black worker  $i$ , where the conditioning is done on black worker  $i$  receiving the same wage rate as the average white worker with identical observable skills ( $X_{ist}^B$ ).

For simplicity of illustration, yet without loss of generality, assume that states can be divided into those with a high taste for discrimination and those where people do not receive as much disutility from working and interacting with minorities. Let  $T_s$  be a binary variable which is equal to one if the taste for discrimination in state  $s$  is high and zero if it is low. We define the construction of this racial bias index below. For

now, recall that theory focuses on the racial preferences of the marginal firm, which we obviously do not observe directly. Rather, we employ this proxy measure of the overall degree of racial bias in each state, and use this as a signal of the marginal firm’s taste for discrimination to test the theory’s predictions.

Thus, we begin with a standard relative log hourly wage equation given by a linear-in-the-parameters specification:

$$R_{ist} \equiv W_{ist}^B - \mu_{st}^W(X_{ist}^B) = \beta_0 N_{st} + \beta_1 N_{st} T_s + \delta_s + \delta_t + \delta_{st} + \varepsilon_{ist}, \quad (3)$$

where  $N_{st}$  denotes the entry of new firms, which serves as a proxy for competition, in state  $s$  in time  $t$ ,  $T_s$  is zero-one racial bias index,  $\delta_s$  is a vector of state fixed effects,  $\delta_t$  is a vector of year fixed effects,  $\delta_{st}$  is a vector of state-year fixed effects, and  $\varepsilon_{ist}$  is person specific idiosyncratic shock. In terms of parameter,  $\beta_0$  is the causal impact of competition on the relative wage rates of black workers in low racial bias states, while  $\beta_0 + \beta_1$  is the effect of competition on the black-white wage gap in high racial bias states.

Becker’s theory makes two key predictions. First, competition boosts the relative wages of black workers in states with a sufficiently high degree of racial bias, i.e.,  $\beta_0 + \beta_1 > 0$ . Second, the impact of competition on blacks’ relative wages is larger in states with a higher degree of racial bias, i.e.,  $\beta_1 > 0$ . Since the marginal employer might have a nonzero taste for discrimination even in low racial bias states, our specification does not necessarily imply that  $\beta_0 = 0$ , only that  $\beta_0 + \beta_1 > 0$  and  $\beta_1 > 0$ .

### 3.2.2 *Estimation*

To consistently estimate the impact of a particular measure of competition on relative wages ( $\beta_0$  and  $\beta_1$ ), we need an instrumental variable that is correlated with the entry of new firms (competition) but not with the state-year time effects ( $\delta_{st}$ ) because the actual entry of new firms could be affected by blacks’ relative wages. For example, firms could enter to exploit the opportunity to hire less expensive labor in states with a large racial wage gap.

In the first-stage, we instrument for entry of new firms using bank deregulation, imposing a log linear first-stage specification. Furthermore, for simplicity we develop the estimation for the case in which  $T_s = 1$ , and describe the econometric specification for the more general case below. Specifically,

$$N_{st} = D'_{st}\gamma + \pi_s + \pi_t + \pi_{st}, \quad (4)$$

where  $D_{st}$  and  $\gamma$  are vectors indicating years since banking deregulation and corresponding coefficients,  $\pi_s$  measures state-specific characteristics affecting competition,  $\pi_t$  captures national time effects, while  $\pi_{st}$  measures state-year effects shaping competition. The term  $D'_{st}\hat{\gamma}$  stands for the projected/instrumented degree of competition that is orthogonal to state-year shocks ( $\pi_{st}$ ) after controlling for  $\pi_t$  and  $\pi_s$ .

The second-stage equation is:

$$R_{ist} = \beta\hat{N}_{st} + \delta'_s + \delta'_t + \eta_{ist}, \quad (5a)$$

where  $\eta_{ist} = \beta D'_{st}(\gamma - \hat{\gamma}) + \beta\pi_{st} + \delta_{st} + \varepsilon_{ist}$ , where  $\hat{N}_{st}$  is the predicted value of new incorporations from the first stage, and  $\delta'_s = \delta_s + \beta\pi_s$ ,  $\delta'_t = \delta_t + \beta\pi_t$ . The causal interpretation rests on the exclusion restriction that  $D_{st}$  has no direct impact on blacks' relative wages beyond its effect on the particular measure of competition used in the analysis, which we confirm below.

We also consider a reduced form specification of the form:

$$R_{ist} = D'_{st}\alpha + \delta'_s + \delta'_t + v_{ist}, \quad (5b)$$

where  $v_{ist} = \beta\pi_{st} + \delta_{st} + \varepsilon_{ist}$ . Unbiased estimation of  $\alpha$  with OLS requires  $D_{st}$  to be uncorrelated with  $v_{ist}$ . Thus, OLS will yield an unbiased estimate of the impact of bank deregulation on black-white wage rate differentials if deregulation in a particular state and year is uncorrelated with, for example, changes in the taste for discrimination, which are reflected in the state-year effect term ( $\delta_{st}$ ). Under these assumptions, OLS produces unbiased estimates of the impact of bank deregulation on discrimination, though it does not necessarily identify a channel running through competition, which motivates the two-stage least squares (2SLS) estimation.

We examine both the 2SLS and reduced form specifications to provide a more comprehensive assessment of discrimination. If the rate of new incorporations is a sound proxy for competition and bank deregulation is a valid instrument, then the 2SLS estimator provides information on the causal impact of competition on blacks' relative wage rates, putting aside for now the complexities associated with accurately measuring the relative wage rates of equivalent black and white workers. Yet, the reduced form analysis is independently valuable. It provides information on whether bank deregulation disproportionately benefited an historically disadvantaged group in

the economy, which contributes to the examination of financial sector policies on the economy.

## 4 Data and The Econometric Design in Practice

### 4.1 Data

In this study we use micro-level and state aggregate data sources. For the micro-level data on labor market characteristics, we use the Integrated Public Use Microdata Series (IPUMS) from the U.S. Current Population Survey, March Supplements for the survey years 1977 to 2007 and the Census of Population for 1970, Form 1 State, and Form 2 State one-percent samples. The CPS March Supplements and the Census samples can be found at <http://usa.ipums.org/>. These are combined with aggregate state level data on bank deregulation, taken from Kroszner and Strahan (1999), and new incorporations as a proxy for competition in the nonfinancial sector, which we obtained from Black and Strahan (2002).

#### *4.1.1 CPS Samples for the Years 1977 to 2007*

The CPS March Annual Demographic Supplements provide information on earnings, along with weeks and hours worked in the calendar year preceding the March survey so that the 1991 survey provides information on earnings in 1990. We start in Survey year 1977 because that is when the CPS reports information on each person's exact state of residence. To enhance comparability and connect our analyses to the literature, we restrict our sample to non-Hispanic, white and black adult civilian males between the ages of 18 and 65 during the working year, and exclude persons living in group quarters or with missing data on relevant demographics. Our main wage sample further excludes the self-employed, persons in the military, agricultural, or private household sectors, persons with inconsistent reports on earnings, and individuals with allocated earnings. We trim wage outliers.

We classify the adult population into six educational categories: (i) persons with 0–8 years of schooling completed; (ii) high school dropouts; (iii) high school graduates, 12 years of schooling; (iv) some college; (v) college graduate; and (vi) advanced degree. Potential work experience is constructed as the maximum between zero and age (in year of survey) minus years of schooling completed minus 7.

Hourly earnings – wage rates – are defined as real annual earnings divided by the product of weekly working hours and annual working weeks. We use the Consumer

Price Index to deflate earnings to 2000 dollars and set hourly earnings to missing if any of these components is missing or zero. Following Autor, Katz, and Kearney (2005), workers with top coded earnings have their annual earnings set to 1.5 times the annual top-code amount. In addition we trim outliers with hourly wages below the 1st percentile and above the 97th percentile of the year-specific distribution of hourly earnings of full-time, full-year workers (i.e., those who report working at least 35 weekly hours and at least 50 annual weeks). This trimming virtually eliminates individuals with top-coded annual earnings. The results are robust to altering the definition of outliers. Finally, in accord with previous research on bank deregulation we drop Delaware and South Dakota from our analyses due to large concentration of credit card banks in these states. Appendix Table 2 provides more details on the construction of our sample.

#### *4.1.2 The 1970 Census*

As discussed in detail below, we use the 1970 Census to construct information on the rate of racial intermarriage in each state. The Census samples are the largest microdata set containing detailed marriage and demographics information. Our primary sample includes married whites and blacks between that ages of 18 to 65, and excludes couples in which at least one person is living in group quarters or has missing data on race, gender, state of residence, marital status and educational attainment. We exclude Hispanics.<sup>3</sup>

#### *4.1.3 State level data on bank deregulation and new incorporations*

We obtain the dates of interstate and intrastate bank deregulation from Kroszner and Strahan (1999) and Amel (2008). Most states removed these geographic restrictions on banking between the mid-1970s and 1994, when they were eliminated by federal legislation. Appendix Table 1 provides the deregulation dates for each state.

The new incorporations data are from Black and Strahan (2002), who obtain them from Dun and Bradstreet. Specifically, we use the log of new business incorporations per capita for each state over the period 1977-1994.

---

<sup>3</sup>The 1970 1% Form 1 State and 1% Form 2 State data sets are 1-in-100 national random samples of the population, that were given to 5% and 15% of the population respectively. Together these two contain more than 4 million records and almost 1.5 million households. We re-weight observations to reflect the coverage rates of the Form 1 and Form 2 samples.



## 4.2 Econometric design in Practice

### 4.2.1 *Generating Relative Wages*

To conduct the analyses, we first compute the estimated relative wage rate for each black worker  $i$  in the sample ( $\hat{R}_{ist}$ ), which equals the worker’s actual wage rate minus the estimated wage rate that the average white worker with identical characteristics would earn.

We follow a two-step procedure for computing the log hourly wage rate that a white worker with identical characteristics as his black counterpart would earn. We first estimate the following Mincerian log hourly wage equation using the sample of white workers:

$$W_{ist}^W = X_{ist}'\theta_t^W + e_{ist}, \quad (6)$$

where  $W_{ist}^W$  is the log hourly wage of white worker  $i$  in state  $s$  during time  $t$ ,  $X_{ist}$  is a vector of person-specific observable determinants of log hourly wages (e.g., quartic in potential experience, and six education categories, state and time effects),  $e_{ist}$  captures the component of wages idiosyncratic to white worker  $i$ . Equation (6) is estimated separately for every year between 1976 and 2006. This yields time-varying returns, or “prices” to observable characteristics, i.e.,  $\theta_t^W$  and state year fixed effects. Further, the average value of unobservable traits among white workers in state  $s$  during time  $t$  are incorporated into the estimation of (6) by the inclusion of state fixed effects in each of the 31 separate regressions composing (6). Below, we analyze the potential biases induced by unobservable traits.

This first step has two noteworthy properties. First, given the changes in the structure of wages in the United States since the mid 1970s (Katz and Autor, 1999), we allow the Mincerian returns to observable skills ( $\theta_t^W$ ) to vary by year. This is crucial for our analyses due to the well-documented skill gap between black and white workers. Failure to account for time-varying returns to observables will lead to erroneous estimates of the dynamic pattern of relative wages, potentially biasing our assessment of the impact of competition on the black-white wage gap.

Second, we include a vector of state dummy variables in (6), which is estimated separately for each year. By allowing state fixed effects to vary by year, we control for all time-varying, state-specific characteristics that might affect the wage rates of white workers. Thus, we control for the state’s unemployment rate, its gross state product, changes in the industrial composition of production, and even the effect of banking deregulation on the wage rates of white workers. By controlling for these

wage rate determinants in general, we can more precisely focus on the impact of bank deregulation on the relative wage rates of black workers in particular.

In the second step, we generate the estimated relative wage rate of each black worker  $i$  in state  $s$  during time  $t$  as the worker's actual wage rate ( $W_{ist}^B$ ) minus the estimated wage rate that a white worker with the same characteristics would earn ( $X_{ist}^{B'}\hat{\theta}_t^W$ ), using the estimated parameters from (6):<sup>4</sup>

$$\hat{R}_{ist} = W_{ist}^B - X_{ist}^{B'}\hat{\theta}_t^W, \quad (7)$$

where ( $X_{ist}^{B'}\hat{\theta}_t^W$ ) is computed based on the following conditions: (1) each black worker's observable Mincerian characteristics ( $X_{ist}^B$ ) are rewarded at the same estimated prices ( $\hat{\theta}_t^W$ ) as his white counterpart and (2) each black worker in state  $s$  during year  $t$  receives as part of his wage rate the value of the unobservable traits of the average white worker in that state and year.

#### 4.2.2 *Reduced Form Estimator*

We estimate the reduced form impact of banking deregulation on black workers' relative wages by estimating the following wage equation using OLS:

$$\hat{R}_{ist} = \alpha D'_{st} + \delta'_s + \delta'_t + \nu_{ist}, \quad (8)$$

where  $D_{st}$  is a vector indicating years since bank deregulation and  $\alpha$  stands for the corresponding coefficients and  $\nu_{ist} = v_{ist} + X_{ist}^{B'}(\theta_t^W - \hat{\theta}_t^W)$ . We consider both inter- and intrastate bank deregulation.  $\delta'_s$  and  $\delta'_t$  stand for state and year fixed effects. Furthermore, to assess the dynamic effects of deregulation on black workers' relative wages, we also allow the relationship between relative wages and deregulation to vary by each year before and after bank deregulation.

Furthermore, we test whether the impact of bank deregulation varies with a state's degree of racial bias by amending equation (8) to include  $T_s$ , the racial bias index.<sup>5</sup>

$$\hat{R}_{ist} = \alpha D'_{st}T_s + \delta'_s + \delta'_t + \nu_{ist}. \quad (9)$$

Theory suggests that bank deregulation that intensifies competition should not affect

---

<sup>4</sup>To connect this to equation (3) of the statistical model, note that the estimated conditional wage rate of black worker  $i$  is  $\hat{\mu}_{st}^W(X_{ist}^B) = X_{ist}^{B'}\hat{\theta}_t^W$ .

<sup>5</sup>Although  $T_s$  should be included independently in (9), the racial bias index does not vary over time; hence, it is implicitly incorporated into  $\delta'_s$ .

racial discrimination unless there is sufficient racial bias, which we test formally below.

#### 4.2.3 2SLS Estimator

The following second stage regression captures the causal relationship of interest:

$$\hat{R}_{ist} = \beta \hat{N}_{st} + \delta'_s + \delta'_t + \epsilon_{ist}, \quad (10)$$

where  $\epsilon_{ist} = \eta_{ist} + X_{ist}^{B'} (\theta_t^W - \hat{\theta}_t^W)$ .

$\hat{N}_{st}$  is the predicted value of new firm entry, which is instrumented using bank deregulation for each state based on the following first stage equation:<sup>6</sup>

$$N_{st} = D'_{st} \gamma + \pi_s + \pi_t + \pi_{st}. \quad (11)$$

Moreover, we conduct the 2SLS estimation while incorporating cross-state differences in racial bias. As with the reduced form, we incorporate the racial bias index in two ways. First, we simply split the sample by the median value of  $T_s$  to assess whether the impact of competition on racial discrimination depends on the degree to which states have a stronger or weaker taste for discrimination. Second, we add an interaction term to (10) and adjust the first-stage specification as well.

Specifically, the second stage becomes:

$$\hat{R}_{ist} = \beta_0 \hat{N}_{st} + \beta_1 \hat{N}_{st} T_s + \delta'_s + \delta'_t + \epsilon_{ist}. \quad (12)$$

The instrumental variables for the endogenous terms,  $\hat{N}_{st} T_s$  and  $\hat{N}_{st}$ , are  $D'$  and  $D'_{st} T_s$ , where  $D'_{st}$  equals years since bank deregulation.

#### 4.2.4 Estimating Racial Bias from a Model of Marriage

Theory predicts that the relationship between competition and the relative wage rates of black workers depends on the taste for discrimination of the marginal firm. We do not directly observe the taste for discrimination in general, or the racial biases of the marginal firm in particular.

Consequently, we compute several estimates of the degree of racial bias in each state and use these as proxy measures of the marginal firm's disutility from hiring minority workers. We develop two types of racial bias indices based on the rate of intermarriage

---

<sup>6</sup>The first stage regression is conducted at the individual level, so that it is weighted by the proportion of black workers in each state.

in 1970. We first define a simple racial bias index as the difference between the rate of intermarriage that would exist if married people were randomly matched and the actual rate of intermarriage. The random intermarriage rate equals  $2P * (1 - P)$ , where  $P$  is the proportion of blacks among the married population. Larger values of this simple racial bias index indicate that intermarriage occurs less in practice than if marriage pairings were random. We interpret larger value as (at least partially) reflecting racial bias.

In the second type of racial bias index, we account for other factors that might induce the actual rate of intermarriage to deviate from the random rate. Intermarriage will depend on the opportunities for interracial social contacts, so that the relative sizes of the black-white populations might independently affect intermarriage (Blau, 1977). Furthermore, since the odds of interethnic unions increase with couples' educational attainment (Massey and Denton, 1987; Qian, 1997; Rubinstein and Brenner, 2008), we also control for education and age. Specifically, we estimate the following equation for all married couples (excluding couples in which either the husband or wife is neither white nor black) in the United States in 1970:

$$I_{is} = bH_{is} + cW_{is} + dS_s + \tau_{is}, \quad (13)$$

where  $I_{is}$  equals one if couple  $i$  in state  $s$  is racially mixed and zero otherwise,  $H_{is}$  and  $W_{is}$  are vectors of age and education characteristics for the two spouses respectively,  $S_s$  are state characteristics,  $\tau_{is}$  is the unexplained component of intermarriage, while  $b$ ,  $c$ , and  $d$  are coefficients. More specifically, the benchmark specification reported in the tables below conditions on nine categories of education, along with age entered as a quartic. For state characteristics, we include the random intermarriage rate defined above along with the percentage of blacks among married couples. We experimented with numerous specifications, including and excluding the random intermarriage rate and the percentage of blacks, changing the specification of education and age controls, and conditioning on metropolitan and urban locations. These combinations produce the same conclusions.

From equation (13), we compute the racial bias index for each state. Let  $\tau_s$  equal the average value of  $\tau_{is}$  across couples in state  $s$ . Recognizing that  $\min\{\tau_s\} < 0$ , we compute the racial bias index as  $T_s = -\tau_s + \max\{\tau_s\}$ , so that  $T_s$  equals zero for the state with the largest  $\tau_s$ . We interpret large values as signaling a stronger taste for discrimination. Appendix Table 3 provides the value of  $T_s$  for each state and the District of Columbia.

These racial bias indices have several noteworthy features. First, they are based on the actual choices of individuals at the margin, not broad surveys of the population's views on race. Second, these intermarriage racial bias indices are highly correlated with other measures of racial attitudes. In particular, Charles and Guryan (2007) examine the evolution of the relationship between the black-white wage differential and self-reported measures of racial attitudes over the period 1972 to 2004, where they develop proxies for the prejudices of the marginal white person. Our various racial bias indices have correlation coefficients of between 0.4 and 0.9 with the Charles and Guryan (2007) regional indexes. Third, besides preferring the objective nature of the intermarriage indices, we require that they are exogenous to changes in the black-white wage gap prior to bank deregulation. The intermarriage indices satisfy these requirements: The indices are based on the cumulative stock of marriages in 1970, reflecting decisions made decades before the median date of bank deregulation in the 1980s. Indeed, the regression coefficient from the regression of blacks' relative wages on the benchmark racial bias index is -0.49 and significant at the five percent level, which is fully consistent with Becker's (1957) theory. Yet, the estimated coefficient from the regression of the change in the black-white wage differential on the racial bias index before bank deregulation is -0.007, with a standard error of 0.015, which supports our empirical strategy and reduces concerns about endogeneity.

Besides the intermarriage indices, we also construct a racial bias index based on wage differentials. Specifically, we simply use the average relative wage rates of black workers in each state during 1976. All of the results hold with this alternative index of racial bias.

We use these measures of racial bias to test whether the impact of competition on the relative wage rates of black workers depends on the degree of racial bias in the economy as predicted by Becker's (1957) taste-based theory of racial discrimination. For our purposes, measuring  $T_s$  with error will bias the results against finding a statistically significant connection between racial bias, competition, and the black-white wage gap. We do not require that  $T_s$  is a perfect measure of the marginal firm's disutility from hiring racial minorities. We simply require that it provides some information on racial attitudes across states.

## 5 Results

### 5.1 Preliminaries

Our empirical analysis rests on the assumption that the cross-state timing of bank deregulation was not affected by the racial wage gap. In Figure 1a, we show that neither the *level* of the estimated wage gap before deregulation (Panel A) nor its rate of *change* prior to deregulation (Panel B) explains cross-state differences in the timing of interstate bank deregulation. Figure 1b confirms these findings for the case of intrastate deregulation. The wage gap does not help predict the timing of either inter- or intrastate deregulation.<sup>7</sup>

Our work also builds on the finding that bank deregulation increases competition in the nonfinancial sector (Black and Strahan, 2002). In Table 1, we show that both interstate bank deregulation and intrastate branch deregulation exert a strong, positive impact on the log of new incorporations per capita over time. In columns (1) – (3), we use simple dummy variables that equal zero before a state deregulates and one afterwards. As shown, interstate deregulation enters significantly and positively, but intrastate does not, which is consistent with the findings in Black and Strahan (2002) and Kerr and Nanda (2007).

The results in Table 1 emphasize that the positive impact of deregulation on competition grows over time. In columns (4) – (6), we include the number of years since deregulation and its quadratic. *Interstate* and *Intrastate* equal the number of years since interstate and intrastate bank deregulation respectively, and equal zero before deregulation. As shown, both linear terms enter positively and significantly, while the quadratic terms are negative, but the coefficients are an order of magnitude smaller.<sup>8</sup> Economically, the coefficients in columns (4) and (5) indicate that five years after either inter- or intrastate deregulation the rate of new incorporations is about 10 percent greater than before deregulation. Furthermore, simultaneously deregulating inter- and intrastate restrictions boosts the rate of new incorporations by 18 percent after five years as shown in column (6).

---

<sup>7</sup>In a regression of the year of deregulation on either the pre-existing level or rate of change in the wage gap, the absolute value of the estimated coefficient is always smaller than the estimated standard error.

<sup>8</sup>The impact of each form of deregulation on competition grows over time, reaching a maximum about a decade after interstate deregulation, and over two decades after intrastate deregulation.

## 5.2 Bank Deregulation and Blacks' Relative Wages

### 5.2.1 Reduced Form Analyses of Bank Deregulation

We next assess the reduced form impact of *Interstate* and *Intrastate* on the relative wage rates of black workers ( $\hat{R}_{ist}$ ). For each form of deregulation, we present three specifications. First, the wage gap is regressed on bank deregulation using the full sample. Second, we add an interaction term of deregulation and the racial bias dummy for each state, which equals one if the value of the racial bias index is greater than or equal to the sample median and zero otherwise. As suggested by theory, the impact of competition-enhancing bank deregulation on blacks' relative wages should be greater in more racially biased states. Third, rather than include an interaction term, we split the sample by the median value of the racial bias index, which allows the coefficients on state and year fixed effects to differ across the two subsamples. Throughout the analyses, we include state and year fixed effects.

Table 2 shows that bank deregulation has a large, significant impact on the relative wage rates of black workers, especially in states with high values of the racial bias index. In the regressions including the interaction of deregulation with the racial bias dummy, the impact of deregulation on blacks' relative wages is increasing in the state's racial bias index. The results hold for both inter- and intrastate bank deregulation. When splitting the sample, the results remain fully consistent with the view that a drop in entry barriers triggers a bigger reduction in racial discrimination among more racially biased economies.

The estimated reduction in racial discrimination from bank deregulation is economically meaningful. Consider column (4) of Table 2, which provides the regression results for states with above the median value of the racial bias index. Among these states, deregulation boosts the wage rates of black workers by 6 percentage points more than their white counterparts after five years ( $6 = 0.012 * 5 * 100$ ). Since the average racial wage gap in these high-bias states was 21 percent in 1976, the results suggest that interstate deregulation eliminates almost 30 percent of the racial wage gap in these high-bias states. The results are virtually identical when using *Intrastate*, as shown in column (8).

### 5.2.2 Dynamic Analysis of the Effect of Bank Deregulation

We next examine more fully the dynamics of the relationship between bank deregulation and the relative wages of blacks. In Figures 2a and 2b, we trace out the year-by-year

relationship between deregulation and the wage gap by including a series of dummy variables in equation (8) for inter- and intrastate deregulation respectively. Specifically,  $D_{-j}$  equals one for the  $j^{\text{th}}$  year before deregulation, and  $D_{+k}$  equals one for the  $k^{\text{th}}$  year after deregulation. These dummy variables equal zero in other years. We present results starting 10 years before deregulation and trace out the year-by-year dynamics of the relationship between deregulation and the wage gap until 15 years afterward deregulation. The year of deregulation is omitted and the regressions include state and year fixed effects.

In examining the dynamic impact of deregulation on racial discrimination, we use two samples of states. For the subsample of states with above-median values of the racial bias index, Figure 2a displays the OLS estimates (solid line) along with the 95% confidence interval (dashed lines) for the coefficients on the series of dummy variables. Furthermore, Figure 2a also depicts the coefficients from the full sample of states (solid line with connecting dots). Figure 2b provides corresponding illustrations for intrastate branch deregulation.

Two crucial messages emerge from Figures 2a and 2b. First, the impact of deregulation on blacks' relative wages is much greater in states where the racial bias index is above the median than in states with lower values of the racial bias index. For example, the impact of interstate bank deregulation on blacks' relative wages rises over time in states with high values of the racial bias index (solid line), while interstate bank deregulation has virtually no effect on the average state (solid line with connecting dots). This is consistent with Becker's (1957) theory of racial discrimination. Second, there is no evidence that trends or innovations in the wage gap precede either interstate or intrastate bank deregulation. Rather, blacks' relative wages rise after bank deregulation for an extensive period. While the dynamics of intrastate deregulation exhibit more variability (Figure 2b) than for interstate deregulation, the same patterns hold.

While demonstrating the powerful impact of bank deregulation on the racial wage gap, these results do not provide direct evidence on the underlying causal mechanisms. We now examine the relationship between competition and blacks' relative wages to assess whether exogenous increases in competition reduce the black-white wage gap.



### 5.3 Competition and Blacks' Relative Wages

#### 5.3.1 Reduced Form Analyses of Competition

In examining the relationship between competition and racial discrimination, we begin with reduced form OLS regressions. In Table 3, the dependent variable is blacks' relative wages  $\left(\hat{R}_{ist}\right)$ . The key regressor is the log of new incorporations per capita, which we use as a proxy for competition. In the first three columns of Table 3, we report OLS regressions. The estimation is conducted on the full sample while adding the interaction of new incorporations with the racial bias dummy to assess whether the relationship between new incorporations and blacks' relative wage rate varies with racial bias. We also split the sample into states with below the median level of the racial bias index and those with high values of the racial bias index.

There is a strong positive association between the rate of new incorporations and the relative wages of black workers in states with a sufficiently high level of the racial bias index. As shown in column (1) that contains the interaction between new incorporations and the racial bias dummy, only the interaction term enters positively and significantly. The rate of new incorporations is positively associated with blacks' relative wages in states with sufficiently high values of the racial bias index.

When splitting the sample between states with a racial bias index above the median and those below, the results are stark. The new incorporations variable is positively and significantly correlated with blacks' relative wages in states above the median level of the racial bias index. In contrast, there is no relationship between the wage gap and our proxy for competition in states with low values of the racial bias index.

#### 5.3.2 2SLS Analyses of Competition

The final three columns of Table 3 report 2SLS estimates of relative wages  $\left(\hat{R}_{ist}\right)$  on the year-state rates of new incorporations. Building on Table 1, we use *Interstate* and *Intrastate*, plus their quadratics, as instruments for the log of new incorporations per capita. In column 4, the second stage regression includes both the log of new incorporations per capita and its interaction with the racial bias dummy. We instrument for both of these terms by also incorporating the full set of interactions of *Interstate*, *Intrastate*, their quadratics, and the racial bias index. In columns (5) and (6), we split the sample by the median of the racial bias index.

As shown at the bottom of Table 3, the instrumental variables pass the validity tests: They significantly explain new incorporations as shown by the F-test of the excluded

instruments, which is also demonstrated in Table 1. Furthermore, the instruments pass the test of the over-identifying restrictions (OIR test), meaning that the hypothesis that the instruments only affect blacks' relative wages through their effect on new incorporations is not rejected.

The exogenous intensification of competition in the overall economy dramatically boosts the wage rates of black workers relative to their white counterparts in states with sufficiently high values of the racial bias index. The results in column (4) indicate that an increase in the rate of new incorporations does not significantly boost blacks' relative wages in states with very low values of the racial bias index. However, the interaction term enters positively and significantly at the one percent level. This result is fully consistent with Becker's (1957) prediction that the impact of competition on blacks' relative wages varies positively with the economy's level of racial bias. These findings are confirmed when splitting the sample at the median level of the racial bias index, demonstrating that an increase in new incorporations boosts blacks' relative wages only in states with high levels of the racial bias index.

The economic impact of competition on racial discrimination is large. For example, recall from column (6) of Table 1 that deregulating both inter- and intrastate restrictions boosts the log of new incorporations by 0.18 after five years. Next, consider the results on the sample of states with higher than the median values of the racial bias index, as reported in equation (6) of Table 3. For these states, the estimated coefficients suggest that the intensification of competition induced by bank deregulation eliminates 22 percent of the initial black-white wage rate gap.<sup>9</sup>

## 6 Robustness Checks

Several factors could confound our ability to draw accurate inferences about the impact of competition of racial discrimination. In this section, we address concerns about changes in the demand for labor, migration, self-employment, and selection into the workforce. As we discuss, some of these factors work against the reported findings, leading us to *underestimate* the beneficial effects of bank deregulation and competition on blacks' relative wages. In these cases, we simply discuss our robustness tests without

---

<sup>9</sup>To get these numbers, first note that deregulating inter- and intrastate deregulation boosts the log new incorporations by about 0.18 after five years  $(=(0.029*5) - (0.002*25) + (0.019*5) - (0.0004*25))$ , which is from Table 1, regression (6). Next, for the high bias states, use regression (3) from Table 4. Now, the estimated increase in blacks' relative wages is 0.047  $(=0.18*0.261)$ . Since the initial wage gap for this subsample is 0.21, this implies that deregulation reduces the initial racial wage gap by about 22% after five years in states with higher values of the racial bias index.

presenting tables. For other factors, the compositional effects either (a) play a central role in Becker’s (1957) theory or (b) potentially lead us to *overestimate* the impact of competition on racial discrimination. In these cases, we present correspondingly more information.

## 6.1 Relative Hours Worked

Becker’s (1957) theory predicts that competition boosts the relative demand for black workers. Our finding that competition increases the relative wages of blacks is fully consistent with this prediction. Yet, we were concerned that blacks’ relative wages could also rise if deregulation induces the labor supply curve of black males to shift leftward. If this perverse effect is operational, then the working hours of blacks should actually fall after deregulation relative to those of whites. We test this.

Table 4 reports the effects of bank deregulation and competition on the relative working hours of blacks in high racial bias states using two approaches. We focus on high racial bias states because this is where competition increases blacks’ relative wages. We first trace the impact of bank deregulation, through competition, to the relative wages of blacks based on Table 3’s regression (6), which yields the projected relative wages of blacks. We then examine the impact of these projected relative wages on blacks’ annual hours worked. Since there is a meaningful kink in the labor supply curve between working and not working, we use both OLS and Tobit specifications. Furthermore, given this nonconvexity, we also examine the subsample of blacks with positive working hours to assess the marginal impact of relative wages on hours worked among those who are working. We use a standard bootstrapping procedure to correct the standard errors since the regressors are estimated.

We examine the impact of bank deregulation on relative working hours while conditioning on state and year fixed effects, along with the projected annual hours worked of a white worker with the identical traits as each black worker. To compute the projected annual hours worked, we first estimate a labor supply equation on a sample of white males only. We estimate the labor supply equation every year, while conditioning on state and year fixed effects and controlling for the same education and experience characteristics used in the wage equation. Then, we use the resulting coefficient estimates on the labor supply characteristics to calculate the predicted number of hours worked of a white worker with each black worker’s characteristics. We include the projected annual hours as a regressor to assess the impact of relative wage rates on relative employment.

In the second approach, we examine the impact of competition on the relative working hours of black workers without tracing the effect through relative wages. Specifically, we reproduce the 2SLS analyses in Table 3 except that the dependent variable is the difference between the actual number of hours worked of each black person and the projected annual hours worked of a white worker with identical traits. The difference between the actual number of hours worked and the projected hours reflects the black-white gap in working hours. We use bank deregulation to identify an exogenous increase in new incorporations and assess the impact on this gap in working hours.

Consistent with theory, bank deregulation that intensifies competition and boosts blacks' relative wages also tends to increase the relative working hours of blacks. As shown, the impact is particularly pronounced among workers. The evidence suggests that bank deregulation spurs the entry of new firms, which boosts the relative demand for black workers, increasing the number of working hours among working blacks. The impact is more muted when considering all black males. This suggests that while deregulation and competition increase the relative demand for black workers, pushing up their relative wage rates and working hours, the impact is not large enough to attract new black workers into the workforce. Most important given the focus of this paper, the Table 4 results clearly demonstrate that bank deregulation and competition do not shift black's labor supply curve to the left.

## 6.2 Selection, Migration, and Self-Employment

We were also concerned about changes in the composition of black males in the overall economy and in the workforce. Bank deregulation and the intensification of competition could affect the flow of people with various skill levels between the state's labor force, the ranks of the unemployed, those out of the labor market, and those living in other states. These compositional changes could potentially affect our estimates of blacks' relative wages beyond any effects associated with the marginal firm's taste for discrimination.

To assess compositional changes in the aggregate, we calculate the projected wage rates for all working age (non-institutionalized) blacks in each state, whether they are working or not. We do this using the estimated returns to observable traits from equation (6) and using the actual traits of each black male. In this way, we compute value of observable traits of all black males. Then, we test the impact of bank deregulation on the composition of skills in the overall economy and in the workplace.

Table 5 provides regression results of the projected wage rates of all relevant black

males in an economy. Besides year and state fixed effects, the regressors are a dummy variable if the person works, *Interstate*, and the interaction between *Interstate* and the dummy variable for working or not. There are similar regressions for *Intrastate*. The summation of the coefficients on *Interstate* and the interaction term provide information on whether the average value of the traits of workers changes after deregulation. The coefficient on *Interstate* provides information on the change in the average value of the traits of individuals who are not working following deregulation.

As shown, deregulation does not have a significant effect on the average value of the traits of black workers. There is no evidence that bank deregulation substantively affects the skill composition of black workers. This reduces concerns that compositional changes are affecting our findings. To the extent that observable traits are correlated with unobservable characteristics, these results further imply that the composition of unobservable traits did not change much following bank deregulation.

Deregulation could also affect migration across state boundaries in the United States. To assess this, we estimate the effect of deregulation on the fraction of black males within states. We find that the share of black males within states increases slightly after deregulation. This is consistent with a situation in which deregulation boosts competition, reduces racial discrimination, and therefore attracts blacks from other states. As shown in Table 5, the net compositional changes of blacks in the economy due to deregulation did not have much of an effect on the average skills of working blacks. There is no reason to suggest that migration lead us to overstate the beneficial effects of deregulation.

Similarly, the boost in blacks' relative wages could attract black males with comparatively low unobserved skills into the labor force, leading us to underestimate the degree to which competition reduces racial discrimination. A quantile regression at the median helps in assessing the importance of this potential bias by putting less weight on entrants of black workers with low unobserved skills. While quantile regressions do not deal formally with selection based on unobservables, they provide helpful information in assessing the potential importance of selection bias in estimating the impact of deregulation on the conditional wage gap. We find no evidence that selection based on unobservables is causing us to underestimate the true effect of competition. While competition increases the relative demand for black workers, the number of new black males pulled into the labor force is relatively small, such that the median regression yields virtually identical results to the OLS coefficient estimates.

### 6.3 Swimming Upstream

Potential biases could arise from changes in the "prices" of unobserved skills. During our estimation period, Juhn, Murphy, and Pierce (1993) document rising returns to unobserved skills in the labor market. National trends in returns to unobserved skills will not affect our results since we control for year fixed effects. However, the intensification of competition when a state deregulates could increase returns to unobservable traits. If workers with higher conditional wages have more of these unobserved skills, then their wages will rise relative to workers with lower conditional wages. Thus, if the average white worker has a higher conditional wage rate than the average black worker, then the average wage rate of white workers will rise relative to the average wage of black workers. This effect will cause the estimated value of blacks' relative wages to fall, even though racial discrimination is not rising.

Under these conditions, we will underestimate the true, positive effect of deregulation on the relative wages of blacks. This is sometimes called "swimming upstream" (Juhn Murphy and Pierce, 1991; Blau and Kahn, 1997).<sup>10</sup> Even if deregulation has a direct positive effect on blacks' relative wages by the marginal employer's taste for discrimination, deregulation could indirectly help the average white worker more than the average black worker by boosting returns to an unobserved skill in which the average white worker has a comparatively large endowment.

To test for swimming upstream, we follow the literature and use quantile regressions. This allows us to compare the wages of the average white workers with black workers that have higher conditional wages than the average black worker. The goal is compare black and white workers that are likely to be more similar in terms of unobserved skills than when using OLS to compare averages from both groups of workers. Recall that all of our analyses are conducted relative to the average white worker, whose average estimated residual wage is zero in every year and every state by construction.

In unreported regressions, we confirm the existence of swimming upstream, suggesting that we are underestimating the beneficial effects of bank deregulation on racial discrimination when using OLS. The median regressions produce almost identical coefficient estimates to those from the OLS regressions reported above. Moreover, in moving from lower quantiles to higher quantiles, we find that deregulation reduces a

---

<sup>10</sup>Blau and Kahn (2000, p. 96) suggest that "growing inequality . . . [is] a major factor retarding convergence in the gender gap". In a recent study Mulligan and Rubinstein (2008) find that selection into the female workforce shifted from negative in the 1970s to positive in the 1990s, and that the majority of the apparent narrowing of the gender wage gap reflects changes in female workforce composition.

larger proportion of the racial wage gap. Besides supporting the swimming upstream view, these patterns provide additional confidence to the findings in Tables 2 and 3.

#### 6.4 Racial Discrimination or the Poor

Since bank deregulation exerts a disproportionately positive impact on those at the lower end of the distribution of income (Beck, Levine, and Levkov, 2008), the current paper’s analysis of racial discrimination could reflect this distributional effect in general, rather than a disproportionately pronounced effect of bank deregulation on blacks in particular. Two observations, however, suggest that this is not the case. First, we find that bank deregulation and competition boost the relative wages of blacks in states with a high degree of racial bias. This is both fully consistent with Becker’s (1957) theory of taste discrimination and difficult to reconcile with the view that our results simply reflect a tightening of the distribution of income.

Second, we perform a rank analysis and compare the change in blacks’ relative wages with those of comparable whites across the full distribution of relative wage rates. We make this comparison before and after deregulation. In this way, we assess the degree to which blacks converge toward their white counterparts across the full distribution of relative wages. If deregulation is simply helping the poor, we should not see that blacks converge toward whites at each point in the wage distribution.

The results show that bank deregulation, and the accompany boost in competition, disproportionately help black workers across the full distribution of wages. The results are presented in Figure 3 for the case of interstate bank deregulation. The results for intrastate are very similar. We show the rank plot for the high racial bias states, and for the sample of states with below the median level of the racial bias index. The solid and dashed lines represent the location of blacks within the conditional log hourly wage distribution of whites before and after deregulation respectively. The median black among the high racial bias states, for example, corresponds to the 28<sup>th</sup> percentile white worker prior to deregulation and the 32<sup>nd</sup> percentile white work after deregulation. The median black, therefore, gained four ranks in the white wage distribution as a result of deregulation. As shown, blacks gained relative to whites at all parts of the wage distribution in high racial bias states. Consistent with the earlier results, there is little change in relative wage rates in the low racial bias states. These results suggest that deregulation exerted a particularly pronounced effect on black workers.

## 7 Conclusions

Forty years after the passage of the Civil Right Act and related anti-discrimination legislation there remain enormous disparities in the economic and social welfare of blacks and whites in the United States. An extensive literature explores the economic and social underpinnings of these differences.

In this paper, we examine one potential determinant of the black-white wage differential. Becker (1957) predicted that the combination of taste-based discrimination and imperfect competition would produce an equilibrium gap between the wages of identical black and white workers. He argued that greater competition would reduce this wage gap. A central implication of Becker's theory is that the impact of greater competition on the black-white wage differential will be larger in economies with a greater "taste for discrimination," holding other factors constant.

We find that greater competition substantively reduces the wage gap by boosting the relative demand for black workers as suggested by theory. Moreover, the intensification of competition only increases blacks' relative wages in states with a sufficiently high degree of racial bias. In these states, we find that deregulating inter- and intrastate banking restrictions eliminates between 20 and 30 percent of the black-white wage differential over a five year period by intensifying competition throughout the economy.

Looking forward, much work remains. The paper emphasizes the powerful role of competition in expanding the economic opportunities of minorities. By reducing discrimination, competition could also increase the incentives for blacks to acquire skills. Thus, future research might merge and extend taste-based and statistical-based explanations of racial discrimination. This paper also advertises the need for additional research on finance and economic opportunity. In this paper, we show that improvements in the functioning of banks substantively enhanced the economic opportunities of a disadvantaged group. These improvements materialize not because banks make more loans to black entrepreneurs, but because improvements in banking disproportionately enhance the labor market opportunities of blacks.



## References

- [1] Almond, Douglas Vincent, Kenneth Y. Chay, and Michael Greenstone. 2006. "Civil Rights, the War on Poverty, and Black-White Convergence in Infant Mortality in the Rural South and Mississippi." *MIT Department of Economics Working Paper* No. 07-04.
- [2] Altonji, Joseph G., and Charles R. Pierret. 2001. "Employer Learning And Statistical Discrimination." *Quarterly Journal of Economics* 116 (February): 313-350.
- [3] Altonji, Joseph G., and Rebecca M. Blank. 1999. "Race and Gender in the Labor Market. In *Handbook of Labor Economics*, vol. 3., edited by Orley Ashenfelter and David Card. St. Louis, MO: Elsevier: 3143–3259.
- [4] Amel, Dean F. 2008. "State Laws Affecting the Geographic Expansion of Commercial Banks." Unpublished manuscript. Washington, D.C.: Board of Governors of the Federal Reserve System.
- [5] Arrow, Kenneth J. 1972. "Some Mathematical Models of Race Discrimination in the Labor Market." In *Racial Discrimination in Economic Life*, edited by A. H. Pascal. Lexington, MA: D.C. Heath Press, 187-204.
- [6] Arrow, Kenneth J. 1973. "The Theory of Discrimination." In *Discrimination in Labor Markets*, edited by Orley Ashenfelter and Albert Rees. Princeton, NJ: Princeton University Press, 3-33.
- [7] Arrow, Kenneth J. 1998. "What Has Economics to Say about Racial Discrimination?" *Journal of Economic Perspectives* 12 (Spring ): 91-100.
- [8] Ashenfelter, Orley C., and Timothy Hannan. 1986. "Sex Discrimination and Product Market Competition: The Case of the Banking Industry." *Quarterly Journal of Economics* 101 (February): 149-174.
- [9] Autor, David H., Lawrence F. Katz, and Melissa S. Kearney. 2008. "Trends in U.S. Wage Inequality: Re-Assessing the Revisionists." *Review of Economics and Statistics* 90 (May): 300-325.
- [10] Beck, Thorsten, Ross Levine, and Alexey Levkov. 2008. "Big Bad Banks? The Impact of U.S. Branch Deregulation on Income Distribution." *Brown University mimeo*.

- [11] Becker, Gary S. 1957. *The Economics of Discrimination*. The University of Chicago Press, Chicago.
- [12] Benabou, Roland. 1996. "Equity and Efficiency in Human Capital Investment: The Local Connection." *Review of Economics Studies* 63(2) (April): 237-264.
- [13] Berger, Alan, Anthony Saunders, Joseph Scalise, and Gregory Udell. 1998. "The Effects of Bank Mergers and Acquisitions on Small Business Lending." *Journal of Financial Economics* 50 (November): 187-229.
- [14] Bertrand, Marianne, and Sendhil Mullainathan. 2004. "Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination." *American Economic Review* 94 (September): 991-1013.
- [15] Black, Sandra E., and Philip E. Strahan. 2001. "The Division of Spoils: Rent-Sharing and Discrimination in a Regulated Industry." *American Economic Review* 91 (September): 814-31.
- [16] Black, Sandra E., and Philip E. Strahan. 2002. "Entrepreneurship and Bank Credit Availability." *Journal of Finance* 57 (December): 2807-32.
- [17] Black, Sandra E., and Elizabeth Brainerd. 2004. "Importing Equality? The Effects of Globalization on Gender Discrimination." *Industrial and Labor Relations Review* 57 (July): 540-559.
- [18] Blau, Francine D., and Lawrence M. Kahn. 1997. "Swimming Upstream: Trends in the Gender Wage Differential in the 1980s." *Journal of Labor Economics* 15 (January): 1-42.
- [19] Blau, Francine D., and Lawrence M. Kahn. 2000. "Gender Differences in Pay." *Journal of Economic Perspectives*, 14: 75-99.
- [20] Blau, Peter M. 1977. *Inequality and Heterogeneity*. New York: Free Press.
- [21] Bound, John, and Richard B. Freedman. 1992. "What When Wrong? The Erosion of Relative Earnings and Employment Among Young Black Men in the 1980s." *Quarterly Journal of Economics* 107 (February): 201-232.
- [22] Butler, Richard, and James J. Heckman. 1997. "The Government's Impact on the Labor Market Status of Black Americans: A Critical Review," In *Equal Rights*

*and Industrial Relations*, edited by Leonard J. Hausman, Orley Ashenfelter, Bayard Rustin, Richard F. Schubert, and Donald Slaiman, Madison, WI: Industrial Relations Research Association: 235-281

- [23] Card, David, and Alan Krueger. "School Quality and Black-White Relative Earnings: A Direct Assessment." *Quarterly Journal of Economics* 107 (February): 151-200.
- [24] Charles, Kerwin K., and Jonathan Guryan. 2007. "Prejudice and the Economics of Discrimination." *National Bureau of Economic Research Working Paper*, No. 13661.
- [25] Coate, Stephen, and Glenn C. Loury. 1993. "Will Affirmative-Action Policies Eliminate Negative Stereotypes?" *American Economic Review* 83 (December): 1220-1240.
- [26] Demirguc-Kunt, Asli, and Ross Levine. 2008. "Finance and Opportunity: Financial Systems and Intergenerational Persistence of Relative Incomes." *Brown University mimeo*.
- [27] Demyanyk, Yuliya, Charlotte, Ostergaard Charlotte, and Bent Sorensen. 2007. "U.S. Banking Deregulation, Small Businesses, and Interstate Insurance of Personal Income." *Journal of Finance* 62 (December): 2763-801.
- [28] Demyanyk, Yuliya. 2008. "U.S. Banking Deregulation and Self-Employment: A Differential Impact on Those in Need." *Journal of Economics and Business* 60 (January-February): 165-78.
- [29] Diamond, Douglas. 1984. "Financial Intermediation and Delegated Monitoring." *The Review of Economic Studies* 51 (July): 393-414.
- [30] Donohue, John, and James J. Heckman. 1991. "Continuous versus Episodic Change: The Impact of Civil Rights Policy on the Economic Status of Blacks." *Journal of Economic Literature* 29 (December): 1603-43.
- [31] Durlauf, Steven N. 1996. "A Theory of Persistent Income Inequality." *Journal of Economic Growth* 1 (March): 75-93

- [32] Economides, Nicholas, Glenn R. Hubbard, and Darius Palia. 1996. "The Political Economy of Branching Restrictions and Deposit Insurance: A Model of Monopolistic Competition among Small and Large Banks." *Journal of Law and Economics* 39 (October): pp. 667-704.
- [33] Fryer, Roland G. Jr., and Steven D. Levitt. 2004. "Understanding the Black-White Test Score Gap in the First Two Years of School." *The Review of Economics and Statistics* 86 (May): 447–464.
- [34] Goldberg, Matthew S. 1982. "Discrimination, Nepotism, and the Long-Run Wage Differential." *Quarterly Journal of Economics* 97 (May): 307-319.
- [35] Heckman, James J., Jora Stixrud, and Sergio Urzua. 2006. "The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior." *Journal of Labor Economics* 24 (July): 411-482.
- [36] Heywood, John S., and James H. Peoples. 1994. "Deregulation and the Prevalence of Black Truck Drivers." *Journal of Law and Economics* 37 (April): 135-155.
- [37] Huang, Rocco R. 2008. "Evaluating the Real Effect of Bank Branching Deregulation: Comparing Contiguous Counties Across US State Borders." *Journal of Financial Economics* 87 (March): 678-705.
- [38] Hubbard, Glenn R., and Darius Palia. 1995. "Executive Pay and Performance: Evidence from the U.S. Banking Industry." *Journal of Financial Economics* 39 (September): 105-30.
- [39] Jayaratne, Jith, and Phillip E. Strahan. 1996. "The Finance-Growth Nexus: Evidence from Bank Branch Deregulation." *Quarterly Journal of Economics* 111 (August ): 639-670.
- [40] Jayaratne, Jith, and Phillip E. Strahan. 1998. "Entry Restrictions, Industry Evolution, and Dynamic Efficiency: Evidence from Commercial Banking." *Journal of Law and Economics* 41 (April): 239-73.
- [41] Jencks, Christopher, and Meredith Phillips. 1998. *The Black-White Test Score Gap*. Washington, DC: Brookings Institution Press.
- [42] Juhn, Chinhui, Kevin M. Murphy, and Brooks Pierce. 1991. "Accounting for the Slowdown in Black-White Wage Convergence." In *Workers and Their Wages*:

*Changing patterns in the United States*, edited by Marvin Kusters, Washington, DC: American Enterprise Press: 107-143.

- [43] Juhn, Chinhui, Kevin M. Murphy, and Brooks Pierce. 1993. "Wage Inequality and the Rise in Returns to Skill." *Journal of Political Economy* 101 (June): 410-442.
- [44] Katz, Lawrence F., and David H. Autor. 1999. "Changes in the Wage Structure and Earnings Inequality." In *Handbook of Labor Economics*, edited by Orley Ashenfelter and David Card, Amsterdam: North-Holland Elsevier Publishers.
- [45] Kerr, William, and Ramana Nanda. 2007. "Democratizing Entry: Banking Deregulations, Financing Constraints, and Entrepreneurship." *HBS Working Paper* 7-33.
- [46] Kroszner, Randall, and Phillip E. Strahan. 1999. "What Drives Deregulation? Economics and Politics of the Relaxation of Bank Branching Deregulation." *Quarterly Journal of Economics* 114 (November): 1437-67.
- [47] Lang, Kevin, Michael Manove, and William Dickens. 2005. "Racial Discrimination in Markets with Announced Wages." *American Economic Review* 95: 1327-40.
- [48] Levine, Ross. 2005. "Finance and Growth: Theory and Evidence." In *Handbook of Economic Growth*, edited by Philippe Aghion and Steven Durlauf, Amsterdam: North-Holland Elsevier Publishers.
- [49] Massey, Douglas S. and Nancy A. Denton. 1987. "Trends in the Residential Segregation of Blacks, Hispanics and Asians: 1970-1980." *American Sociological Review* 52 (December): 802-825.
- [50] Mulligan, Casey B., and Yona Rubinstein. 2008. "Selection, Investment, and Women's Relative Wages Over Time." *Quarterly Journal of Economics* 123 (August): 1061-1110.
- [51] Neal, Derek A. 2006. "Why Has Black-White Skill Convergence Stopped?" In *Handbook of the Economics of Education*, edited by Erik Hanushek and Finis Welch, Amsterdam: North-Holland.
- [52] Neal, Derek A., and William R. Johnson. 1996. "The Role of Premarket Factors in Black-White Wage Differences." *Journal of Political Economy* 104 (October): 869-895.

- [53] Oster, Sharon M. 1975. "Industry Differences in the Level of Discrimination Against Women," *Quarterly Journal of Economics* 89 (May): 215-229.
- [54] Peoples, James H., and Wayne K. Talley. 2001. "Black-White Earnings Differential: Privatization versus Deregulation." *American Economic Review Papers and Proceedings* 91 (May): 164-168.
- [55] Phelps, Edmund S. 1972. "The Statistical Theory of Racism and Sexism," *American Economic Review* 62 (September): 659-661.
- [56] Qian, Zhenchao. 1997. "Breaking the Racial Barriers: Variations in Interracial Marriage Between 1980 and 1990," *Demography* 34 (May): 263-276.
- [57] Rubinstein Yona, and Dror Brenner. 2008. "Pride and Prejudice: Evidence from the 'Promised Land'". Brown University mimeo.
- [58] Shepherd, William G., and Sharon G. Levin, Sharon G. 1973. "Managerial Discrimination in Large Firms." *The Review of Economics and Statistics* 55 (November): 412-422.
- [59] Southworth, Shirley D. 1928. *Branch Banking in the United States*. New York, NY: McGraw-Hill.
- [60] Smith, James P., and Finis R. Welch. 1989. "Black Economic Progress After Myrdal." *Journal of Economic Literature* 27 (June): 519-564.
- [61] White, Eugene N. 1982. "The Political Economy of Banking Regulation, 1864-1933." *Journal of Economic History* 42 (March): 33-40.

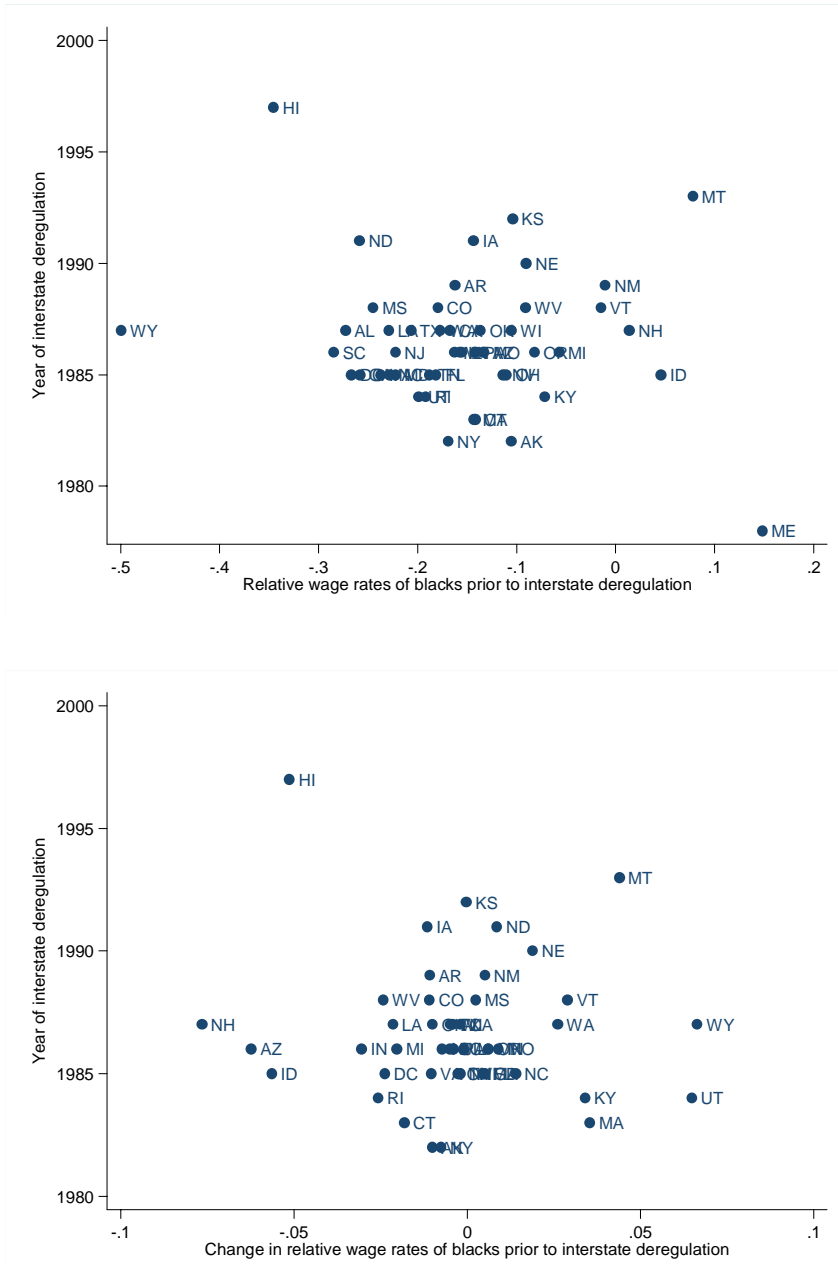


FIGURE 1A  
Pre-Existing Black-White Wage Differentials and the Timing of Interstate Deregulation

Notes: The upper figure plots the year of deregulation against the *average* black-white wage differential in all years prior to interstate deregulation. The lower figure plots the year of deregulation against the *change* in the black-white wage differential in years prior to interstate deregulation. All statistics are weighted by CPS sampling weights.

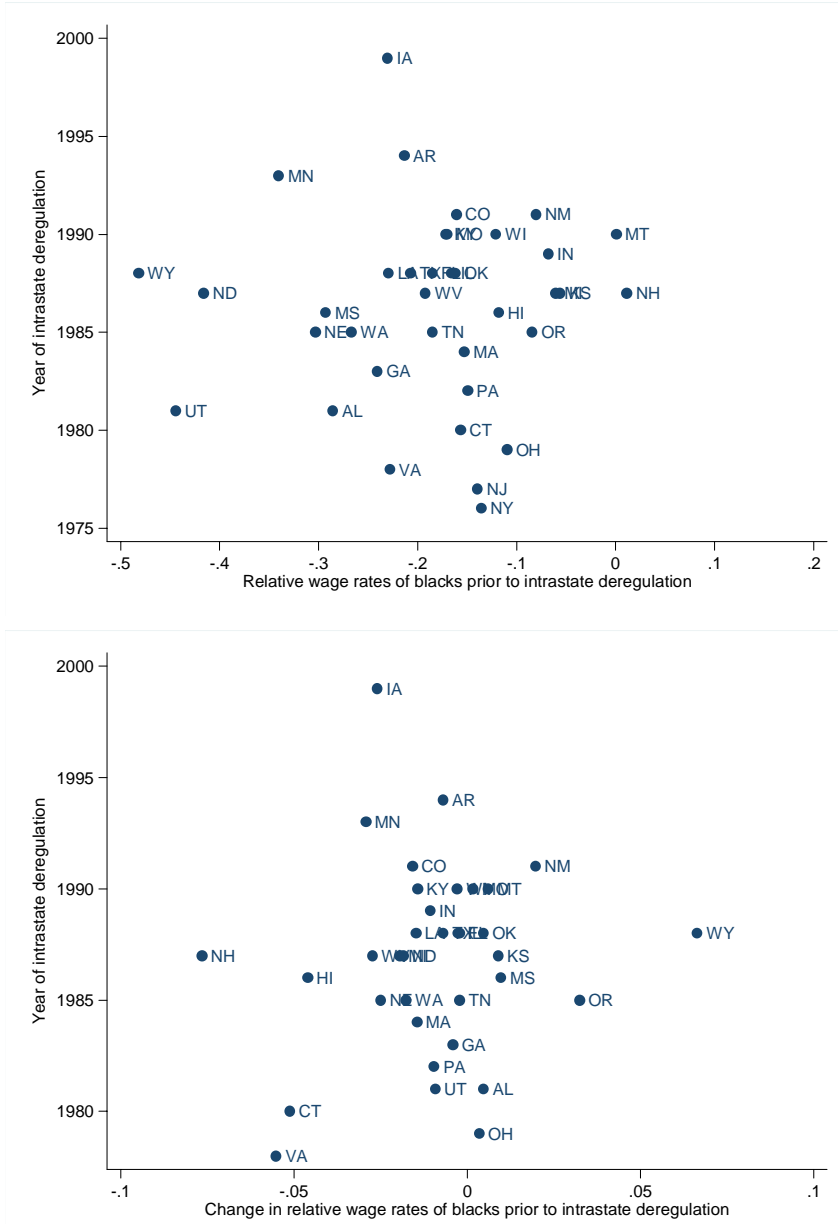


FIGURE 1B  
Pre-Existing Black-White Wage Differentials and the Timing of Intrastate Deregulation

Notes: The upper figure plots the year of deregulation against the *average* black-white wage differential in all years prior to intrastate deregulation. The lower figure plots the year of deregulation against the *change* in the black-white wage differential in years prior to intrastate deregulation. All statistics are weighted by CPS sampling weights.



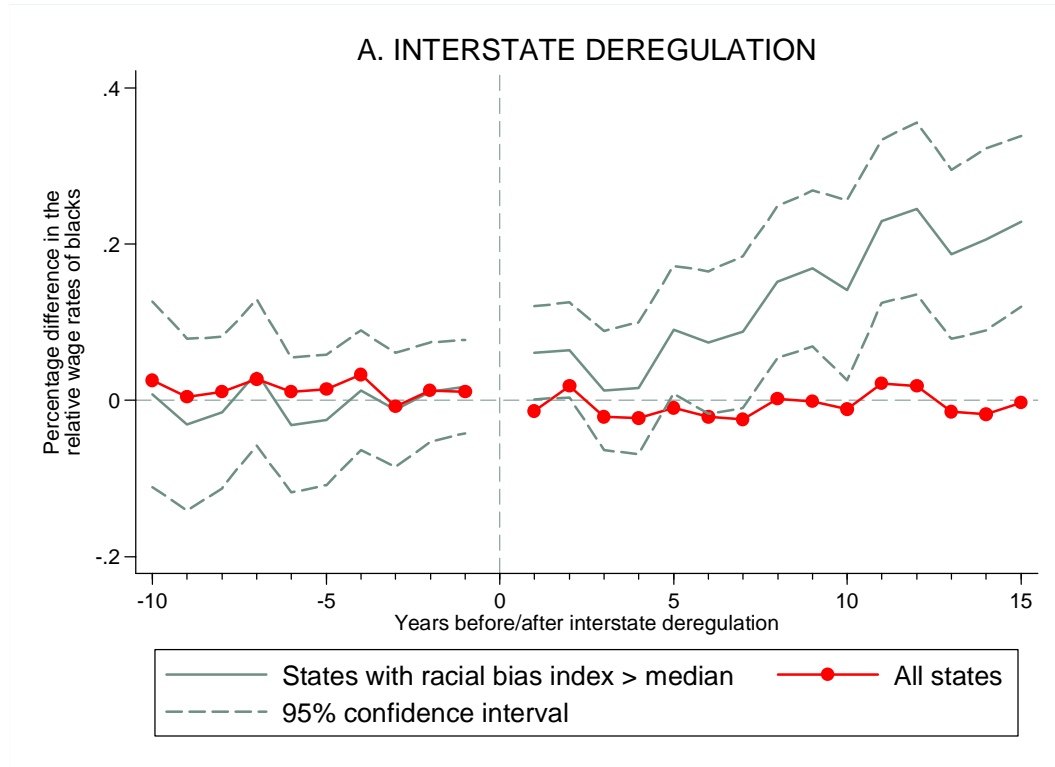


FIGURE 2A  
Relative Wage Rates of Blacks, Before and After Interstate Deregulation

Notes: The figure plots the impact of interstate deregulation on the relative wage rates of blacks for each year before and after deregulation. We consider a twenty five year window, spanning from 10 years before deregulation until 15 years after deregulation. The solid line represents the impact of deregulation on the relative wage rates of blacks in high racial bias states. The dashed lines are the corresponding 95% confidence intervals, adjusted for state-year clustering. The solid line with connecting dots represents the impact of deregulation on the relative wage rates of blacks in states with racial bias index below the median. Specifically, we report estimated coefficients and the corresponding confidence intervals from the following regression:

$$\widehat{R}_{ist}^B = \alpha + \beta_1 D_{-10} + \beta_2 D_{-9} + \dots + \beta_{24} D_{+14} + \beta_{25} D_{+15} + \delta_t + \delta_s + v_{ist}$$

The  $D$ 's equal zero, except as follows:  $D_j$  equals one for all states in the  $j^{\text{th}}$  year before deregulation, while  $D_{+j}$  equals one for all states in the  $j^{\text{th}}$  year after deregulation. For example, since the state of New York deregulated interstate banking in 1982,  $D_{-2}$  is equal to one in 1980, while  $D_{+3}$  is equal to one in 1985. We exclude the year of deregulation, thus estimating the dynamic effect of deregulation on the relative wages of blacks relative to the year of deregulation.

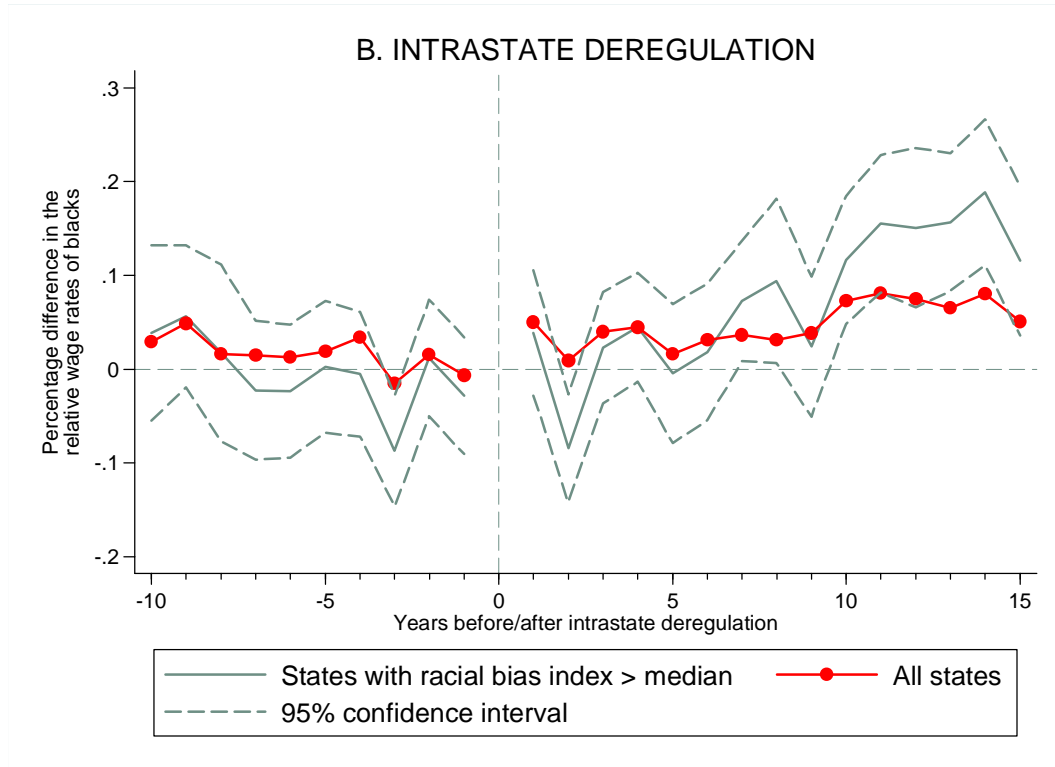
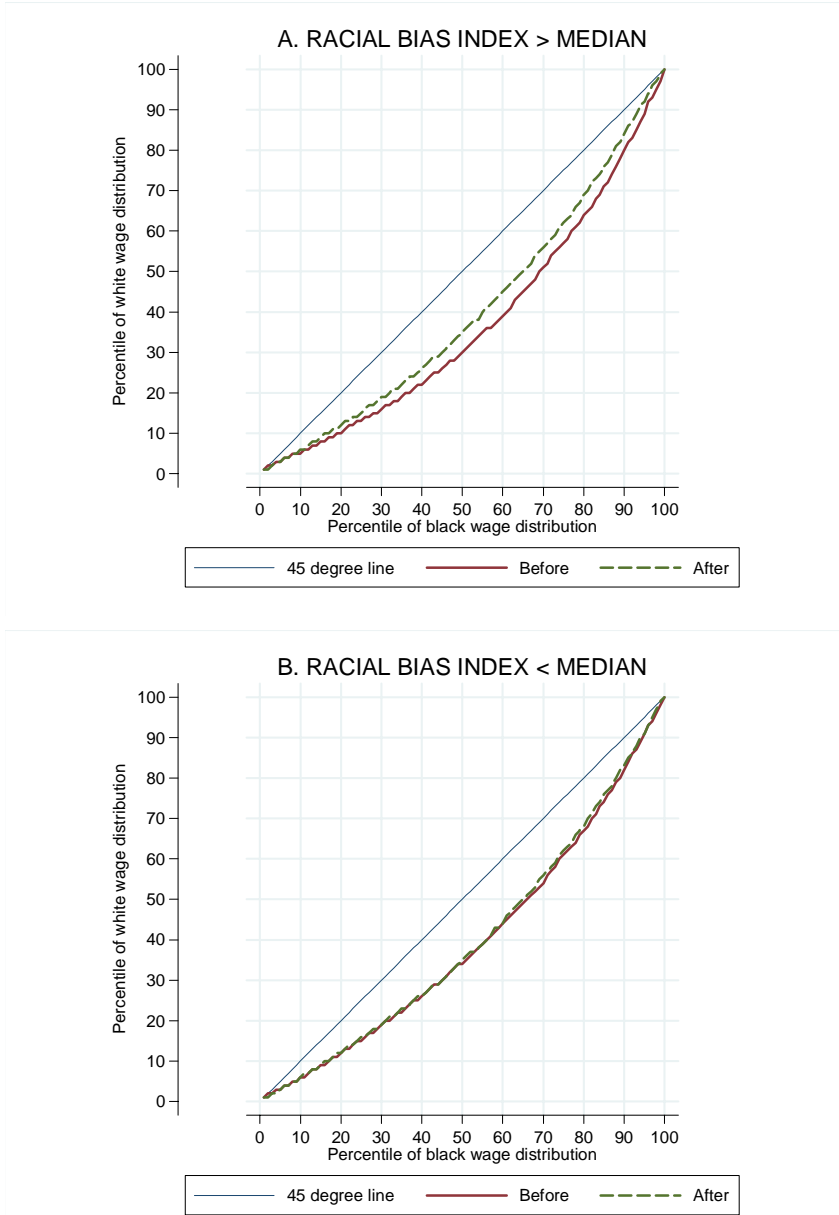


FIGURE 2B  
Relative Wage Rates of Blacks, Before and After Intrastate Deregulation

Notes: The figure plots the impact of intrastate deregulation on the relative wage rates of blacks for each year before and after deregulation. We consider a twenty five year window, spanning from 10 years before deregulation until 15 years after deregulation. The solid line represents the impact of deregulation on the relative wage rates of blacks in high racial bias states. The dashed lines are the corresponding 95% confidence intervals, adjusted for state-year clustering. The solid line with connecting dots represents the impact of deregulation on the relative wage rates of blacks in states with racial bias index below the median. Specifically, we report estimated coefficients and the corresponding confidence intervals from the following regression:

$$\widehat{R}_{ist}^B = \alpha + \beta_1 D_{-10} + \beta_2 D_{-9} + \dots + \beta_{24} D_{+14} + \beta_{25} D_{+15} + \delta_t + \delta_s + v_{ist}$$

The  $D$ 's equal zero, except as follows:  $D_j$  equals one for all states in the  $j^{\text{th}}$  year before deregulation, while  $D_{+j}$  equals one for all states in the  $j^{\text{th}}$  year after deregulation.



**FIGURE 3**  
 The Location of Blacks in the White Wage Distribution  
 Before and After Interstate Deregulation

*Notes:* The plots provide rank analyses and compare the change in black workers' relative wages with those of comparable whites across the full distribution of wage rates, before and after interstate deregulation. The results in this plot were obtained using the following procedure: First, we calculate residuals for black and white workers from equation (7). We keep 100 black workers, each corresponding to a different percentile (1-100) of the black workers' relative log hourly wage distribution. Next, we calculate their position in the white workers' relative log hours wage distribution. We repeat this procedure before (solid line) and after (dashed line) deregulation. The upper figure refers to states with racial bias index above the median. The lower figure refers to states with racial bias index below the median. We use CPS sampling weights in all estimations.

TABLE 1  
Bank Deregulation and Entry of Firms in the Non-Financial Sector

	(1)	(2)	(3)	(4)	(5)	(6)
Interstate indicator	.084*** (.031) {.009}		.082** (.031) {.012}			
Intrastate indicator		.040 (.041) {.334}	.038 (.041) {.362}			
Years since interstate deregulation				.032** (.015) {.040}		.029** (.014) {.046}
Years since interstate deregulation squared				-.002 (.001) {.139}		-.002 (.001) {.112}
Years since intrastate deregulation					.021*** (.008) {.007}	.019** (.008) {.023}
Years since intrastate deregulation squared					-.0004* (.0002) {.082}	-.0004* (.0002) {.081}
Constant	.838*** (.036) {.000}	.634*** (.023) {.000}	.803*** (.060) {.000}	.696*** (.026) {.000}	.592*** (.027) {.000}	.599*** (.027) {.000}
Observations	882	882	882	882	882	882

*Notes:* The dependent variable is the log of new corporations per capita. Robust standard errors are adjusted for clustering at the state level and appear in parentheses. P-values in brackets. All regressions include state and year fixed effects. \*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1 percent levels respectively.

TABLE 2  
Bank Deregulation and the Relative Wage Rates of Blacks: OLS Estimates

	All States		Racial Bias Index:		All States		Racial Bias Index:	
	(1)	(2)	Below	Above	(5)	(6)	Below	Above
			Median	Median			Median	Median
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Years since interstate deregulation	.001 (.003) {.677}	.004 (.003) {.197}	.003 (.003) {.410}	.012* (.007) {.071}				
(Years since interstate deregulation) x (Racial bias index > Median)		.003*** (.001) {.000}						
Years since intrastate deregulation					.005*** (.001) {.000}	.005*** (.001) {.000}	.004*** (.002) {.004}	.011*** (.002) {.000}
(Years since intrastate deregulation) x (Racial bias index > Median)						.004*** (.001) {.000}		
Impact after 5 years	.006 (.015) {.677}	.037** (.016) {.020}	.013 (.016) {.410}	.061* (.034) {.071}	.023*** (.006) {.000}	.044*** (.007) {.000}	.022*** (.008) {.004}	.057*** (.012) {.000}
Impact after 5 years as % of sample's initial racial wage gap	4%	22%	9%	29%	14%	26%	15%	27%
Observations	73,801	73,801	48,367	25,434	73,801	73,801	48,367	25,434

*Notes:* The dependent variable is the relative wage rates of blacks. Standard errors are adjusted for state-year clustering and appear in parentheses. P-values are in brackets. All regressions include state and year fixed effects. The reported number of observations is for blacks only. The average initial racial wage gap is 17% for all states, 15% for states with a racial bias index below the median, and 21% for states with a racial bias index above the median. \*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1 percent levels respectively.

TABLE 3  
Entry of Non-Financial Firms and the Relative Wage Rates of Blacks: OLS and 2SLS Estimates

	Racial Bias Index:			Racial Bias Index:		
	All States	Below Median	Above Median	All States	Below Median	Above Median
	OLS	OLS	OLS	2SLS	2SLS	2SLS
Log new corporation per capita	-.032 (.022) {.150}	-.038 (.023) {.101}	.137*** (.038) {.000}	-.086 (.056) {.125}	-.131* (.067) {.051}	.261*** (.071) {.000}
(Log new corporation per capita) x (Racial bias index > Median)			.160*** (.038) {.000}	.310*** (.077) {.000}		
<i>Instruments:</i>						
Years since deregulation <sup>1</sup>				Yes	Yes	Yes
Years since deregulation squared <sup>2</sup>				Yes	Yes	Yes
(Yrs since deregulation) x (Racial bias index > Median)				Yes		
(Yrs since deregulation squared) x (Racial bias index > Median)				Yes		
F-test of excluded instruments <sup>3</sup>				12.8	7.3	21.5
F-test of excluded instruments <sup>4</sup>				23.6		
OIR test (p-value)				0.20	0.26	0.19
Observations	37,876	24,754	13,122	37,876	24,754	13,122

*Notes:* The dependent variable is the relative wage rates of blacks. Standard errors are adjusted for state-year clustering and appear in parentheses. P-values are in brackets. All regressions include state and year fixed effects. The reported number of observations is for blacks only. Data on new corporations per capita are available only for the period 1977-1994. \*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1 percent levels respectively.

1. Years since deregulation includes both years since interstate deregulation and years since intrastate deregulation.
2. Years since deregulation squared includes both years since interstate deregulation squared and years since intrastate deregulation squared.
3. This is the F-test when the instrumented variable is log new corporations per capita.
4. This is the F-test when the instrumented variable is log new corporations per capita interacted with the racial bias index for states above the median.

TABLE 4  
Relative Log Hourly Wages and Annual Working Hours

	Annual Hours				Log(Annual Hours)	
	All	All	Hours>0	All	All	All
	OLS	Tobit	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
Projected Relative log hourly wage	377* (223) {.091}	376* (223) {.092}	424* (223) {.057}		.658** (0.285)	
Log new corporations per capita				59 (105) {.575}		.271*** (.106) {.010}
<i>Instruments:</i>						
Years since deregulation <sup>1</sup>	Yes	Yes	Yes	Yes	Yes	Yes
Years since deregulation squared <sup>2</sup>	Yes	Yes	Yes	Yes	Yes	Yes
F-test of excluded instruments	21.5	21.5	21.5	21.7	21.5	21.3
OIR test (p-value)	.19	.19	.19	.39	.19	.49
Observations	20,556	20,556	16,951	20,556	16,951	16,951

*Notes:* The dependent variable is either hours worked or the log of hours worked. As indicated, some specifications include all working-age black males, while others include only working black males. Standard errors are adjusted for state-year clustering and appear in parentheses. In regressions (1) - (3) and (4), the standard errors are bootstrapped. P-values are in brackets. All regressions include state and year fixed effects. The analysis excludes states with below the median values of the racial bias index. Data on new corporations per capita are available for the period 1977-1994. \*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1 percent levels respectively.

1. Years since deregulation includes both years since interstate deregulation and years since intrastate deregulation.

2. Years since deregulation squared includes both years since interstate deregulation squared and years since intrastate deregulation squared.

TABLE 5  
Bank Deregulation and Selection on Observable Characteristics

	All States		Racial Bias Index > Median	
	(1)	(2)	(3)	(4)
1 if person reports wages	.066*** (.003) {.000}	.075*** (.003) {.000}	.069*** (.005) {.000}	.082*** (.005) {.000}
Years since interstate deregulation		-.004*** (.001) {.000}	-.001 (.003) {.628}	
(Years since interstate deregulation) x (1 if person reports wages)		.002*** (.000) {.000}	.002*** (.000) {.000}	
Years since intrastate deregulation			-.001 (.000) {.279}	-.000 (.001) {.654}
(Years since intrastate deregulation) x (1 if person reports wages)			.001*** (.000) {.000}	.000 (.000) {.528}
Impact of deregulation on the observable skills of workers <sup>1</sup>	-.002 (.001) {.113}	.0001 (.0005) {.865}	.001 (.002) {.728}	-.0002 (.0008) {.837}
Observations	116,593	116,593	39,292	39,292

*Notes:* The dependent variable is the predicted relative wages of blacks. Standard errors are adjusted for state-year clustering and appear in parentheses. P-values are in brackets. All regressions control for state and year fixed effects. The reported number of observations is for blacks only. \*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1 percent levels respectively.

1. Tests null hypothesis that the coefficient on *Years since deregulation* plus the coefficient on the interaction term, *(Years since intrastate deregulation) x (1 if person reports wages)*, equals zero.



APPENDIX TABLE 1  
 Dates of Intrastate and Interstate Deregulations, by States

State	State code	Type of deregulation:		State	State code	Type of deregulation:	
		Intra-state	Inter-state			Intra-state	Inter-state
Alabama	AL	1981	1987	Montana	MT	1990	1993
Alaska	AK	1960	1982	Nebraska	NE	1985	1990
Arizona	AZ	1960	1986	Nevada	NV	1960	1985
Arkansas	AR	1994	1989	New Hampshire	NH	1987	1987
California	CA	1960	1987	New Jersey	NJ	1977	1986
Colorado	CO	1991	1988	New Mexico	NM	1991	1989
Connecticut	CT	1980	1983	New York	NY	1976	1982
District of Columbia	DC	1960	1985	North Carolina	NC	1960	1985
Florida	FL	1988	1985	North Dakota	ND	1987	1991
Georgia	GA	1983	1985	Ohio	OH	1979	1985
Hawaii	HI	1986	1997	Oklahoma	OK	1988	1987
Idaho	ID	1960	1985	Oregon	OR	1985	1986
Illinois	IL	1988	1986	Pennsylvania	PA	1982	1986
Indiana	IN	1989	1986	Rhode Island	RI	1960	1984
Iowa	IA	1999	1991	South Carolina	SC	1960	1986
Kansas	KS	1987	1992	Tennessee	TN	1985	1985
Kentucky	KY	1990	1984	Texas	TX	1988	1987
Louisiana	LA	1988	1987	Utah	UT	1981	1984
Maine	ME	1975	1978	Vermont	VT	1970	1988
Maryland	MD	1960	1985	Virginia	VA	1978	1985
Massachusetts	MA	1984	1983	Washington	WA	1985	1987
Michigan	MI	1987	1986	West Virginia	WV	1987	1988
Minnesota	MN	1993	1986	Wisconsin	WI	1990	1987
Mississippi	MS	1986	1988	Wyoming	WY	1988	1987
Missouri	MO	1990	1986				

*Note:* Dates of intrastate and interstate deregulations are taken from Kroszner and Strahan (1999).

APPENDIX TABLE 2  
Summary Statistics: Number of observations

Restriction / Selection Rule	Observations
All observations in sample years 1977 to 2007	5,085,135
Civilian adults, not in group quarters, with positive sampling weight and non-missing demographics such as: age, gender, state and region of residence, martial status, and education	3,805,475
Excluding:	
Observations in Delaware and South Dakota	3,712,856
Women	1,749,618
Younger than 18 or older than 65	1,392,503
More than 50 years of potential experience	1,337,897
Hispanics or other race groups but Whites or Blacks	1,149,855
Main sample:	
Whites	1,033,262
Blacks	116,593
Wage sample:	
All	756,996
Whites	683,195
Blacks	73,801

*Notes:* March Current Population Survey data were obtained from <<http://cps.ipums.org/cps/>>. We start in Survey year 1977 because that is when the CPS reports information on each person's exact state of residence. The 2007 Survey is the latest Survey available. We exclude Delaware and South Dakota due to large concentration of credit card banks in these two states. The 'wage sample' differs from the 'main sample' in that we drop self-employed and agricultural workers, workers in private household sector, those with wages below the 1<sup>st</sup> and above the 97<sup>th</sup> percentile of year-specific wage distribution of full-time, full-year workers (i.e., those who work at least 50 weeks per year and at least 35 hours per week). Finally, we include in the 'wage sample' only wage and salary workers.

APPENDIX TABLE 3  
Racial Bias Index by States, 1970

States with racial bias index < median		States with racial bias index > median	
State	Racial Bias Index	State	Racial Bias Index
Alaska	0.00	Arkansas	0.30
Hawaii	0.07	Virginia	0.30
Washington	0.10	South Dakota	0.30
New York	0.11	Colorado	0.30
Nevada	0.12	North Carolina	0.32
California	0.15	Texas	0.32
District of Columbia	0.18	Nebraska	0.32
Delaware	0.24	Minnesota	0.32
South Carolina	0.24	Mississippi	0.33
New Jersey	0.25	Oregon	0.33
Pennsylvania	0.25	Louisiana	0.33
Michigan	0.26	Georgia	0.34
Kentucky	0.26	Oklahoma	0.35
Illinois	0.26	Indiana	0.35
Maryland	0.27	Alabama	0.35
Connecticut	0.27	Wisconsin	0.36
Rhode island	0.27	Vermont	0.36
New Mexico	0.27	Utah	0.37
Kansas	0.28	Idaho	0.37
Massachusetts	0.28	Tennessee	0.39
Ohio	0.28	Iowa	0.39
Missouri	0.28	Montana	0.40
Arizona	0.29	North Dakota	0.43
Florida	0.29	West Virginia	0.45
		Maine	0.45
		Wyoming	0.46
		New Hampshire	0.46

*Notes:* The racial bias index is based on inter-racial marriage data obtained from the 1970 Census of Population. The sample includes married whites and blacks between that ages of 18 to 65, and excludes couples in which at least one person is living in group quarters or has missing data on race, gender, state of residence, marital status, or educational attainment. The racial bias index is based on the difference between the estimated rate of intermarriage in 1970, where the estimation is based on each state's racial composition along with each individual's education and age characteristics, and the actual rate of intermarriage. Larger values of the racial bias index signify that the actual rate of intermarriage is correspondingly smaller than the estimated rate.