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**Working Paper No. 588**

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**Decomposition of the Black-White Wage Differential  
in the Physician Market**

by

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Bard College

**March 2010**

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## **ABSTRACT**

This paper proposes a difference-in-differences strategy to decompose the contributions of various types of discrimination to the black-white wage differential. The proposed estimation strategy is implemented using data from the Young Physicians Survey. The results suggest that potential discrimination plays a small role in the racial wage gap among physicians. At most, discrimination lowers the hourly wages of black physicians by 3.3 percent. Decomposition shows that consumer discrimination accounts for all of the potential discrimination in the physician market, and that the effect of firm discrimination may actually favor black physicians. Interpretations of the estimates, however, are complicated by the possibility that, relative to white physicians, black physicians negatively self-select into self-employment.

**Keywords:** Discrimination; Physician Market; Wage Gaps

**JEL Classifications:** J01, J7, J44

## I. INTRODUCTION

Despite the progress made in the last fifty years, the gap in earnings between blacks and whites remains significant today. Although there are a number of factors that may account for this difference in earnings, economists have traditionally focused on labor market discrimination as the cause of the inequity. The study of labor market discrimination was formalized by Becker's economic theory of discrimination (1957) in which discrimination against a particular group can originate from three sources: employers, coworkers, and consumers.<sup>1</sup> Becker outlines the conditions under which various forms of discrimination would result in wage disparities. Instead of isolating the effects of different types of discrimination, empirical studies ensuing Becker's analysis have largely focused on the total impact of discrimination on the earnings of minorities.<sup>2</sup> Decomposition of discrimination, however, is crucial in targeting enforcement of antidiscrimination legislation, which is intended to mainly deter firm-based discrimination, but not necessarily acts driven by prejudicial attitudes of consumers.

In this paper, we develop a general framework in the spirit of Becker's work to isolate the effect of firm discrimination from that of consumer discrimination. The model is based on the insight that self-employed individuals are not subject to discrimination from firms and, therefore, any wage penalty experienced by salaried minority workers in excess of the wage penalty experienced by self-employed minority workers who belong to the same industry can be attributed to firm discrimination. The model, however, clarifies that this intuition is not generally correct unless a number of conditions are satisfied. Data from the Young Physicians Survey is used to quantify the size of the earnings differential between black and white physicians.

The remainder of the article is organized as follows. Section II provides a brief review of preference-based theories of discrimination and thereby lays the foundations

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<sup>1</sup> All nonconsumer based discrimination, i.e., employer and coworker discrimination, is collectively referred to as "firm discrimination" in this paper.

<sup>2</sup> One exception is the studies on the effect of customer discrimination on the market for sports memorabilia. Nardinelli and Simon (1990) pioneered this innovative approach of isolating the impact of consumer discrimination in a market.

for the discussion of the model.<sup>3</sup> In Section III we introduce a simple model to decompose wage differentials associated with discrimination. The empirical implementation of the model is discussed in Section IV. In Section V, the data used in the statistical analysis is introduced and the empirical results are presented. The robustness of the results is checked in Section VI. Section VII concludes.

## II. PREFERENCE-BASED THEORIES OF DISCRIMINATION

In his seminal work, Becker defines discrimination as an unwillingness to be in the presence of people of a different race. Hence, a firm that has a “taste for discrimination” would not pay a worker of a different race a wage commensurate to that worker’s productivity. If we assume that only the majority may discriminate against others, then a discriminating majority employer would be willing pay a minority worker who generates a marginal product value of  $V$  a maximum wage of  $(1-D)V$ , where  $D$  represents the intensity of discrimination by the firm and its value is less than one. As a result of being underpaid relative to the level of productivity, the minority worker might be driven to work for a nondiscriminating firm, which is willing to offer the worker a wage higher than  $(1-D)V$ . If the number of nondiscriminating firms is sufficiently large in the market, this particular minority worker’s wage is likely to be bid up to  $V$ , the true value of the worker, and any negative wage effects of discrimination would be completely undone. In general, if the number of nondiscriminating employers is large relative to the number of minority workers, or if the nondiscriminating firms have constant or increasing returns to scale technologies (which would allow the nondiscriminating firms to expand and hire a large number of minority workers), then minority workers may not be affected by discrimination at all. In other words, the prejudicial attitude of some of the firms may or may not cause minority workers to earn lower wages than their majority counterparts

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<sup>3</sup> In models such as Becker’s, personal prejudice is the driving force for differences in observed labor market outcomes between various groups. However, there is an alternative model of statistical discrimination that demonstrates how between-group wage differentials can arise from imperfect information that firms have about job applicants. Consult Aigner and Cain (1977), Lundberg and Startz (1983), and Oettinger (1996) for examples of the statistical discrimination model. As O’Neill and O’Neill (2005) have noted, although the nature of discrimination in the statistical discrimination model is drastically different from that in the taste-based model, it is difficult to distinguish between the two models in practice.

who are similar in terms of productivity. Rather, the effect of discrimination at the market level is determined by the transaction between the marginal firm and the marginal minority worker.

An interesting implication of Becker's model is that any discrimination-related wage disparity is likely to be a product of consumer behaviors. As mentioned earlier, there is a real possibility that minority members can largely, if not entirely, avoid firm discrimination. However, if consumers are unwilling to purchase goods and services produced by minorities, then minority workers would not be as valuable to all firms and minority workers would receive lower wages than majority workers as a result. For expository convenience, let's suppose the labor market is competitive. Following the notations introduced earlier, the value of a worker,  $V$ , would be equal to  $P$  (price of the output produced by the firm)  $\times MP$  (marginal product of the worker). Suppose consumers prefer to purchase goods and services produced by majority workers. It follows that they would pay a higher price,  $P = P_w$ , for output produced by majority workers and a lower price,  $P = P_m$ , for output produced by minorities. As a consequence, two equally productive workers—one majority and one minority—would receive different wages ( $P_w \times MP$  for the white worker and  $P_m \times MP$  for the minority worker), even if there were no prejudicial firms.<sup>4</sup>

More recent literature shows that both consumer and firm discrimination may lead to wage differentials if the job search is not frictionless. Borjas and Bronars (1989) demonstrate that consumer discrimination would bring about lower mean incomes, as well as negative selection into self-employment among minorities. Sasaki (1999) considers a model where an increase in the degree of coworker discrimination results in lower wages and higher unemployment for the minority group; Rosen (2003) shows that firms with a positive discrimination coefficient would have the highest profit levels and wage equalization does not occur. Given that wage differentials can arise theoretically in a competitive labor market from both consumer and firm discrimination with the

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<sup>4</sup> Becker's model of discrimination was challenged by Arrow (1973) and Cain (1986), among others, who argue that it is unlikely for both firm and consumer discrimination to engender wage differentials in a competitive labor market in the long run; instead, discriminatory tastes would manifest themselves as segregation.

introduction of search friction, the pertinent question is then how to quantify the effect of each type of discrimination in order to effectively target enforcement of antidiscriminatory policies.

### III. THE GENERAL FRAMEWORK

Suppose there are large numbers of both self-employed and salaried workers within the same industry. Since those who are self-employed would not encounter firm discrimination, any discrimination that is experienced by self-employed workers must have originated from consumers. Salaried workers, on the other hand, may face discrimination that is both employer- and consumer-based. Based on this intuition, we make two claims. First, the difference in earnings between a majority group (denoted as whites) and a minority group (denoted as blacks) among those who are self-employed would account for the impact of consumer discrimination if there were no difference in productivity between self-employed black and white workers. Second, the double difference in earnings would capture the influence of firm discrimination if: (a) the nature of demand for the output provided by self-employed and salaried workers is similar; and (b) there is no difference in productivity between self-employed and salaried workers within each racial group.

We now illustrate the above two claims. Let  $P_s$  and  $P_n$  denote the prices that consumers are willing to pay for the output of self-employed and salaried white workers, respectively. Let  $D_c$  and  $D_f$  denote the discrimination coefficients of consumers and firms, respectively (both  $D_c$  and  $D_f < 1$ ). Let  $MP_{sw}$ ,  $MP_{sb}$ ,  $MP_{nw}$ , and  $MP_{nb}$  denote the marginal products produced by self-employed whites, self-employed blacks, salaried whites, and salaried blacks, respectively. In the competitive labor market equilibrium, the wage received by each group of workers would be:

$$W_{sw} = P_s \times MP_{sw}. \quad (1)$$

$$W_{sb} = (1 - D_c)P_s \times MP_{sb}. \quad (2)$$

$$W_{nw} = P_n \times MP_{nw}. \quad (3)$$

$$W_{nb} = (1 - D_c - D_f) P_n \times MP_{nb}. \quad (4)$$

It follows that the difference in the wages received by self-employed whites and self-employed blacks is:

$$W_{sw} - W_{sb} = P_s \times (MP_{sw} - MP_{sb}) + D_c P_s \times MP_{sb}, \quad (5)$$

while the difference in the wages received by salaried whites and salaried blacks is:

$$W_{nw} - W_{nb} = P_n \times (MP_{nw} - MP_{nb}) + (D_c + D_f) P_n \times MP_{nb}. \quad (6)$$

The double difference in wages is therefore:

$$\begin{aligned} (W_{nw} - W_{nb}) - (W_{sw} - W_{sb}) &= [P_n \times (MP_{nw} - MP_{nb}) - P_s \times (MP_{sw} - MP_{sb})] + \\ &\quad [D_c(P_n \times MP_{nb} - P_s \times MP_{sb}) + D_f P_n \times MP_{nb}]. \quad (7) \end{aligned}$$

It is clear that if black and white workers are equally productive, i.e.,  $MP_{sw} = MP_{sb}$ , equation (5) reduces to:

$$W_{sw} - W_{sb} = D_c P_s \times MP_{sb}. \quad (8)$$

If the willingness to pay for the output of self-employed and salaried workers is the same, i.e.,  $P_s = P_n = P$ , then equation (7) becomes:

$$\begin{aligned} (W_{nw} - W_{nb}) - (W_{sw} - W_{sb}) &= P \times [(MP_{nw} - MP_{sw}) - (MP_{nb} - MP_{sb})] + \\ &\quad [D_c P \times (MP_{nb} - MP_{sb}) + D_f P \times MP_{nb}]. \quad (9) \end{aligned}$$

Further, if self-employed and salaried workers are equally productive within each racial group, i.e.,  $MP_{nw} - MP_{sw} = MP_{nb} - MP_{sb} = 0$ , then equation (8) is simplified to:



$$(W_{nw} - W_{nb}) - (W_{sw} - W_{sb}) = D_f P \times MP_{nb}. \quad (10)$$

#### IV. EMPIRICAL SPECIFICATION

The above framework is empirically implemented by performing separate Blinder-Oaxaca decompositions for self-employed and salaried workers while controlling for consumer demand, worker productivity, and other relevant demographic variables. The Blinder-Oaxaca decomposition is a standard technique used to divide the wage differential between two groups into a part that is “explained” by differences in observable characteristics and a residual that is “unexplained” by differences in those characteristics.<sup>5</sup> This unexplained part is often regarded as the impact of discrimination on the wage differential. Given that we need to analyze the wage differentials for both self-employed and salaried physicians, the following OLS wage equations are considered:

$$\ln W_{ij} = X_{ij} \beta_{ij} + \varepsilon_{ij}, \quad i = s, n \text{ and } j = w, b \quad (11)$$

In equation (11),  $\ln W$  is the natural log of wage,  $X$  is the set of covariates, and  $\varepsilon$  is the error term. The covariates include physician’s marital status, board certification status, the number of years of experience, experience squared, variables that control for local healthcare market conditions, and a number of dummies that indicate physician’s primary medical specialty. For physicians who belong to the same sector (as each physician is either in the self-employment sector or the salary-employment sector), the difference in the expected log wages can be written as follows:

$$E(\ln W_{iw}) - E(\ln W_{ib}) = [E(X_{iw}) - E(X_{ib})] \beta_i^* + [E(X_{iw})(\beta_{iw} - \beta_i^*) + E(X_{ib})(\beta_i^* - \beta_{ib})].^6 \quad i = s, n \quad (12)$$

<sup>5</sup> Please refer to Blinder (1973), Oaxaca (1973), Reimers (1983), Cotton (1988), Oaxaca and Ransom (1994), and Jann (2008) for more on the Blinder-Oaxaca decomposition method.

<sup>6</sup> Cotton’s formulation of the Blinder-Oaxaca decomposition is adopted in this study.

$\beta_i^*$  in equation (12) is the set of theoretical coefficients that would have prevailed in each sector in the absence of any discrimination. In this paper, we follow the recommendation made by Cotton and set  $\hat{\beta}_i^* = \frac{N_{ib}}{N_{ib} + N_{iw}} \hat{\beta}_{ib} + \frac{N_{iw}}{N_{ib} + N_{iw}} \hat{\beta}_{iw}$  in the decompositions, where  $N_{ib}$  and  $N_{iw}$  are the numbers of black and white physicians in each sector  $i$ , respectively. The right hand side of (12) consists of two terms. The first term  $[E(X_{iw}) - E(X_{ib})]\beta_i^*$  accounts for the extent of the wage gap due to differences in covariates and is the “explained” part of the differential. On the other hand, the second term  $[E(X_{iw})(\beta_{iw} - \beta_i^*) + E(X_{ib})(\beta_i^* - \beta_{ib})]$  represents the component of the wage gap due to differences in coefficients and is referred to as the “unexplained” part of the differential. In the equation for self-employed physicians ( $i = s$ ), the unexplained part on the right-hand side of (12) would capture the effect of consumer discrimination if productivity can be held constant across racial groups. In order to quantify the impact of firm discrimination, we need to hold consumer demand and worker productivity across different sectors constant and subtract (12) with  $i = s$  from (12) with  $i = n$  to derive the following:

$$\begin{aligned}
& [E(\ln W_{nw}) - E(\ln W_{nb})] - [E(\ln W_{sw}) - E(\ln W_{sb})] = \\
& [E(X_{nw}) - E(X_{nb})]\beta_n^* - [E(X_{sw}) - E(X_{sb})]\beta_s^* \\
& + \{ [E(X_{nw})(\beta_{nw} - \beta_n^*) + E(X_{nb})(\beta_n^* - \beta_{nb})] \\
& - [E(X_{sw})(\beta_{sw} - \beta_s^*) + E(X_{sb})(\beta_s^* - \beta_{sb})] \} \quad . \quad (13)
\end{aligned}$$

In equation (13), the term in  $\{ \}$  is the difference in the unexplained wage gaps between the salary-employment sector and the self-employment sector—it represents the effect of firm discrimination on the wages of the minority group.

## V. DATA AND RESULTS

The data source used to carry out the study is the Young Physicians Survey (YPS). The YPS was initially conducted in 1987 by the Robert Wood Johnson Foundation,

Mathematica Institute, and the American Medical Association to investigate the factors that influence the career decisions of young physicians (below 40 years of age and had been in practice for two to six years) and the characteristics of their practices. The survey contains information on a wide range of variables—such as physician specialty, board certification status, and waiting time for patients—that would enable us to control for consumer demand and worker productivity, thereby effectively isolating the effects of different types of discrimination in the physician market.

There were 5,868 respondents in the original wave of the YPS. Among those respondents, 3,124 were reinterviewed in 1991 in the second wave of the survey, which included a total of 6,053 physicians. We first examine the data from the 1987 wave to detect and decompose any possible discrimination in the market for young physicians. The group of physicians who were interviewed in both 1987 and 1991 were used to assess whether the nature of selection into self-employment differs between black and white physicians.

We restricted the sample used in the estimation to male physicians who worked for at least 20 hours a week, a minimum of 26 weeks in a year, and who earned a wage above the federal minimum wage. The final samples include 2,763 white physicians and 396 black physicians from 1987.

Table 1 presents the summary statistics of the variables included in the regression analysis and table 2 reports employment outcomes associated with physicians in various demographic and professional categories. In 1987, the number of average weekly work hours was almost identical for white and black physicians, but blacks had a lower mean income due to a roughly 11% lower hourly wage (\$32.12 vs. \$35.60). This wage differential, however, can be caused by differences in characteristics as the distribution of specialties varies across races and black physicians are less likely to be married, board certified, and practice in high income areas.

Among the nine categories of physician specialties listed, blacks have a greater tendency to specialize in three of them: pediatrics, obstetrics/gynecology, and psychiatry, which are ranked ninth, fourth, and fifth, respectively, in terms of average hourly earnings. Thus, based on summary statistics alone, black physicians seem to have a marginally higher likelihood of being in the less financially lucrative specialties.

Consistent with the general findings on the effect of marital status on male earnings, single male physicians have lower wages and work fewer hours than their married counterparts. The lower probability of being married also contributes to the lower wages earned by black physicians. Surprisingly, the status of board certification appears to have no bearing on one's wage rate. This unexpected result shows that physicians are not penalized, at least from the perspective of contemporaneous monetary compensation, for not being board certified in the beginning stage of their careers. Hence, the substantially lower rate of board certification among the black physicians in the sample does not adversely affect their hourly earnings. However, since blacks and whites have almost identical levels of experience in the sample, the dramatic difference in the rates of board certification (43.7% vs. 74.2%) suggests that there are perhaps differences in unobservable determinants of wages between these two groups if the process of obtaining board certification is not discriminatory against blacks.

The only explanatory variable included in the regression that may lend an advantage to blacks is the physician-to-population ratio. Black physicians tend to practice in areas where the physician-to-population ratio is low. This means that black physicians would, on average, face less competition and their earnings should be higher as a result. The advantage of less competition enjoyed by black physicians, however, is somewhat, if not entirely, negated by the lower per capita income of their practice locations.

As established in tables 1 and 2, black physicians, in general, have observable characteristics that are less favorable to achieving greater earnings. The magnitudes of these effects on wages are shown in table 3, which entails the estimation results of the wage regressions used in the Blinder-Oaxaca decompositions. The most striking result from table 3 is perhaps the size of the experience coefficient for blacks relative to that for whites.<sup>7</sup> At the group mean, wages for black physicians would increase by almost 10.8% while wages for white physicians would only go up by 8.9%. To the extent of our knowledge, this is the first study that documents higher returns to experience for blacks than for whites. We offer three reasons that can help explain this unique result. The first reason is the homogeneity of the sample used in this study. Most studies of earnings differentials are based on datasets such as the Current Population Survey and the National

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<sup>7</sup> The significance of the coefficient on experience for blacks is significant at right around the 10% level.

Longitudinal Survey of Youth in which the respondents are drawn from the general population. If blacks were more likely to be employed in industries where returns to experience are low, conventional analysis that relies on data compiled from the general population would underestimate the returns to experience for blacks. The focus on a single profession in this paper therefore greatly reduces the heterogeneity in earnings due to the possibility that blacks are concentrated in professions in which returns to experience are generally low. Second, blacks who choose the career path of physicians may possess traits that enable them to realize superior returns to experience. Medicine is one of the most demanding and selective professions. If the environmental factors are less favorable for blacks to break into the profession, those who eventually succeed in entering may just have exceptional talents and motivation that are productive complements of experience. The final explanation is related to psychological factors. Studies in psychology have found that it is common for whites to hold black physicians in high esteems. The rationale for this finding is that when two stereotypes (such as the racial stereotype and the doctor stereotype) are in clash, individuals would only activate the stereotype that confers them the greatest psychological benefit. Hence, if patients more often than not have the motivation to suppress any racial stereotypes they have toward black physicians, it is then more likely for the earnings of black physicians to rise over time.

The status of being married has a positive effect on wages for white physicians who are self-employed, but shows no statistically significant effect on physicians in any other category. Consistent with the summary statistics, board certification has generally no effect on earnings except in the case of salaried black physicians. Within the subgroup of salaried black physicians, the achievement of board certification would raise the hourly wage by about 14%. The coefficients on physician specialties are largely consistent with the findings in table 2. However, it is worth noting that most of those coefficients are insignificant for blacks, as there are few blacks in many of the specialty categories. Finally, the two variables that control for local market conditions (the physician-to-population ratio and per capita income) have either weak or no effects on earnings. As the physicians-to-population ratio increase by 10%, i.e., the number of physicians on a per capita basis decreases by 10%, the hourly wage of self-employed

whites would go up by 0.4%, while the hourly wage of salaried blacks would actually decline by 0.6%. If the per capita income in a local area were to rise by 10%, the hourly wage of self-employed blacks would increase by 1.6% and the hourly wage of self-employed whites would go up by about 0.8%.

The details of the Blinder-Oaxaca decompositions are shown in table 4. The decomposition results suggest that the wage gap among salaried physicians is mostly attributable to differences in covariates, while the wage differential among self-employed physicians is entirely due to differences in coefficients. The portion of the wage gap that can be explained by differences in covariates is actually negative among those who are self-employed. This means that relative to self-employed white physicians, self-employed black physicians, on average, have more characteristics associated with higher earnings. The size of the unexplained self-employed wage gap of .1134 indicates the magnitude of the black-white wage differential due to consumer discrimination. We can subtract the unexplained gap of .1134 among the self-employed from the unexplained gap of .0179 among the salaried physicians to quantify the magnitude of the wage differential due to firm discrimination. The difference in these two gaps is -.0955. Since salaried workers may suffer from both firm and consumer discrimination, while those who are self-employed may only be affected by consumer discrimination; the negative difference-in-differences estimate is quite unexpected. However, we should keep in mind that the reliability of the estimates derived from the Blinder-Oaxaca decompositions crucially depends on the conditions of identical demand, equal productivity across employment sectors within each group, and equal productivity across races within the self-employment sector being satisfied. We attempt to determine if these conditions hold in our sample of physicians in the following section.

## **VI. ROBUSTNESS TESTS**

### **Variations in the Willingness to Pay for Physician Services**

Although we control for variables, such as physician-to-population ratios and income per capita, that can potentially affect the general demand for physicians in each local market, there may still be a great deal of variations in the demand for physician services within

the same local market. Thus, it is important to ensure that the average demand for self-employed physicians is not significantly different from that for salaried physicians in the sample. The YPS provides information on the fees charged for office visits and the number of days a new patient has to wait for an appointment. We use these two variables to approximate for the demand for each individual physician. Table 5 reports fees charged for an office visit and waiting time for a new patient depending on whether the physician owns the practice or is a salaried employee. According to the average waiting time, salaried physicians seem to have a 40% higher demand than self-employed physicians. It is worth noting, however, that information on these two variables is missing for a particularly large number of salaried physicians, as many of them either did not have knowledge of such information or simply refused to provide it. On the question of waiting time for an appointment, only 551 out of the 931 salaried physicians who are in the sample used in regression analysis had a definitive answer (a response rate of 59%), while 1,095 out of 1,565 possible self-employed physicians gave an exact response (a rate of 70%). Although there is a much longer waiting time for salaried physicians in the reduced sample, the fees charged by salaried physicians in the limited sample are only about 6% higher (\$37.74 vs. \$35.59) and the difference is not statistically significant. As pointed out by Reyes (2007), institutional factors, such as health insurance arrangements, often preclude medical fees from fully adjusting to meet excessive demand. Hence, on the basis of fees for office visits, the condition of similar willingness to pay for services provided by self-employed and salaried physicians does not appear to be violated.

While the rigidity of the institutional structure in the healthcare industry may have brought about similar fees charged by physicians, they do pose a potential problem that can result in different willingness to pay for physician services depending on whether the physician is an owner of a practice or just an employee of a healthcare provider. Most individuals in the United States have health insurance coverage and, hence, do not bear the full cost of healthcare. Since those individuals who have health insurance only pay a fraction of the total medical expenses, they would be more likely to pay higher gross prices for services. Knowing this, self-employed physicians who retain total revenues net of costs as earnings may purposely seek out clients who have health insurance coverage. This possibility, once again, can be addressed by the rich data provided by the YPS.

There is a question in the YPS asking the respondents to estimate the percentage of patients in their practices who do not have health insurance coverage. Based on the responses to this question, we compute the estimated percentage of patients who have health insurance coverage in each physician's main practice and present the results in table 6. As expected, self-employed physicians have a greater proportion of clients with health insurance coverage than salaried physicians. The difference in percentages, however, is minimal (91% vs. 87%). The small difference in the proportions of patients with health insurance coverage between the two groups of physicians is perhaps due to the inability of salaried physicians to choose their own patients. Instead, it is the owners of a practice who determine the composition of its clientele and those employers would also be motivated to pursue patients with health insurance coverage.

The last factor that may lead to systematic variations in the willingness to pay in the healthcare market pertains to the phenomenon of supplier-induced demand. In certain market transactions, suppliers have more knowledge about the usefulness and suitability of the products than demanders and, as a result, demanders rely on suppliers for expert advice in making the purchase decisions. The providers (physicians) in the healthcare market, perhaps more so than suppliers in any other markets, dictate the type of services purchased by the consumers (patients). There is therefore an incentive for physicians to recommend expensive treatment options and this incentive may be greater for self-employed than salaried physicians whose earnings are likely to be less dependent on services provided. Due to data limitation, we cannot directly test whether there is a difference in the degrees of supplier-induced demand between different types of physicians. However, past studies have shown that the extent of supplier-induced demand in the healthcare industry is insignificant.<sup>8</sup>

### **Differentials in Productivity**

The status as residual claimants for self-employed physicians not only may result in systematic variations in the consumers' willingness to pay, as previously noted, it may also lead to differences in average productivity between self-employed and salaried



physicians. It is possible that those physicians who are willing to devote high levels of effort to work (i.e., physicians who have high productivity conditional on observable characteristics) would find self-employment particularly attractive since they would be able to retain residual revenues as earnings. The YPS provides information on the number of patients seen by a doctor in a week. Combined with the information on the number of hours physicians spend on patient care per week, we can compute the number of patients a physician sees on an hourly basis. If self-employed physicians are indeed more productive than salaried physicians on average, we should perhaps observe a difference in the number of patients seen per hour between these two groups. Table 7 reports the average numbers of patients that self-employed and salaried physicians see in an hour. Surprisingly, it is the salaried physicians who are about 10% more productive overall (1.91 vs. 1.74 patients per hour). Comparison of physician efficiency is also done for each individual specialty. However, due to a relatively small number of physicians in each specialty, the differentials in productivity are all statistically insignificant other than the case of internal medicine, which happens to be the most popular specialty. Within the category of internal medicine, salaried physicians are approximately 18% more efficient in producing office visits (1.72 vs. 1.46 patients per hour).<sup>9</sup>

The number of patient visits per hour by employment sector and race are presented in table 8. The group difference in productivity between black and white physicians is not statistically significant and that suggests the estimate of the effect of consumer discrimination is perhaps reliable despite a much lower rate of board certification among black physicians. Among both blacks and whites, salaried physicians see more patients per hour than self-employed physicians; salaried black physicians

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<sup>8</sup> Rossiter and Wilensky (1984) find that a 10% increase in physician density would raise both utilization and expenditures on physician services by approximately 1%. Stano (1987) argues that the magnitude of the elasticity is even smaller than that.

<sup>9</sup> There is a note of caution in equating the number of office visits a physician generates to how efficient that physician is. As recognized by Langwell (1982), when the number of patient visits in a given time interval is used to proxy for physician efficiency, average quality of the service provided is implicitly assumed to be constant, but that assumption may not be correct in reality. It is possible that self-employed physicians are more inclined to provide a higher average quality office visit by spending more time with each patient as a way of generating repeat customers. Salaried physicians, on the other hand, may have more of an incentive to get patients quickly out of their offices in order to leave work at a reasonable hour. Hence, the greater number of office visits produced in an hour by salaried physicians does not necessarily imply higher productivity.

produce 14% more patient visits than self-employed black physicians, while salaried white physicians generate almost 7% more patient visits than self-employed white physicians, and both differentials are statistically significant. The statistically significant productivity differential within each group seems to have violated one of the (sufficient) conditions for the clear-cut interpretation of the double difference in wage gaps. The larger productivity differential among blacks is consistent with a negative self-selection into self-employment by blacks (relative to whites), as documented by Borjas and Bronars (1989) and Kawaguchi (2005). If black physicians negatively self-select into self-employment relative to white physicians, the double difference in wage gaps would understate the effect of firm discrimination, as can be clearly seen from equation (9).

We exploit the longitudinal element of the YPS to further investigate the issue of negative selection into self-employment among black physicians. After applying various sample restrictions, there are 1,470 black or white male physicians who have valid employment and wage data in both the 1987 and 1991 surveys. Table 9 tabulates their employment transitions from 1987 to 1991. The number of physicians who changed their employment sectors from 1987 to 1991 is relatively small. There were a total of 248 physicians who switched from the salary-employment sector to the self-employment sector, while 96 physicians made the reverse move. The number of blacks who moved from one employment sector to the other is even smaller—only 42 of them made the switch either way.

In order to determine if the nature of selection into self-employment is indeed different between black and white physicians, we compare the 1987 wages of those who switched sectors between 1987 and 1991 with the 1987 wages of those who remained in the same sectors within each racial group. Those comparisons are reported in table 10. Among blacks who were employees of healthcare providers in 1987, those who switched to self-employment in 1991 had a 5% lower average wage in 1987 than those who remained as employees. The difference of 5%, however, is not statistically significant. Among whites who were salaried physicians in 1987, the ones who moved to the self-employment sector had a 7% higher wage in 1987 than the ones who did not make the move. Among the physicians who were self-employed in 1987, no statistically significant relationships can be found between the average wage of sector switchers and that of

nonswitchers within either blacks or whites. Considering all the evidence, black physicians seem to exhibit a negative selection into self-employment relative to white physicians.

## **VII. CONCLUSION**

A difference-in-differences strategy is proposed in this paper to decompose the contributions of different types of discrimination to the black-white wage differential. The strategy is based on the intuition that self-employed individuals are not likely to be subject to firm discrimination, while salaried workers may suffer from both firm and consumer discrimination. Hence, after controlling for all the characteristics that can potentially affect earnings, the wage difference between self-employed black and white workers can be attributed to consumer discrimination, while the wage difference between salaried black and white workers in excess of the difference between self-employed black and white workers is attributable to firm discrimination.

The sufficient conditions under which the difference and double difference estimates would accurately reflect the distinct effects of consumer and firm discrimination on earnings are derived in a general framework. In order for the wage difference between self-employed black and white workers to correctly measure the effect of consumer discrimination, these two groups of workers must be equally productive. The difference-in-differences estimate would precisely indicate the fraction of the racial wage gap that results from firm discrimination if consumer's willingness to pay is identical for both self-employed and salaried workers, and if self-employed and salaried workers are equally productive within each racial group.

Data from the Young Physicians Survey is used to implement the proposed strategy. The results suggest that potential discrimination plays a small role in the racial wage gap among physicians. At most, discrimination lowers the hourly wages of black physicians by 3.3%. The decompositions show that consumer discrimination accounts for all of the potential discrimination in the physician market and that the effect of firm discrimination is actually in favor of black physicians. The interpretations of the estimates, however, are complicated by the possibility that relative to white physicians,

black physicians negatively self-select into self-employment. This relative negative selection into self-employment by blacks would both overestimate the effect of consumer discrimination and underestimate the effect of firm discrimination.

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## TABLES

**Table 1. Summary Statistics**

	<b>Blacks</b>		<b>Whites</b>	
<b>Hourly Wage</b>	34.9	(27.59)	37.53	(27.44)
<b>Weekly Hours*</b>	60.64	(19.05)	60.75	(14.83)
<b>Annual Income*</b>	93,930	(57,840)	103,800	(72,170)
<b>Married</b>	.745	(.437)	.858	(.349)
<b>Years of Experience</b>	3.521	(1.129)	3.477	(1.152)
<b>Board Certified</b>	.45	(.498)	.744	(.436)
<b>Physician Specialty:</b>				
<b>General Practice</b>	.135	(.342)	.18	(.384)
<b>Internal Medicine</b>	.238	(.426)	.256	(.436)
<b>Surgery</b>	.202	(.402)	.213	(.409)
<b>Pediatrics</b>	.099	(.3)	.063	(.243)
<b>Obgyn</b>	.128	(.334)	.049	(.215)
<b>Radiology</b>	.025	(.156)	.051	(.22)
<b>Psychiatry</b>	.053	(.225)	.043	(.204)
<b>Anesthesiology</b>	.043	(.202)	.053	(.224)
<b>Other Specialties</b>	.078	(.269)	.093	(.291)
<b>Physican-to-population ratio</b>	505.1	(872.1)	552.6	(862.4)
<b>Per capita income</b>	11,426	(5,397)	12,647	(4,935)
<b>Number of physicians</b>	282		2,214	

**Notes:**

1. \* indicates that the variable is not included in the regression analysis.
2. The numbers in ( ) indicate standard errors.

**Table 2. Employment Outcomes in Each Category in 1987**

	<b>Hourly Wage</b>	<b>Weekly Hours</b>	<b>Annual Income</b>
<b>Married</b>	37.54	60.98	104,013
<b>Nonmarried</b>	35.55	59.40	95,664
<b>Board certified</b>	37.18	60.67	102,889
<b>Non-board certified</b>	37.36	60.90	102,300
<b>Specialties:</b>			
<b>General Practice</b>	26.97	59.25	73,560
<b>Internal Medicine</b>	30.46	61.91	87,548
<b>Surgery</b>	48.45	64.32	140,646
<b>Pediatrics</b>	26.16	59.65	71,725
<b>Obgyn</b>	40.31	67.24	121,139
<b>Radiology</b>	48.54	54.25	115,492
<b>Psychiatry</b>	38.67	53.30	92,586
<b>Anesthesiology</b>	55.95	60.67	145,651
<b>Other Specialties</b>	38.57	55.78	97,750

**Table 3. Wage Equation Estimates for the Year 1987**

	All Physicians		Self-Employed		Salaried	
	Blacks	Whites	Blacks	Whites	Blacks	Whites
<b>Intercept</b>	1.6111 (.8305)	2.3820 (.3206)	2.4424 (1.2440)	2.7621 (.4553)	1.1211 (.9002)	2.5475 (.4160)
<b>Married</b>	-.00876 (.0775)	.0796 (.0306)	-.0416 (.1285)	.1004 (.0434)	.0454 (.0743)	.0241 (.0394)
<b>Experience</b>	.3070 (.1867)	.2535 (.0632)	.2156 (.3041)	.3377 (.0876)	.4754 (.1856)	.0291 (.0854)
<b>Experience<sup>2</sup></b>	-.0287 (.0257)	-.0239 (.0088)	-.0161 (.0410)	-.0346 (.0120)	-.0531 (.0260)	.0033 (.0121)
<b>Board</b>	.1109 (.0726)	.0101 (.0260)	.1150 (.1147)	-.0074 (.0345)	.1432 (.0732)	.0382 (.0366)
<b>General practice</b>	-.2445 (.0956)	-.3410 (.0276)	-.3437 (.1477)	-.3954 (.0357)	-.0894 (.0867)	-.2069 (.0411)
<b>Internal medicine</b>	-.2200 (.0736)	-.2063 (.0229)	-.2757 (.1189)	-.2099 (.0310)	-.1323 (.0709)	-.1978 (.0317)
<b>Surgery</b>	.1472 (.0785)	.1928 (.0241)	.1415 (.1143)	.1765 (.0307)	.0765 (.0898)	.1371 (.0389)
<b>Pediatrics</b>	-.1644 (.1025)	-.3581 (.0396)	-.2436 (.1751)	-.3927 (.0594)	-.0249 (.0918)	-.2814 (.0479)
<b>Obgyn</b>	.2884 (.0926)	-.0412 (.0447)	.3534 (.1404)	-.0199 (.0574)	.2451 (.0992)	-.1388 (.0667)
<b>Radiology</b>	.2249 (.1926)	.2906 (.0437)	.4257 (.3036)	.3356 (.0634)	-.0629 (.1880)	.2603 (.0544)
<b>Psychiatry</b>	.1198 (.1353)	-.0348 (.0471)	.2416 (.2712)	-.093 (.0616)	.1663 (.1114)	.0669 (.0679)
<b>Anesthesiology</b>	-.03320 (.1495)	.4357 (.0430)	-.1301 (.1831)	.4747 (.0553)	-.0894 (.0867)	.2711 (.0647)
<b>Other specialties</b>	-.1181 (.1134)	.0624 (.0334)	-.1691 (.1742)	.1242 (.0537)	-.0889 (.1149)	.0896 (.0385)
<b>Ln (md-pop ratio)</b>	-.0009 (.0291)	-.0036 (.0098)	.0668 (.0458)	.0401 (.0143)	-.0670 (.0302)	-.0126 (.0128)
<b>Ln (per capita income)</b>	.1145 (.0859)	.0551 (.0325)	.0124 (.1325)	-.0206 (.0469)	.1615 (.0905)	.0777 (.0414)
<b>Ln (wage)</b>	3.3647	3.4590	3.4300	3.5315	3.2697	3.3348
<b>R<sup>2</sup></b>	.1560	.2173	.1759	.2484	.2665	.1736
<b>N</b>	282	2214	167	1398	115	816

**Notes:**

1. The dependent variable is the natural log of the hourly wage.
2. The numbers in ( ) indicate standard errors.
3. Following Yun (2005), we estimate the “normalized” wage regressions. Hence, the coefficient on each physician specialty expresses the wage deviation in percentages from the mean of all specialties.



**Table 4. The Blinder-Oaxaca Decompositions**

	All physicians	Self-employed	Salaried
<b>Total wage gap</b>	.0944	.1015	.0651
<b>Explained wage gap</b>	.0243	-.0119	.0473
<b>Unexplained wage gap</b>	.0701	.1134	.0179

**Note:**

Difference in unexplained wage gaps between self-employed and salaried physicians  
= -.0955

**Table 5. Fees and Waiting Time (in Days) for Appointment**

	Self-employed physicians	Salaried physicians	Differential
<b>Fees charged</b>	\$35.59 (22.57) N = 1,275	\$37.74 (32.18) N = 406	-\$2.15 (1.72)
<b>Waiting time</b>	8.39 (16.59) N = 1,095	11.73 (15.23) N = 551	-3.34 (.82)

**Note:** The numbers in ( ) indicate standard errors.

**Table 6. Proportion of Patients with Insurance**

Self-employed physicians	Salaried physicians	Differential
.9071 (.1012) N = 1,465	.8713 (.1598) N = 684	.0359 (.0067)

**Note:** The numbers in ( ) indicate standard errors.

**Table 7. Number of Patients Seen in an Hour by Specialty and Employment Sector**

	<b>Self-employed Physicians</b>	<b>Salaried physicians</b>	<b>Differential</b>
<b>All Specialties</b>	1.7364 (1.0355) N = 1,309	1.9084 (1.4865) N = 777	-0.172 (0.0605)
<b>General Practice</b>	2.2242 (1.0015) N = 289	2.3478 (1.2323) N = 142	-.1236 (.1190)
<b>Internal Medicine</b>	1.4605 (.85) N = 379	1.7221 (1.5225) N = 240	-.2616 (.1075)
<b>Surgery</b>	1.5755 (.9333) N = 315	1.6822 (1.3503) N = 121	-.1067 (.1335)
<b>Pediatrics</b>	2.1153 (1.0222) N = 79	1.9455 (1.44) N = 85	.1698 (.1940)
<b>Obgyn</b>	1.49 (.6303) N = 94	1.5765 (.9669) N = 49	-.0865 (.1527)
<b>Radiology</b>	5.5 (1.8028) N = 3	3.348 (3.4234) N = 5	2.152 (1.8513)
<b>Psychiatry</b>	.9548 (.5179) N = 66	.9414 (.6927) N = 42	.0134 (.1245)
<b>Anesthesiology</b>	.7018 ( ) N = 1	2.9444 (2.907) N = 2	-2.2426 (2.0556)
<b>Other Specialties</b>	2.3247 (1.5192) N = 83	2.503 (1.833) N = 91	-.1783 (.2544)

**Note:** The numbers in ( ) indicate standard errors.

**Table 8. Number of Patients Seen in an Hour by Race and Employment Sector**

	<b>Blacks</b>	<b>Whites</b>	<b>Differential</b>
<b>All</b>	1.7303 (1.0621) N = 246	1.8098 (1.2458) N = 1,840	-.0795 (.0737)
<b>Self-employed</b>	1.6243 (.8884) N = 140	1.7498 (1.0513) N = 1,169	-.1255 (.0811)
<b>Salaried</b>	1.8704 (1.2461) N = 106	1.9144 (1.5217) N = 671	-.044 (.1249)
<b>Differential</b>	-.2461 (.1424)	-.1646 (.0663)	

**Note:** The numbers in ( ) indicate standard error.

**Table 9. Employment Transition from 1987 to 1991**

	<b>Salaried employee in 1991</b>	<b>Self-employed in 1991</b>
<b>Salaried employee in 1987</b>	N = 499 Blacks = 75 Whites = 424	N = 248 Blacks = 25 Whites = 223
<b>Self-employed in 1987</b>	N = 96 Blacks = 17 Whites = 79	N = 627 Blacks = 71 Whites = 556

**Table 10. Wage (from 1987) Comparisons between Sector Switchers and Non-sector Switchers**

	<b>Blacks</b>			<b>Whites</b>		
	<b>Salaried employee in 1991</b>	<b>Self- employed in 1991</b>	<b>Differential</b>	<b>Salaried employee in 1991</b>	<b>Self- employed in 1991</b>	<b>Differential</b>
<b>Salaried employee in 1987</b>	26.7 (10.03) N = 75	25.48 (12.62) N = 25	-1.22 (3.52)	28.41 (12.03) N = 424	30.4 (15.03) N = 223	1.99 (1.16)
<b>Self- employed in 1987</b>	36.81 (25.59) N = 17	34.98 (24.72) N = 71	-1.83 (6.86)	39.66 (26.58) N = 79	39.34 (24.82) N = 556	-.32 (3.17)

**Note:** The numbers in ( ) indicate standard errors.