

Race Discrimination: An Economic Perspective

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In this article, we discuss the theory and evidence on discrimination in two key domains—the labor market and the criminal justice system—from an economic perspective. We define discrimination as treating someone differently based on characteristics such as gender, race, or religion. Prejudice may lead to discrimination, but only if you act on it. Moreover, discrimination by individuals does not necessarily lead to discrimination at a market or societal level. We focus primarily on discrimination against blacks, although many of the concepts discussed apply much more broadly.

While documenting racial disparities is relatively easy, identifying discrimination as the cause is more challenging. Discrimination may create racial disparities in outcomes, but so can differences in preferences or true underlying differences in innate characteristics. Thus, we begin with two sections discussing approaches to identifying discrimination in the labor market and criminal justice system. One theme of this discussion is that discrimination can happen in different areas. For example, unequal labor market outcomes could result from discrimination by employers, or discrimination by potential coworkers, or the discriminatory attitudes of customers, or some combination of these. Unequal outcomes in the criminal justice system could result from discrimination in police actions or court decisions. Of course, focusing on the areas in which discrimination occurs can help us better focus antidiscrimination policy.

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Even when disparities can be attributed to discrimination, the causes of discriminatory behavior may differ. Economists distinguish between two main models: “taste-based” and “statistical” discrimination. For each of these models, we take a deeper look at both the theory and the evidence.

Taste-based discrimination reflects prejudice or preferences. Thus, an employer who hires men rather than women because of a personal preference for working with men is discriminating based on tastes. Taste-based discrimination can also reflect *invalid* statistical inference. Thus, someone who, contrary to a large body of evidence, believes immigrants are more likely to commit violent crimes is discriminating based on prejudice. Note that distinguishing between valid and invalid statistical discrimination is not always straightforward. For example, invalid statistical inference may reflect valid statistical assessment of a nonrepresentative sample, as when an employer ascribes differences in an earlier job applicants pool to a current one even though the applicant population has changed.

The canonical Becker ([1957] 1971) model of employer discrimination suggests that market forces push back against taste-based discrimination, because prejudiced employers will pay more for (or hire less qualified) preferred race workers, thereby decreasing profits. Consequently, in a basic model, competition from nondiscriminating firms drives discriminators from the market until wage differentials between equally productive workers are eliminated. Becker’s theory suggests that taste-based discrimination is most likely where 1) the race of the worker is salient and the customer market is not easily segmented or 2) the forces of competition are weak or absent. The second condition justifies focusing on areas such as law enforcement and criminal justice that are largely immune from competitive forces. Given this theoretical perspective, it is not surprising that there is considerable (although not universal) evidence of race discrimination in the US justice system at virtually every stage. It is, perhaps, more surprising that there is also evidence of taste-based labor market discrimination.

Statistical discrimination, first developed in the pioneering work of Phelps (1972) and Arrow (1972a, b), is discrimination based on *valid* statistical inference. For example, doctors typically discriminate between men and women regarding who should receive breast cancer screening. Although some men do get breast cancer, it is much more common among women; therefore, doctors typically recommend screening for women but not men. When a characteristic like race is correlated with unobserved or imperfectly observed productivity, criminal conduct, or some other factor, people may use that characteristic to update their prior estimates. Firms engaging in statistical discrimination maximize profits; actors in the law enforcement and legal systems may be acting as rational Bayesians. But even when based on valid statistical inference, this form of discrimination can be harmful to individuals and socially undesirable.

Because informational imperfections drive statistical discrimination, firms may seek additional information. We discuss and critically assess the effect of increasing information on discrimination. The role of information is a particularly salient issue in criminal justice. Risk prediction algorithms seemingly remove implicit and

explicit bias from sentencing and bail decisions. However, discrimination in criminal justice treatment can lead to discriminatory algorithms in a manner analogous to the role of disparities in promoting statistical discrimination.

In the conclusion, we point out that although economic studies often focus on discrimination in specific domains like the labor market or the criminal justice system, real-world discrimination arises in a system of self-reinforcing linkages between different domains of discrimination. For example, discrimination leads to social and residential distance, which reinforces between-group differences. Such differences, in turn, favor additional discrimination and social distance. This suggests that policies to address discrimination might usefully seek key points of leverage that could propagate through a range of outcomes.

Discrimination in the Labor Market

Racial disparities in the labor market are readily apparent. As one example, black men in 2010, relative to white men, were 28 percent less likely to be employed and earned 31 percent less annually conditional on employment (Kahn-Lang 2018). Relative to white women, black women also earn less, although the differential is only about half that for males (Daly, Hobijn, and Pedtke 2020). This is in part because it is obscured by a strong positive relation between skill and employment among black but not white women (Neal 2004). These disparities do not prove that labor market discrimination exists, but they surely suggest that the question is worth exploring.

Traditionally, much of the evidence for labor market discrimination came from ordinary least squares regressions with wages as the dependent variable and a set of control variables like age and education, along with a dummy variable for race, as the explanatory variables. The working assumption was that if the coefficient on the dummy variable for race was significant, this was evidence of discrimination. However, because the set of observable control variables for differences between blacks and whites was inevitably incomplete, at best the coefficient on race represented an unexplained differential that might reflect discrimination. In addition, some control variables might themselves reflect past discrimination. For example, using parental income as a control variable reduces the racial gap in earnings. However, lower levels of parental income for blacks relative to whites might reflect labor market discrimination experienced by their parents.

As an example of the controversies that arise around these kinds of results, Neal and Johnson (1996) showed that controlling for performance on the Armed Forces Qualifying Test (AFQT), a measure of cognitive skill, eliminated roughly three-quarters of the black-white wage differential among men. However, Lang and Manove (2011) showed that, conditional on their AFQT score, blacks get more education than whites do. Adding education to the controls raises the estimated black-white wage differential by about six percentage points. Moreover, this gap persists with an added “kitchen sink” of control variables, although it remains possible that including some other variable would eliminate the gap.

One useful perspective from Becker ([1957] 1971) is that there are multiple possible sources of taste-based discrimination in hiring—the employer, coworkers, and customers—and their effects would not be the same. In addition, focusing on specific decision-makers allows for research methods that provide a cleaner empirical test for the existence of discrimination.

Employer Discrimination

Researchers have proposed a number of strategies for identifying discrimination by employers. Goldin and Rouse (2000) take advantage of a natural experiment hiring in which symphony orchestras switched to blind auditions. They find that females are substantially more likely to be hired when auditions are blind than when employers observe gender during auditions. Unfortunately, such natural experiments are rare. Consequently, most researchers have relied on experimental evidence to identify discrimination.

“Audit studies,” in which matched pairs of black and white actors posing as workers and using similar fictitious resumes applied for jobs, have been used to study employer-based discrimination. Bendick (2007) reviewed ten such studies; all showed disparate treatment favoring whites, although some disparities were statistically insignificant. However, there are concerns that these studies may pick up something other than discrimination. Audit studies attempt to match the black and white applicants as closely as possible but cannot match them perfectly. Therefore, researchers might accidentally or unconsciously choose white applicants whose appearance or presentation make them more attractive to employers for reasons unrelated to race. Further, actors who know they are in a study may subconsciously act differently based on their role.

To avoid this problem, researchers turned to “correspondence studies” in which information on the application—most commonly name—signals race. Because the resumes are fictional, researchers can ensure that, except for the information signaling race, the content of resumes is uncorrelated with race. In a well-known study, Bertrand and Mullainathan (2004) found that 9.7 percent of resumes with a white-sounding name elicited a callback, relative to 6.5 percent of those with black-sounding names. However, name may signal more than race; for example, it might also signal social class. Jacquemet and Yannelis (2012) find support for this concern, showing considerable variation in callback rates across names within race. However, Fryer and Levitt (2004) find that blacks with and without black-sounding names have similar outcomes once they control for zip code at birth, suggesting that either discrimination is based on race, not names, or discrimination at the resume-screening stage may not translate to discriminatory outcomes.

Some recent papers use within-establishment variation to make a more compelling case for discrimination. Giuliano, Levine, and Leonard (2009) studied a large US retailer with many outlets. Because hiring managers in these outlets change frequently, the authors could compare hiring by black and white managers in the same outlet. Relative to black managers, white managers hired more white workers

and fewer black workers, especially in the South. This pattern could reflect a number of decision processes: 1) discrimination by white and/or black managers, 2) synergies between same-race managers and workers, 3) different hiring networks, or 4) workers preferring managers of their own race. The evidence for each of the last three is weak. For example, the relative performance of black workers is higher under black managers, but the estimate falls well short of statistical significance at conventional levels. Managers are more likely to hire workers who live near them, but this accounts for little of the own-race effect. White workers are somewhat more likely to quit when they get a new black manager, but the estimated effect is only marginally statistically significant. Discrimination favoring own-race employees seems to us to be the dominant explanation in this study, although admittedly this is the residual explanation.

Coworker Discrimination

Perhaps employers do not themselves have a taste for discrimination but are pressured to act as if they do because of prejudice from their employees. As one example, the Giuliano, Levine, and Leonard (2009) study above also provides evidence that workers are less likely to quit when more coworkers have the same race/ethnicity. These effects are large and highly significant for whites and Asians, smaller and marginally significant for blacks, and small and statistically insignificant for Hispanics.

In contrast, Bygren (2010) finds, in a matched sample of Swedish firms and workers, that workers are less likely to leave a given establishment when there are more workers of the *opposite* sex, suggesting at least that Swedish workers do not systematically prefer to work with their own sex.

In an experimental study, Hedegaard and Tyran (2018) hired secondary school students for real, albeit short-term, jobs preparing letters for mailing. Initially, workers worked alone and were paid piece rate. They were then told that they would work in pairs that shared compensation. Some workers could choose between a worker with a Danish-sounding name and one with a Muslim-sounding name. They were also told how many letters each worker had prepared the previous week. Assuming workers believe that last week's output predicts output when paired with another worker, the authors calculated the cost of choosing the less productive worker. On average, workers were willing to pay 8 percent of their earnings for two days to work with someone with the same ethnicity.

Customer Discrimination

Still another possibility is that employers who are not themselves prejudiced discriminate in hiring because their customers are prejudiced. The importance of customer-based discrimination probably depends heavily on the product or service. Some relevant studies focus on intriguing groups from which it may be unwise to draw broad conclusions. In "fantasy" sports, Bryson and Chevalier (2015) find that, conditional on price and past performance, white and nonwhite players are equally likely to be selected when the season begins or traded during the season in the

(English) Fantasy Premier League. Similarly, Broyles and Keen (2010) find that trading card prices for players in the (American) National Basketball Association are unrelated to player race. These contexts, however, require no true interaction between “customer” and “player.” In a much more intimate context, brothel owners in New York charged a premium for lighter-skin blacks and a larger premium for white sex workers (Mumford 1997, p. 105). From the other side of the market, Li, Lang, and Leong (2018) find evidence of discrimination against darker-skin customers by present-day Singapore street sex workers.

In practice, the intimacy of most interactions between customers and workers falls somewhere in the middle of that between fantasy sports teams and players and that between clients and sex workers, and the evidence on customer discrimination in more mainstream settings is limited. Customers give smaller tips to black taxi drivers than to white ones, but we cannot be sure that this disparity is unrelated to service quality (Ayres, Vars, and Zakariya 2005).

Leonard, Levine, and Giuliano (2010) used data from the retailer described above to assess the importance of customer discrimination in a more common setting. They found that in areas with a larger proportion of whites, having more black employees slightly reduces sales, but having more Hispanics slightly increases them; the results are small in either case and, given the large number of hypotheses tested, may be spurious. They do find benefits from having more Asian workers when the proportion of individuals nearby speaking only Asian-Pacific languages is high. Similarly, Combes et al. (2016) show that a higher proportion of French residents is associated with a larger increase in the disparity in employment between African and French workers in jobs with customer contact than in those without such contact. They argue that this is best explained by customer discrimination.

Perhaps the strongest evidence for customer discrimination stems from online transactions with individual sellers. Buyers were less likely to make an offer to purchase an iPod Nano (portable digital music player) offered by a black person and made lower offers if they did (Doleac and Stein 2013). Similarly, Arab sellers and buyers faced discrimination in an online market for used automobiles in Israel (Zussman 2013). The authors suggest that customers must trust that the product is legitimate, as advertised, and procured legally and that race or ethnicity affects perceived trustworthiness.

Linking Evidence on Discrimination to Broader Disparities

There is a missing link between the evidence that most clearly demonstrates the existence of labor market discrimination and the size of the racial disparities in labor markets. Many of the studies regarding discrimination have focused on a specific group and setting: a large US retailer, resumes submitted to a certain group of employers, online buyers, and so on. The narrow focus of these studies helps make their statistical identification persuasive but makes it harder to draw a direct connection to the aggregate racial disparities in labor markets. For example, even if some firms discriminate when screening resumes, it is unclear how this translates into employment and earnings disparities.

In addition, there are theoretical reasons to hesitate before jumping straight from evidence of discrimination by some to aggregate results. As the Becker ([1957] 1971) model points out, if only some firms discriminate by race, blacks can find equally desirable employment at other firms. Thus, workplaces could show a high degree of segregation by race without a resulting gap in wages.

Discrimination in the Criminal Justice System

Policing

There are clear racial disparities in the criminal justice system. Such discrepancies are particularly salient in policing. One estimate suggests that blacks and whites use marijuana at similar rates, but blacks are 3.7 times as likely to be arrested for its use (ACLU 2013). Similarly, black drivers are stopped more frequently than white drivers and are more likely to be subjected to search if stopped (Pierson et al. 2017).

What other factors might account, at least in part, for such discrepancies? Location is one possibility. Crime is more concentrated in black communities. This leads to increased policing in those locations, which may increase the likelihood that black drivers are stopped or arrested. However, racial disparities remain after accounting for location. Using data on state patrol stops in 20 states, Pierson et al. (2017) estimate that black drivers are 40 percent more likely to be stopped than white drivers, after controlling for age, gender, and location. As noted earlier, however, such disparities do not prove the existence of discrimination. The remaining disparities could reflect differences in driving behavior; black drivers may speed or break other traffic laws more frequently than whites do. Similarly, blacks may carry larger amounts of marijuana or use it in more public places. It is difficult to dismiss such possibilities, because we generally lack data on offenders who were not apprehended. Similarly, we observe these events in the data as documented by the police, who may also be biased by discrimination.

Again, the challenge is to find research techniques that provide evidence on whether disparities in policing are due to discrimination. Such studies have produced conflicting results. One approach, called the “outcomes model,” argues that absent discrimination, black and white drivers on the margin of being stopped should be equally likely to be found at fault. If, conditional on a stop, blacks are less likely to be found at fault, this suggests discrimination. However, this insight only applies for the marginal person stopped, something which is typically unobservable; we cannot simply compare the average rates at which searches uncover contraband. Knowles, Persico, and Todd (2001) address this issue by modeling police searches during traffic stops as resulting from sequential decisions in which the driver first decides whether to carry contraband and the police decide whether to search based on the proportion of drivers with contraband. They show that in the equilibrium of this model, the average and marginal rates of contraband found during police searches will be equal. Using data on traffic stops in Maryland, they find similar rates

of contraband on white and black drivers, conditional on search. They conclude that search differentials are consistent with no discrimination.

However, Engel and Tillyer (2008) argue that this method requires the strong assumption that drivers are rational actors with full information regarding the likelihood of being stopped and searched. Simoiu, Corbett-Davies, and Goel (2017) model the police decision to search as a function of a continuous signal, sent by drivers to police, on their likelihood of carrying contraband. They show that by imposing a strict functional form on the distribution of the signals, they can identify the police threshold for search. They find police have a lower signal threshold for search for black and Hispanic drivers relative to white drivers, suggesting the presence of discrimination.

Another approach argues that the “veil of darkness” at night makes it harder for police to discriminate based on race. In other words, if racial discrepancies reflect discrimination, they should be more prevalent during daylight hours. Grogger and Ridgeway (2006) find that at times of day that are dark only at certain times of the year, racial disparities in police stops are unrelated to whether it is dark. Horrace and Rohlin (2016) measure whether streets are well lit during nondaylight hours. After accounting for street lighting, they find light is associated with a 15 percent increase in the odds of a black driver being stopped relative to a white driver. Kalinowski, Ross, and Ross (2017) further argue that drivers may rationally respond to differences in police behavior in darkness. After accounting for this in a theoretical model, they find support for police discrimination.

Fryer (2019) finds that after controlling for key characteristics of police interactions, there are no racial discrepancies in officer-involved shootings. However, he finds that police are more likely to use force against blacks and Hispanics. In a working paper commenting on the results, Knox, Lowe, and Mummolo (2019) argue that Fryer’s estimates are likely understated because they do not account for bias in administrative police data. Police may be more likely to interact with or record interactions with blacks and, conditional on recording an interaction, may record more severe conditions. Assuming reasonable discrepancies in recording by race dramatically increases the estimated discriminatory component of force against blacks.

Courts

Court settings also show substantial disparities by race. Blacks are more likely to be assigned monetary bail instead of being released without bail, be assigned higher monetary bail conditional on getting monetary bail (Arnold, Dobbie, and Yang 2018), be convicted conditional on being charged (Anwar, Bayer, and Hjalmarrson 2012), and receive harsher sentences conditional on conviction (Mauer 2011). Once again, it is challenging to determine the extent to which this reflects discrimination rather than other factors. First, disparities may represent true differences in observable and unobservable case characteristics. Using a rich dataset with substantial case information, Rehavi and Starr (2014) show that controlling for measured case characteristics eliminates much, but not all, of the racial disparities in sentencing. In addition, black

defendants, on average, have access to fewer resources than white defendants, which plausibly leads to inferior legal representation and ability to navigate the system.

Much of the research on identifying discrimination in court settings has relied on the outcomes model. Some judges are stricter, while others are more lenient. Consequently, some defendants receive bail only because they were randomly assigned to a lenient judge. Arnold, Dobbie, and Yang (2018) argue that using random judge assignment as an instrument for bail setting allows them to identify the marginal defendants—that is, those who would be granted monetary bail by more lenient judges but not released by others. They find less pretrial misconduct by marginally released black defendants than marginally released white defendants, which implies substantial discrimination in bail setting. In contrast, Anwar and Fang (2015) identify marginal parole applicants as applicants granted parole between their minimum and maximum sentences, arguing that because parole can be granted at any time in this range, prisoners will tend to be released at the point when marginal benefit equals marginal cost. They observe no racial disparity in recidivism among prisoners released by the parole board in this period and thus no evidence of discrimination.

There is limited clear evidence of discrimination in sentencing. Abrams, Bertrand, and Mullainathan (2012) show that despite random assignment of defendants to judges, the relative incarceration rates of black and white defendants vary among judges. Therefore, they argue that there is at least some discrimination in sentencing. They find no statistically significant variation in relative sentence lengths conditional on incarceration. Alesina and La Ferrara (2014) find that minority defendants' death sentences are overturned more frequently on appeal, suggesting discrimination in the lower courts. However, this conclusion requires that the superior courts have improved accuracy which, in turn, limits racial bias.

Taste-Based Discrimination

The Importance of Labor Market Frictions in the Theory

In the simplest version of Becker's ([1957] 1971) canonical model of employer discrimination, employers dislike hiring black workers and require a fixed level of compensation to hire a black worker rather than a white one. If the black-white wage gap exceeds this compensating differential, the employer hires only blacks; if not, the employer hires only whites. However, the prejudiced behavior by some firms means that less prejudiced firms hiring only black workers are more profitable, because they can hire productive workers at relatively low wages. The less prejudiced firms expand, while all-white firms contract. This increases the demand for black workers, and their relative wages rise. If there are sufficient unprejudiced employers, they will eventually drive the wage differential to zero. Prejudiced employers may survive and employ only white workers, but black and white workers will be equally well off.

The analysis is similar in the case of coworker bias. If white workers require a compensating differential for working alongside black workers, firms should hire either an all-white or an all-black workforce, but after the adjustments are done, there should be no wage gap. If customers dislike being served by black workers, a wage gap will persist only if there are too few unprejudiced consumers to be served by those black workers who are not employed in jobs where they are invisible to consumers.

Thus, one key takeaway from Becker's model is that the extent to which discrimination affects wages depends on the proportions of employers who are highly or mildly prejudiced and the flexibility of the market in allocating black workers to the least prejudiced firms. Lang and Lehmann (2012) argue that models of taste discrimination requiring a large number of highly discriminatory employers are inconsistent with survey evidence, which suggests that most Americans are not highly prejudiced.¹ We therefore limit our discussion to models of taste-based discrimination based on either a relatively small proportion of highly discriminatory employers or a large number of mildly prejudiced employers.

Taste-based discrimination models with labor market frictions generally assume that job applications have an opportunity cost. Therefore, workers do not apply for jobs they are unlikely to get or where they anticipate being unproductive. For example, Rosén (1997) assumes that each unemployed worker is matched with exactly one vacancy each period, but a vacancy may have multiple applicants. In this model, workers learn about their own match-specific productivity after being matched. If hired, a worker earns a fixed proportion of that match-specific productivity. Because the worker engages in sequential search with no recall, there is no on-the-job search, and there is a (very) small cost to bargaining, the worker applies only to jobs at which productivity exceeds a given reservation level. The firm sees the workers who choose to apply and selects one worker with whom to bargain. In the method of bargaining in the Rosén (1997) model ("Rubinstein bargaining"), the wage is a fixed proportion of match-specific productivity. Therefore, the firm wants to bargain with the worker with the highest match-specific productivity but does not observe this information, which is private to the worker.

Suppose that for some reason (there will be a reason in equilibrium, but we're not there yet) when both black and white workers apply, at least some firms choose to bargain first with whites. On average, black workers will have to search longer to find a job and will therefore set a lower reservation match-specific productivity. Consequently, firms that are otherwise indifferent between blacks and whites know blacks have a lower reservation productivity than whites. Therefore, firms would prefer to bargain with whites because they have higher expected productivity. If

¹For example, fully 96 percent of Americans say they would be willing to vote for a black person for president. Doubtless, some survey respondents hide socially unacceptable feelings. However, in 2015 91 percent and in 2019, 95 percent of survey respondents said they would vote for a woman (McCarthy 2019). In contrast, using a list technique designed to eliminate social acceptability bias, Burden, Ono, and Yamada (2017) estimated that 13 percent would not vote for a woman. This suggests to us that while very low levels of expressed prejudice do underestimate true prejudice, they are not hiding very widespread strong prejudice.

no firm is prejudiced, there are only two stable equilibria: either all firms prefer to bargain with blacks or they all prefer to bargain with whites. If even a small group of firms is highly prejudiced against blacks in this setting, the equilibrium in which all firms discriminate against blacks seems more natural.

In the model of Lang, Manove, and Dickens (2005), firms announce wages simultaneously. Workers observe all the posted wages, and each applies to a single firm. If a firm receives at least one application, the firm hires one worker at the announced wage. Because the wage is fixed, if firms have a mild preference for white workers, they always choose a white applicant over a black one. Consequently, blacks strongly prefer not to apply where whites are likely to apply. In equilibrium, there are two wages, a high wage with a low vacancy rate attracting only whites and a low wage with a high vacancy rate attracting only blacks. With heterogeneous risk aversion, highly risk-averse whites may apply to the same jobs as less risk-averse blacks, in which case, such blacks will have relatively low rates of job finding. In this model, the discriminatory equilibrium is more plausible when mild prejudice is widespread.

In sum, when there are labor market frictions and wages are not set competitively, equally productive black workers may not be costlessly reallocated to alternative and equally paid jobs, while prejudiced firms may not have lower profits and therefore need not be driven out of business.

Evidence of Taste-Based Discrimination

Most people do not admit or may not recognize that they are discriminating, let alone attribute it to prejudice, making discrimination hard to identify and measure. This section describes some evidence on taste-based discrimination and the strategies that researchers have used to identify it.

Charles and Guryan (2008) use the simple version of the Becker ([1957] 1971) model to test for taste discrimination by employers. In this model, the racial prejudice of the marginal employer of black employees determines the racial wage gap. Because blacks represent a minority of workers, the racial prejudice of relatively unprejudiced employers—those hiring the marginal worker between the more prejudiced and the less prejudiced employers—should determine the wage gap. (Note that statistical discrimination models apply across all rational employers and thus do not make this prediction.) The authors use questions from the General Social Survey, such as whether the respondent opposes interracial marriage or would not vote for a black president, to create a “prejudice index.” They then estimate the tenth, fiftieth, and ninetieth percentile of racial prejudice in each state. In one state, the median respondent might strongly disagree with one of those statements but only somewhat disagree with the other, while in another state, the median respondent might only somewhat disagree with both. The fiftieth percentile would be more prejudiced in the former. Consistent with Becker’s theory and thus taste discrimination, they find that the tenth percentile of racial prejudice best predicts the racial wage gap.²

²They and we ignore the problem that prejudice is measured on an ordinal scale. Their result can also be interpreted as supporting their choice of cardinalization.

In an alternative approach, Glover, Pallais, and Pariente (2017) study a large supermarket chain in France employing significant numbers of North and Sub-Saharan Africans as probationary cashiers. The authors used an implicit attitudes test to measure each manager's bias against North Africans.³ They find that North Africans were less likely to be offered overtime when assigned to a biased manager. In addition, a given North African worked less rapidly and was absent more frequently when assigned to a biased manager rather than an unbiased manager, providing further evidence of the impacts of manager prejudice on employees.

In the area of criminal justice, a growing literature attempts to identify taste-based discrimination under the assumption that blacks are less prejudiced against blacks than their white counterparts. These studies generally find smaller racial disparities when the decision-maker is black. This has been demonstrated for motor vehicle searches (Anwar and Fang 2006; Antonovics and Knight 2009), automobile crash investigations (West 2018), and jury convictions (Anwar, Bayer, and Hjalmarsson 2012).

Goncalves and Mello (2017) test whether police officers treat white drivers caught speeding more leniently than they do black drivers. Because penalties jump discontinuously at certain thresholds, officers sometimes reduce the penalty by lowering the driver's speed to just under a threshold. The authors show that black drivers were less likely than white drivers to have a reported speed just below the threshold and that this is highly unlikely to reflect differences in true speeding behavior. They also show that fewer than 20 percent of officers account for the racial discrepancy, suggesting that "a few bad apples" drive the racial disparities in police traffic stops.

Statistical Discrimination

The Importance of Information Imperfections in the Theory

Economists have traditionally modeled statistical discrimination as fully rational (Phelps 1972; Arrow 1972a, b); conversely, they have viewed inferences and actions based on false beliefs as a form of prejudice akin to taste discrimination. For example, an employer who inaccurately believes that blacks are less productive than they really are will act much like a Becker-style firm that gets disutility from hiring blacks. We begin this section with an overview of models of statistical discrimination based on differential productivity, self-enforcing disparities, and differential observability. Recently, however, economists have begun to recognize that new information

³This particular implicit attitudes test measured the speed with which an individual correctly assigned French or North African names and positive or negative words about worker competence to the right category when competence and French were in the same box (requiring that the same key be typed) and when competence and North African were in the same box. Managers who believe that North Africans are less competent tend to take longer to perform the task in the latter case than in the former.

may correct false beliefs, and so we will then turn to the small literature that models inaccurate statistical discrimination.

Statistical discrimination can arise from true underlying differences between groups in situations where within-group variation is difficult to observe. Suppose that conditional on observable factors, black drivers are more likely to carry contraband. Then, an officer might be much more likely to search the cars of black drivers. Consider an extreme example of a police officer who knows that 5 percent of blacks and 3 percent of whites carry contraband (holding observable variables constant) but cannot distinguish within race who is more likely to transgress. Moreover, say that for this officer (or police department), the threshold for searching is 4 percent: thus, the officer searches all blacks and no whites. Note that differences producing statistical discrimination need not be innate. They may reflect disparities or discrimination elsewhere in the system.

Once disparities have caused statistical discrimination, the outcome can be self-enforcing. In the Coate and Loury (1993) model of self-confirming expectations, also called “rational stereotyping,” there can be multiple equilibria, one of which is discriminatory. To gain some intuition, consider a simplified version of their model (from Lang 2007, pp. 277-80). Suppose workers can either invest in themselves (trained) or not (untrained) at some cost. Firms can only observe an imperfect signal of whether the worker is trained that takes on only three values: definitely trained, maybe trained, and definitely not trained. Firms want to assign trained workers to a skilled job and untrained workers to an unskilled job. In a world in which most workers train, a worker with a “maybe” signal probably trained.⁴ Firms will assign such workers to the skilled job. In contrast, if few workers trained, someone with a maybe signal probably did not train. Firms will assign such workers to the unskilled job. Depending on parameters, two equilibria can arise with different proportions of workers investing. If whites are in the high-investment equilibrium and blacks in the low, we have a model of discrimination.

In this model of self-confirming expectations, if blacks were convinced that the labor market will reward them if they invest in themselves and employers were convinced that blacks and whites invest in themselves at the same rate, the self-confirming expectations would shift to a new nondiscriminatory equilibrium. In a sense, this conclusion offers some grounds for optimism. Ferguson (1998) argues that schools are often in an equilibrium where teachers have low expectations of their black students, but that it is possible to move to an equilibrium where black students meet the standards of teachers who have been convinced to have higher expectations for them.

In the real world, of course, we generally cannot wave our hands and eliminate discrimination by changing beliefs. Therefore, historical discrepancies due to legal

⁴To keep the presentation simple, we skip the details. In a more detailed description, this statement depends on the probability of trained and untrained workers getting a “maybe” signal. Similarly, later statements in this paragraph depend on the productivity of trained and untrained workers in the two types of jobs.

discrimination are likely to persist. Cavournidis, Lang, and Weinstein (2019) develop a model with two equilibria but in which history matters. In the equilibrium of this model, firms scrutinize their black workers more closely than they do their white workers. Consequently, a larger share of low-performance black workers than of low-performance white workers separates into unemployment. Because productivity is correlated across jobs, the black unemployment pool is more heavily “churned” and therefore weaker than the white unemployment pool. Provided that workers can, to some extent, hide their employment histories, race will serve as an indicator of expected worker productivity. This creates a self-reaffirming dynamic in which it is optimal for firms to scrutinize black workers but not white ones. This model also makes a number of predictions that are consistent with the true state of the world: for example, whites have higher wages on average, but the wage distributions of blacks and whites can overlap; there are shorter unemployment and longer employment durations for whites; and the separation hazard rate into nonemployment will be higher for blacks with low tenure but converge to whites’ hazard rate.

Consider another set of assumptions, based on differential observability rather than differential productivity, that could underlie a model of statistical discrimination. Suppose that employers are better at figuring out the productivity of white workers than that of black workers. Then employers will treat black workers more like an average black worker and differentiate more among white workers. In the extreme, employers will pay all blacks the same but pay whites according to their productivity. In this scenario, high-productivity blacks will be disadvantaged relative to whites, but low-productivity blacks will be better off. If blacks and whites are equally productive, on average, they will earn the same wages. From behind a Rawlsian veil of ignorance, a risk-averse person would prefer to be black.

With modifications, this model can produce a black-white wage differential. First, if jobs are differentially sensitive to skill, it will be efficient to place low-productivity workers in jobs that are relatively insensitive to skill and high-productivity workers in jobs where skill is highly valued. With differential observability, white workers earn more because the market does a better job of matching them to jobs. This effect is stronger if skill is multidimensional. If the market cannot tell which blacks should be (say) poets and which should be mathematicians, there will be a larger share of blacks whose skills are mismatched with their jobs, and blacks, on average, will earn less than whites will.

Alternatively, differential observability can affect the incentives of workers to invest in their own human capital. Say that workers can make unobservable investments in themselves (as in Lundberg and Startz 1983). An individual black worker benefits less than a white counterpart does from making unobservable investments, because the black worker is treated more like the average black. Therefore, blacks make fewer unobservable investments. An implication of this model, as Lang and Manove (2011) point out, is that high-ability blacks have a stronger incentive to signal their productivity by making observable investments. This signaling model predicts the surprising fact that blacks get more education than whites with the same test scores in school. However, this model cannot explain the Neal and Johnson

(1996) result, which Lang and Manove confirm, that black men get lower wages when only test scores are used as a control variable. We expect that a model in which blacks have higher observed educational attainment but put in less (unobserved) effort in school might reconcile many of the results in the literature, but this model has not been formalized.

Incorrect Beliefs and Information

If employers believe incorrectly that blacks are less productive than whites, they will behave similarly to employers engaged in taste discrimination. However, models of taste-based discrimination and incorrect statistical discrimination do differ in some implications—like the effect of improving information. This difference has been explored in some experimental studies.

In a public goods experimental game, subjects received a pot of money from which they chose how much to contribute to a public good and how much to retain. The socially efficient outcome in this game requires everyone to contribute everything, but the equilibrium of the static or finitely repeated game is that subjects should hope for others to contribute so that they can act as free riders but not contribute themselves. In the Castillo and Petrie (2010) version of this game, subjects first played with random partners but then learned that they could choose their partners for the remainder of the game. Subjects randomly received one of three treatments: information about the public goods levels in the participants' prior rounds, a photo revealing the race and sex of the other players, and both. In the absence of information, subjects preferred all other race/ethnic groups to blacks even though all groups except whites contributed similarly. However, in the presence of information, there was no impact of race and sex on the ranking of potential partners.

More recently, Bohren, Imas, and Rosenberg (2019) performed an experiment in which subjects made wage offers to potential hires to perform mathematical calculations. In the absence of information on past performance, Indians and males received higher offers than Americans and females, but the male/female pay gap was less than the actual gap in performance, while Americans actually outperformed Indians on the task. When participants learned about the average performance of the different groups and hired additional workers, the offers more closely, but not fully, resembled the actual productivity gap.

There is relatively little nonexperimental research on inaccurate statistical discrimination. Laouenan and Rathelot (2017) show that minorities (African Americans in North America and Arabs, Muslims, and Sub-Saharan Africans in North America and Europe) renting on Airbnb charge substantially less than other Airbnb proprietors do. After controlling for observable characteristics of the rental unit, a small price gap remains. However, minorities benefit more from a measure of the number and quality of reviews. This suggests that the price gap at least partially reflects statistical discrimination. On the other hand, the price gap declines as the number of reviews increases. If renters care only about the expected average review, this is inconsistent with accurate statistical discrimination. The authors conclude

that renters engage in inaccurate statistical discrimination. They do not address whether their results can be reconciled with accurate statistical discrimination if renters care about elements of the review distribution other than the mean. This paper demonstrates the difficulty of establishing inaccurate statistical discrimination with observational data. Future research on this topic must make a compelling case that both the pattern of discrimination is inconsistent with taste discrimination and there is no model that rationalizes the observed behavior when information is imperfect but statistically accurate.

Evidence of Statistical Discrimination

There is strong evidence of statistical discrimination in a wide range of settings (for example, on the market for sports cards, see List 2004; on the commercial sex market in Singapore, see Li, Lang, and Leong 2018). This form of discrimination can often be considered acceptable and allows us to make more efficient decisions. For example, many people give up their seat on a bus to someone who appears elderly or pregnant. People presumably reason that, judging statistically based on appearance, these categories of people may benefit more from sitting. In other cases, statistical discrimination may be both undesirable and socially unacceptable. For example, if police stop and search blacks more frequently because they are statistically more likely to be carrying contraband, they will stop many more innocent blacks than innocent whites, and any positive effects from such a policy in reducing crime would need to be balanced against adverse effects both on those stopped and on police/community relations. Statistical discrimination may be socially undesirable even when it is privately beneficial. Each firm may benefit from scrutinizing black workers more carefully, but the effect on total output may be negative, as unlucky black workers spend more time unemployed. And of course, we recognize that statistical arguments may simply obscure prejudice.

The theory of statistical discrimination suggests that providing information about characteristics correlated with race can reduce discrimination. Thus, if blacks are more likely than whites to have been imprisoned for drug offenses, providing information about convictions for past drug offenses may increase employers' willingness to hire black workers. Consistent with this insight, Wozniak (2015) finds that drug testing increased the employment of blacks.

Similarly, firms are less likely to hire workers with known criminal records. Because a higher proportion of blacks have criminal records than whites do, one might expect that preventing employers from inquiring about criminal records, at least at an early stage, would increase black employment. However, if firms cannot ask for information about criminal records, they may rely on correlates of criminal history, including being a young black man. This concern is even greater if employers tend to exaggerate the prevalence of criminal histories among black men, thus leading to inaccurate statistical discrimination. Agan and Starr (2018) investigate "ban the box" legislation in which companies are forbidden from asking job applicants about criminal background. Before such rules took effect, employers interviewed similar proportions of black and white male job applicants without

criminal records. Prohibiting firms from requesting this information reduced callbacks of black men relative to otherwise similar whites. Consistent with this, Doleac and Hansen (2016) find that banning the box reduced the employment of low-skill young black men by 3.4 percentage points and low-skill young Hispanic men by 2.3 percentage points. Similarly, occupational licensing increases the share of minority workers in an occupation despite their lower pass rates on such exams (Law and Marks 2009). Prohibiting the use of credit reports in hiring reduced black employment rather than increasing it (Bartik and Nelson 2019).

Taken together, these studies provide strong evidence that statistical discrimination plays an important role in hiring. Additional information, even if it adversely related to being black, reduces reliance on statistical discrimination and can raise black employment. However, this argument does not address how such hiring practices might affect the quality of the pool of workers available for hire. As discussed earlier (in the context of Cavounidis, Lang, and Weinstein 2019), if a set of firms introduces additional information into hiring practices, the quality of the workers they hire increases, but the quality of the pool of workers available to other firms declines. We know virtually nothing about how such policies affect long-run equilibrium.

It has been suggested that algorithms can diminish racial bias in decision-making (Kleinberg et al. 2018). Algorithms use the prior relation between individual characteristics and outcomes to predict outcomes for other individuals. This approach has become particularly popular in criminal justice: courts use algorithms to estimate the risk of future offending, which then informs decisions about bail and sentencing. Of course, algorithms by definition eliminate the risk of human taste-based discrimination. However, if the data used as the basis for the algorithm includes biased outcomes, the algorithm inherits the bias. Thus, if blacks who commit a crime are more likely to be arrested, an algorithm that uses arrest histories to predict recidivism inherits that bias (Mayson 2018). In practice, many predictors in an algorithmic model are correlated with race (zip code, family situation, prior offenses) and together may predict race quite accurately. It should be noted that the direction of this bias can go in either direction: if blacks with a low likelihood of reoffense are more likely to be arrested, a model predicting reoffense could favor blacks (Rambachan and Roth 2019).

In addition, the risk scores generated by algorithms rarely determine the outcome fully. Instead, judges (or other decision-makers) use them to inform their decisions. As judges adjust the recommendation from the risk score, racial discrepancies can increase. For example, imagine a risk score that perfectly estimates a defendant's risk of recidivism. Suppose further that judges, based either on prejudice or the incorrect belief that race has been excluded from the predictors, enforce harsher sentences on black defendants. Then even with the algorithm, the judge's actions will be discriminatory, possibly more than it would be without the algorithm. Overall, recent research on the use of algorithms in practice has found that algorithms do not reduce racial disparities and sometimes increase them: for example, Doleac and Stevenson (2019) look at this issue using

sentencing data from Virginia, while Albright (2019) uses data from bail decisions in Kentucky.

Final Thoughts: Discrimination as System

The focus of this essay has been on how economists view discrimination through the prism of the taste-based and statistical discrimination contexts, with an emphasis on the labor market and criminal justice. But discrimination potentially occurs in many domains, including important areas such as housing, education, and medical treatment (for a short summary of the evidence on discrimination in these areas, see Lang and Spitzer forthcoming). Discrimination works as a system, with discrimination in each institution potentially reinforcing disparities and discrimination in other institutions—and with the effects in some cases potentially reaching across generations. Economists, with some exceptions, have tended to ignore or undervalue what sociologists have called the system of discrimination (Reskin 2012, see also the discussion in this issue by Small and Pager) while perhaps doing a better job of recognizing the relation between disparities and discrimination in their models of statistical discrimination.

For example, a key insight of the statistical discrimination literature is that disparities breed discrimination. If blacks are more likely to have been in prison, employers may use race as an indicator of past imprisonment and discriminate against blacks in employment. If discrimination in the justice system makes blacks more likely to have been in prison, discrimination in the justice system causes labor market discrimination. If blacks' weaker labor market performance makes criminal activity more attractive to them, players in the justice system may statistically discriminate against blacks. Looking beyond the domains of the labor market and criminal justice system, discrimination in educational settings can make blacks less prepared to enter the labor force. By creating wage disparity, labor market discrimination may contribute to residential segregation and educational disparities. Earlier discrimination in job markets and housing markets that affects a previous generation of parents creates discrepancies in the quality of public education that children of different races receive, which in turn may create productivity differences and labor market discrepancies across the next generation—even without active discrimination by current employers.

This idea of discrimination as a system is not easy for economists to address. Developing truly general equilibrium models is difficult, especially when the endogenous variables go beyond prices and quantities. Empirical microeconomists, the primary group of economists who study discrimination, have in recent years placed a heavy emphasis on credible identification. While it is possible to imagine studying linkages across the system of discrimination through natural experiments or methods like regression discontinuities and differences-in-differences, it is not trivial to do so. However, the idea of discrimination as a system does suggest some different angles for research and policy analysis.

To the extent that discrimination is a system, efforts to prohibit discrimination in one institution will have only limited effect. Thus, the antidiscrimination policies most likely to be effective will target key leverage points where decreasing discrimination could have strong ripple effects throughout the system (Reskin 2012). In considering policy proposals to address discrimination in the labor market and criminal justice system, we may have to look beyond these two institutions. For example, policies that address discrimination in education can decrease statistical discrimination by decreasing racial disparities among workers entering the labor market.

In addition, policies to increase interracial contact—like limiting residential segregation—may offer a useful point of leverage. Residential and social segregation may lead to prejudice and taste-based discrimination. Pettigrew and Tropp (2006) provide a meta-analysis of 515 studies and conclude that there is strong support for “intergroup contact theory,” which proposes that contact tends to reduce prejudice. Some economists have contributed to our understanding of this topic. Carrell, Hoekstra, and West (2015), for example, found that having an additional black member in an Air Force squadron of roughly 35 people increased the probability of having a black roommate as a sophomore (usually not a freshman squadron member) by about one percentage point, or about 18 percent. Similarly, exposure to more black peers with high admissions scores increased the probability that whites reported that they had become more accepting of African Americans. Dahl, Kotsadam, and Rooth (2018) find similar positive effects on male attitudes towards female recruits from having been assigned to a squad with a woman member during boot camp in Norway. In particular, given the importance of networks in job search, social distance can directly increase racial disparities in employment (Loury 2000). These studies, together with the large literature outside economics, suggest a public interest in greater integration and reducing social distance across groups.

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