Learning to Discriminate on the Job

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Abstract

Using administrative records from a large national US retailer, we find managers learn to discriminate "on the job" as they gain experience hiring workers of different races. First, we find that negative and positive experiences with black hires seed the race of future hires, consistent with managers updating their beliefs about the productivity of worker groups. Second, experiences with black workers have a larger impact on future hiring than those with white workers, consistent with greater updating about their productivity. Third, negative experiences have more persistent impacts on future hiring, consistent with negatively-biased beliefs being slower to self-correct than positively-biased ones, because hiring begets learning. These dynamics, combined with the minority status of black workers, yield larger, particularly persistent declines in black hiring following managers' negative hiring experiences. Our results suggest that managers develop biased beliefs from endogenous learning about racial groups, which systematically disadvantages minority workers.

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Extensive and persistent racial disparities pervade the labor market. The full-time male black-white earnings ratio was 0.77 in 2010 with little progress since the 1990s, while the relative unemployment gap has remained approximately constant for decades (Lang and Lehmann, 2012). Substantial recent effort has sought to understand the root causes of discrimination and its impact on labor market disparities. In particular, recent studies have traced discrimination to biased beliefs, in the sense of incorrect group perceptions, among individual recruiters, managers, judges, physicians, and other influential decision-makers who can be enormously consequential in shaping economic outcomes (Reuben et al., 2014; Arnold et al., 2018; Bohren et al., 2019; Bordalo et al., 2019; Sarsons, 2019).

But where do individuals' biased beliefs come from? This paper investigates whether they emerge specifically from a decision-marker's domain-specific and personal experience with their environment, rather than information that is not lived, consistent with so-called evidence on "experience effects" in finance and economics (Malmendier, 2021a,b). In particular, we posit that an individual's experience hiring different races shape their beliefs about each race's productivity, influencing their subsequent hiring. As manager's avoid hiring workers of a given race following bad experiences, these biases become slow to self-correct. In essence, employers learn from a selected sample of worker productivity, selected by their own hiring decisions which are seeded by their previous experiences (Leung, 2018; Lepage, 2022).

Identifying the root of discrimination and the specific mechanisms through which biased beliefs arise and persist in the labor market is key to understand outcome disparities and generate effective policies. However, data limitations have stymied efforts to study the emergence of individuals' biased beliefs and discriminatory hiring in labor markets (Charles and Guryan, 2011; Guryan and Charles, 2013). For instance, Census and audit study data typically lack information on hiring managers, inhibiting the ability to study the emergence and evolution of individual-level discrimination over time.

We seek to overcome this challenge using administrative data from the US operations of a large national retailer to examine how managers' past experience hiring workers of different races affects the race of their subsequent hires. The data include >1 million workers in permanent positions working for >27,000 store managers across >4,000 stores between 2009 and 2016. The data are particularly well suited to study the evolution of manager-level hiring discrimination: hiring is highly decentralized and at the discretion of department managers, who are free to draw upon their past experience to make hiring decisions. Because department managers hire for departments nested within stores, we are able to isolate manager effects from the effects of the job or store location. The data also afford relatively high power to study the evolution of hiring across a large set of managers;

about half a percent of the stock of the US labor force was hired by the firm in this period. Workers in the retail-trade sector constitute about 10% of the US labor force and share similar barriers to economic mobility as other working class occupations (Bureau of Labor Statistics, 2021).

We begin by documenting substantial variation in the race of workers hired by managers that is not explained by location or jobs. Our main analysis proceeds by examining whether manager-level variation in hiring itself reflects belief formation while "on the job." We consider a theoretical framework in which managers are initially uncertain about the performance distribution among applicants of different racial groups (e.g. white and black), particularly minority groups, about whom managers have less initial information and therefore weaker priors.[1] They update their beliefs as they hire workers, with positive experiences leading managers to increase their hiring of the group on expected productivity grounds. In contrast, negative experiences reduce future hiring, presenting fewer cases from which managers update their beliefs. Therefore, the model predicts that negatively-biased beliefs self-correct more slowly than positively-biased ones. The larger magnitude of belief updating and rarity of subsequent hiring following negative experiences with minority hires yield persistently lower hiring rates for these workers.

Because we do not directly observe manager beliefs, we infer belief-updating using within-manager variation in the race of hires, conditional on whether the manager had previous negative or positive hiring experiences with different racial groups. To operationalize negative and positive experiences, we use realized tenure among new hires of different races for permanent positions. Turnover at this firm (and in retail generally) is very high, as are the costs of recruiting, training, and ramping up new workers. For subsets of workers for whom data are available, turnover is correlated with worse outcomes in other dimensions as well, including lower objective performance. Informed by our institutional setting, our main analysis classify positive experiences as new hires who achieve at least 12 months of tenure in their position and negative experiences as new hires who are fired or quit within 3 months, both of which we show are salient to managers. Our main results follow.

First, positive past experiences increase a manager's propensity to hire from that group, whereas negative experiences decrease their propensity. If beliefs or biases were static, hiring for different groups would vary across managers, but would not depend on whether previous individual hiring experiences were positive or negative. Instead, this result is consistent with the proposition that managers update their beliefs while on the job, and not with the

[1]The idea that employers have noisier information about minority workers is consistent with previous work in statistical discrimination (Lundberg and Startz, 1983; Lang, 1986; Cornell and Welch, 1996; Morgan and Várdy, 2009), but we explicitly consider the dynamic implications of noisier information for subsequent hiring and belief updating.

proposition that discriminatory beliefs and behaviors are entirely fixed by the time they become managers.

Second, the impact of experiences on future hiring is much more pronounced for black workers. Given that the distribution of negative and positive experiences is similar across black and white workers at the firm, one interpretation is that managers have relatively weak priors about the performance distribution of black workers, for example because they are a minority, and as a result, similar information yields greater changes in beliefs. Behavioral biases, particularly stereotyping, may also amplify updating if managers generalize their experiences with minority workers (Allport et al., 1954).

Third, early negative experiences with black workers lead to persistent declines in black hiring, while the effects of early positive experiences or early negative experiences with white workers are comparatively short-lived. Intuitively, negative experiences reduce future hiring, which slows the rate at which managers correct their negatively-biased beliefs. In contrast, positive experiences yield more future hiring and a larger sample of hires from which to correct their positively-biased beliefs. As a result, managers underestimate the performance of black workers on average. Combined with our second result and with naturally lower rates of hiring for minority workers, negative experiences with black workers also have more persistent impacts than for white workers. The initial "seeding" of hiring experiences with minorities has substantial, persistent effects on hiring discrimination, systematically reducing black hiring across managers at the firm.

After establishing our main results, we conduct a set of supplementary analyses examining how managers learn to discriminate on the job. First, an additional implication of our model is that hiring experiences should play a particularly important role in influencing hiring early on in a manager's hiring career, when they are most uncertain about the performance of worker groups. Accordingly, we find that the weight that managers put on their past experiences decreases as they gain hiring experience. Second, another implication of our model is that workers who overcome a negative bias—that is, workers who are hired by a manager who had negative experiences with that worker's group—should be positively selected. Consistent with this, and in contrast with several alternative mechanisms that could generate persistence in group hiring within managers, we find that hiring outcomes are negatively serially correlated. Third, we examine other seemingly-observable sources of information that managers may be able to draw upon when updating beliefs, and find little evidence that learning occurs based on hires at other departments within the same store.

Our final set of analyses situates manager-specific experience effects against other mechanisms that could also yield a path-dependent trajectory in the race of hires. One broad class of alternatives attributes the race of future hires to the hiring history of the department

or to the manager's team rather than the manager themselves. For instance, referrals, productive complementarities, or employee discrimination could explain why the race of a department's past hires predicts future hires. We present a set of results that show that time, manager, and team composition placebos fail to predict the race of future hires, while the hiring experience of the "true" manager adds substantially to our ability to predict future hiring. These analyses therefore require alternative explanations to be manager-specific, such as stationary taste-based discrimination or pre-existing manager biases which could affect both hiring decisions and hiring outcomes.[2] However, stationarity is not consistent with our finding that the race of hires depends on whether early experiences are positive or negative, or that the quality of hiring experiences is negatively serially correlated with the quality of past hiring experiences. We caution that our tests do not rule out that these other factors may be at play. Rather, we propose that accounting for on-the-job hiring experience of individual managers adds to our ability to predict hiring discrimination.

Our evidence contributes to the emergent literature linking personal and cognitive biases to discrimination, including the stereotypical exaggeration of true group differences (Bordalo et al., 2016), implicit group associations (Bertrand et al., 2005; Rooth, 2010; Glover et al., 2017), and biased updating (Sarsons, 2019). Our results suggest that a micro-foundation of biased beliefs should not be thought of as static, but rather evolving with personal experience. If personal experience is also a product of a decision-maker's own decisions, then they can become insulated from information and diversity experiences that could debias their beliefs.

Our results relate to the increasing interest in discrimination research that examines discriminatory beliefs and behaviors of individual decision-makers, which has largely set aside the question of where such beliefs originate and how they evolve. We contribute to a growing body of work on managers, particularly in decentralized organizations, having discretion in hiring which leaves room for individual biases (Hoffman et al., 2018; Li et al., 2020). We contribute to a broader literature documenting heterogeneous hiring discrimination across managers, but we focus on their own market interactions with groups rather than differences by manager race or gender (Giuliano et al., 2009; Giuliano and Ransom, 2013; Åslund et al., 2014; Hjort, 2014; Glover et al., 2017; Berson et al., 2020; Cullen and Perez-Truglia, 2021; Ronchi and Smith, 2021). Our results relate more specifically to the literature on belief formation, particularly evidence on "experience effects" (Malmendier and Nagel, 2011; Malmendier, 2021a,b). These studies have found that decisions are largely governed by subjective beliefs formed over personal experiences, and not by group-level averages or expert assessments. Our results suggest discriminatory behaviors are also largely governed

[2]Similarly, differences in applicant pools or worker sorting across managers based on their experiences with a worker group provide poor alternative explanations for our findings, as discussed in Section 6.

by experience effects that operate similarly in labor markets, providing a new explanation for persistent between-group outcome disparities.

Our results give cause for both pessimism and optimism for efforts to combat discrimination. On one hand, minorities are inherently disadvantaged because negatively-biased beliefs about them are larger and more persistent, even without invoking behavioral biases, biased priors, productivity differentials, or prejudice. On the other, an important driver of hiring discrimination appears to be mistaken manager beliefs, suggesting room for new organizational practices like information-based policies and contact-based interventions, such as hiring algorithms or affirmative action policies that may accelerate learning and the correction of biased beliefs (Miller, 2017; Paluck et al., 2019; Li et al., 2020).

The remainder of the paper is organized as follows. In Section 1, we present our theoretical framework. In Section 2, we describe our data and institutional setting. Section 3 presents our empirical approach, while Section 4 presents our main results on how previous experiences of managers with groups generate hiring discrimination. Section 5 presents additional results regarding employer learning from experience, while Section 6 investigates alternative interpretations of our main results. Lastly, Section 7 concludes.

1 Theoretical framework

We present a framework in which managers update their beliefs about the productivity of worker groups based on the observed productivity of their hires, and hire based on their (endogenous) beliefs. Moreover, minorities are disadvantaged because managers are initially more uncertain about their productivity and because the arrival rate of hires, and thereby belief updating, is slower.

As an illustrative example, suppose a manager has a bad experience hiring a member of a small racial minority, and so develops strong negatively-biased beliefs against the productivity of applicants of that race. In that case, negative bias may be slow to self-correct, if it ever does, if the manager never again hires an applicant of that race. In contrast, biases should correct faster for majority groups or if a favorable experience hiring a minority prompts the manager to hire more from the group.

The model is adapted from Lepage (2022), focusing on shorter-run individual hiring decisions of managers, from a finite exogenous set of applicants, and at an exogenous wage set by the firm. Our exposition considers managers who condition beliefs on race, but in principle, the model could be applied to any group characteristic, such as education or personality. Moreover, although managers in the model update their beliefs about the general productivity of black workers, we emphasize that managers may only be updating

their beliefs about the performance of hires given their location or job.

As in statistical discrimination, managers hire workers based on their expected productivity and, in the absence of perfect information on individuals, use group membership as a potentially relevant indicator of individual productivity. Unlike standard models of statistical discrimination, we do not assume that employers have complete information on group productivity or that their beliefs are confirmed in equilibrium, for example through endogenous worker responses (Coate and Loury, 1993). Rather, managers are initially uncertain about the productivity of groups, and have particularly weak priors about minority groups (Lundberg and Startz, 1983; Lang, 1986; Cornell and Welch, 1996; Morgan and Várdy, 2009). Then, experiences with these workers play a disproportionate role in shaping belief updating and subsequent hiring. Noisier initial information on minority workers could arise because they are fewer in the labor force and managers therefore typically have observed less information about them.[3]

Specifically, a manager is tasked with hiring the most productive worker from a candidate pool of two groups denoted by W and B. Our framework focuses on managers updating their beliefs about the minority group B, which we posit is the key driver of hiring discrimination. Managers take vacancies and entry wages for a position as given. The expected productivity of worker i from group B, x_{iB}, depends on a noisy signal of individual productivity s_{iB} observed prior to hiring and group membership. The individual signal is composed of the worker's productivity and an unbiased noise component: $s_{iB} = x_{iB} + \varepsilon_{iB}$ with $\varepsilon_{iB} \sim N(0, \sigma^2_{\varepsilon B})$. For example, it could include information from a resume, pre-employment test, or interview.

Worker productivity is normally distributed with mean μ_B and variance σ^2_B, such that $x_{iB} \sim N(\mu_B, \sigma^2_B)$. The productivity distribution of group B is static, but beliefs about it evolve heterogeneously over time. To simplify exposition, we assume that managers know the variance of group productivity σ^2_B and the noisiness of individual signals $\sigma^2_{\varepsilon B}$.[4] We focus on posterior beliefs about the mean productivity of group B, $\hat{\mu}_B$, and define $S_{Bmt} = \{x_{iBn} : i \text{ from } B \text{ is hired by } m \text{ at time } n\}_{n=1}^{t}$ as the information set about workers from group B available to manager m at time t.

[3] Alternatively, it could arise from in-group/out-group dynamics, leading managers to have better initial information on their own group, (e.g. Cornell and Welch, 1996; Benson et al., 2019). This distinction is of limited importance for our predictions and tests, but could lead to differences in hiring discrimination across manager race as explored in Appendix D.

[4] Employers also learning about productivity variance or individual signal precision with experience affects the relative weight attached to individual signals versus group membership, but not the substantive implication that positive (negative) experiences increase (decrease) group B's expected productivity, and therefore the probability of hiring from the group in the future (Lepage, 2022).

The expected productivity of worker i from group B for manager m at time t is

$$P_{iBmt} = E[x_{iB}|s_{iB}, E[\hat{\mu}_B|S_{Bm,t-1}]] = \gamma_{Bmt}s_{iB} + (1-\gamma_{Bmt})E[\hat{\mu}_B|S_{Bm,t-1}]$$

where $\gamma_{Bmt} = \frac{\sigma_B^2 + Var[\hat{\mu}_B|S_{Bm,t-1}]}{\sigma_B^2 + Var[\hat{\mu}_B|S_{Bm,t-1}] + \sigma_{\varepsilon B}^2}$.[5] The manager hires the worker with the highest expected productivity out of the set of applicants A_t, with fraction F_{Bt} from group B.[6] That is, worker i from group B is hired at time t if $P_{iBmt} > P_{i'g'mt}$ for all $i' \in A_t$ from group g', and for $g' \in \{W, B\}$. Managers have a prior belief distribution about group B's mean productivity $\hat{\mu}_B|S_{Bm0}$ which they update based on their hires' productivity. x_{iB} is not randomly drawn, because managers select workers based on expected productivity.

Accordingly, managers first form an expectation about x_{iB} given that worker i has the highest expected productivity out of all applicants

$$E[x_{iB}|P_{iBmt} > P_{i'g'mt}\ \forall i' \in A_t, g' \in \{W, B\}].$$

Second, managers update their beliefs from $\hat{\mu}_B|S_{Bm,t-1}$ to $\hat{\mu}_B|S_{Bmt}$. Posterior variance monotonically decreases with additional hires, while the direction of updating depends on the discrepancy between the hire's expected and observed productivity

$$E[x_{iB}|P_{iBmt} > P_{i'g'mt}\ \forall i' \in A_t, g' \in \{W, B\}] - x_{iB}. \tag{1}$$

If realized productivity is above (below) expectation, denoted as a positive (negative) hiring experience, managers update their beliefs based on equation (1) with upwards updating when the difference is negative and downwards updating otherwise. A positive (negative) experience with group B increases (decreases) $E[\hat{\mu}_B|S_{Bmt}]$ and $P_{iBm,t+1}$ relative to group W, increasing (decreasing) the probability that a group B worker is hired in period $t+1$.

The rate of hiring also drives the speed of learning. Contrasting negative and positive hiring experiences, a positive experience, through increasing the probability of subsequent hiring from the group, also increases the probability of observing signals about the group's productivity at time $t+1$ and beyond. Depending on the manager's prior, these additional signals may partially undo the impact of the positive experience through reversion to the mean and in any case lead to more accurate beliefs. In contrast, a negative experience,

[5] Employers know σ_B^2 for a given mean, but uncertainty about the mean introduces additional variance in expected productivity $Var[\hat{\mu}_B|S_{Bm,t-1}]$.

[6] Managers should also value learning about group B to improve subsequent hiring decisions. We abstract from this feature since it does not change the direction of belief updating and that of its impact on hiring and learning across groups.

through decreasing the probability of subsequent hiring from the group, also decreases the probability of observing signals about the group's productivity at time $t+1$ and beyond. Regardless of prior beliefs, the impact may be more persistent, because it decreases learning.

In addition, since group B workers are baseline more infrequently hired, experiences with them may also have more persistent impacts since learning about their productivity is slower and it is likely easier for managers to avoid hiring groups who constitute a minority of applicants following negative experiences.

Disproportionate updating, combined with more persistent impacts of negative experiences on subsequent hiring, predict that hiring experiences systematically decrease relative group B hiring across managers. To summarize, our framework yields three key predictions regarding managers' beliefs updating:

1. Managers update their beliefs of group B productivity from their hiring experiences.

2. Managers disproportionately update their beliefs of group B, about whom they have weaker priors.

3. Managers' negatively-biased beliefs about group B productivity correct more slowly than positive ones and than negatively-biased beliefs about group A productivity.

These predictions don't rely on prior bias or prejudice and are robust to deviations from Bayesian updating that do not impact the direction of updating. They do not rely on whether worker groups have true productivity differences: whatever the true productivity of minority groups is, employers will underestimate it on average. They differ from predictions of other, typically static types of bias such as inattention discrimination, implicit biases, attribution bias, negative stereotypes, and self-fulfilling prophecies, and are robust to considering them. In fact, these other sources of bias are largely complementary since they would generally predict lower group B hiring by managers, slowing down learning and amplifying biased beliefs that arise from managers' experience in our framework.

Since we do not observe beliefs directly, we implement our tests under the condition that belief updating is reflected through hiring decisions. This yields the following three testable predictions regarding how individual managers hire black and white workers at the firm

1. Within managers, positive/negative experiences with black workers positively/negatively affect the share of future black hires.

2. Within managers, positive/negative experiences with black workers disproportionately affect the share of future hires, compared to positive/negative experiences with white workers.

3. Within managers, negative experiences with black workers have a more persistent impact on the share of future black hires than positive experiences and negative experiences with white workers

Our main hypotheses focus on the impact of hiring experiences on hiring shares. However, our model makes two additional testable predictions specific to learning. First, belief updating should become weaker over time as a manager's experience hiring workers of a given race grows. Second, the threshold value of the individual signal s_{iB} that a manager requires to hire a black worker evolves with experience, creating selection in the productivity of subsequent black hires.

2 Setting

Our data consist of monthly longitudinal administrative records on workers and managers from the US operations of a large national retailer between February 2009 and October 2016. For each worker and manager, we observe tenure, demographics, job, department, and location. We also observe employment termination including dismissals, quits, and layoffs. Each store is led by one store manager and a set of department managers who hire for their respective department (on average 5-6 managers per store), allowing us to study hiring decisions of each department manager over time. We restrict our sample to new hires into permanent non-managerial retail positions, as these are presumably the most consequential for the manager and positions for which tenure can be used as a measure of the worker's performance (Autor and Scarborough, 2008). Excluding transfers or returning workers allows us to concentrate on hires that were chosen by the manager specifically in the given hiring period and are therefore likely more salient.

We focus on white and black workers because they are the two largest racial categories in our data, which makes it most feasible to estimate managers' evolving hiring behavior.[7] Summary statistics on workers and managers are presented Table 1. In particular, black and white workers account for nearly 80% of hires, slightly more than half of workers are female, and managers on average hire 5-6 workers per year.

To study how managers' previous experiences influence their hiring, we consider both a time panel that captures previous experiences in months leading up to a manager's current hiring decision as well as a manager-level panel in which one observation corresponds to a month in which a manager hires at least one black or white worker, which we refer to as a

[7]Hispanics are treated as a separate category in the data and corresponding analyses are presented in Appendix D. Evidence on differentials between Hispanic and white workers is more mitigated and harder to interpret since the firm does not distinguish between race and ethnicity.

hiring event. Our analysis restricts our sample to new managers who began hiring for the first time during our sample period, since we can observe their first hiring experiences with workers at the firm. On average, managers hire workers approximately every two and a half months. We observe 60,096 hiring events (46% of all manager-months) with an average of 2.3 workers per hiring event (0.75 black, 1.55 white). One motivation for organizing the data by hiring event is to focus on belief updating from managers' own hiring experiences, which is likely concentrated in periods managers hire workers and arises irregularly across time.[8]

Staffing levels for permanent positions in each store are determined by forecasts made by the firm's headquarters. When a manager is tasked with filling a vacancy, the manager would typically begin by requesting a shortlist of candidates from the location's designated HR representative. The manager can then interview candidates and make offers. Workers in most entry-level jobs (e.g. cashiers, sales associates, and material handlers) are provided one week of formal online skills training and a week of job shadowing before moving to regular status. Most entry-level positions are filled from evergreen requisitions, meaning candidates can apply at any time and may be called to interview as needed. Positions may also be filled by department managers who conduct informal or spot interviews with candidates prior to submitting a formal application, and then notify a HR representative of their interview performance. Anecdotal evidence from store managers we interviewed indicates that it would be rare for a manager to have prior familiarity with a new applicant, though there is no formal process for tracking referrals and we do not observe these instances directly. More generally, as we discuss below, there is limited room for individual managers to influence the applicant pool they receive for a position, and applicant pool endogeneity, sorting between workers and managers, or referral hiring provide poor alternative explanations for our findings.

Applicants take an online screening test that classifies them into three recommendation tiers. Department managers observe screening test results, but are free to deviate from the algorithmic recommendation when selecting applicants to interview. Department managers are trained in behavioral interview techniques. For instance, a customer service applicant may be asked how they might respond to a hypothetical scenario, like dealing with a difficult customer, or to discuss an instance they confronted a problem and were proud of the solution they offered (Dipboye et al., 2004).

Turnover at the firm is high, in line with the retail sector more generally which has 50%

[8]In these specifications, we control for the number of hires in a given hiring event and the time between hiring events to account for the possibility that negative and positive experiences affect the time in between hiring events, but these controls have little impact on the results. Focusing on a manager's own experiences also ignores potential spillovers from experiences across managers. Ultimately, results shown below indicate that managers' updating behavior is qualitatively similar whether considering a time or a manager-event panel and that managers do not seem to learn from the experiences of other managers at their store.

greater turnover than the US average.[9] High turnover provides valuable variation in hiring of workers within managers even over a limited time horizon, allowing us to better study adjustments that managers make with hiring experience. Survey evidence indicates that the average cost of hiring and training a replacement retail worker is $3,328 or around 10 weeks of worker salary (Boushey and Glynn, 2012). Accordingly, retaining workers hired for permanent positions is one of the most important aspects of department managers' jobs.

Figure 1 shows that nearly 90% of workers no longer work in the specific position for which they were hired at a given store after one year. Most turnover reflects dismissals and quits, especially in the first three months of employment, with around 68% versus 52% after one year. Other sources of turnover for a department manager are transfers across departments and stores, layoffs, and promotions/disability/death, which account respectively for 18%, 25%, and 5% of turnover at the 12 month mark. After the first year of employment, the turnover rate falls substantially and remains below 2% per month.

There is large variation in black hiring across managers at the firm. Figure 2 shows the share of black and white workers hired over our sample by each manager. The mean share of black workers hired is 20%, the median is 8%, and more than a quarter of managers hire no black workers. The mean share of white workers hired is 56% and the median is 59%. In Appendix B, we present evidence that variation in the share of black hires persists after controlling for the manager race as well as store, department, and job effects. A substantial share of residual variation is explained by manager fixed effects, implying that individual manager effects play a substantial role in determining the race of hires. Next, we study whether these individual effects are in fact dynamically driven by experiences on the job.

3 Belief updating from experience

Our main empirical analysis examines whether manager-level variation in hiring can be explained by managers' updating from their own prior experiences. Our first specification investigates how experiences with black and white workers in previous hiring events affect the share of black hiring in the current event. We estimate the model

$$FB_{emlt} = \beta_1 \overline{EXP}_{B,e-1} + \beta_2 \overline{EXP}_{W,e-1} + X_{emlt}\zeta + \theta_t + \lambda_l + \gamma_m + \varepsilon_{gemlt} \tag{2}$$

where the dependent variable is the fraction of black workers hired in hiring event e by manager m in location l at time t. $\overline{EXP}_{B,e-1}$ and $\overline{EXP}_{W,e-1}$ respectively indicate the share of black and white hires up to hiring event $e-1$ for whom the hiring experience was negative

[9] https://www.bls.gov/news.release/jolts.t18.htm.

(manifested by being fired or having quit within three months), and their coefficients reflect how negative hiring experiences affect the race of future hires. Other specifications consider indicators for positive, rather than negative, experiences (manifested by a tenure of at least 12 months). X_{emlt} includes the fraction of full-time workers, fraction female, average age, total number of hires, number of previous hiring events, time since last hiring event, yearly state unemployment, and yearly state college attainment. θ_t, λ_l, and γ_m represent month and year, store, and manager fixed effects. Time fixed effects account for potential differences in the applicant pool and worker performance at the firm over time. Store fixed effects account for differences between applicant pools, local markets, and store-level characteristics faced by the manager, among other factors. Manager fixed effects account for time-invariant manager differences that may affect their willingness or ability to hire applicants of different races. Standard errors are clustered at the manager level, although results are similar when clustering at the store level.

We use the coefficients on $\overline{EXP}_{B,e-1}$ and $\overline{EXP}_{W,e-1}$ to test our key predictions. Intuitively, near-zero estimates suggest that heterogeneity in the race of manager's hires can be explained by factors relating to the hiring context and (potentially unobserved time-invariant) manager characteristics. In contrast, if past experience predicts future hiring net of these other factors, we would interpret that as evidence that manager group perceptions are not fully formed or immutable by the time they begin hiring. Rather, negative and positive experiences with a group would appear to affect manager's beliefs and therefore their propensity to hire from a group.

While this specification provides an intuitive way to investigate how an employer's hiring experiences affect the race of future hires, the interpretation is complicated because the quality of hiring experiences after the first can be endogenous to previous experiences, as would be the case if managers adjust their hiring thresholds based on past experiences. For instance, if a manager has a bad experience with a black worker, sets a higher bar for hiring the next black worker, but still has another negative experience, then the manager may update their beliefs more after their second hire than the first given that the second performed poorly despite overcoming a greater hiring bar.

Accordingly, we conduct additional analyses setting aside endogenous hiring quality by restricting the sample to a manager's first hiring experience or experience with incumbent workers

$$FB_{emlt} = \beta_1 EXP_{B,1} + \beta_2 EXP_{W,1} + X_{emlt}\zeta + \theta_t + \lambda_l + \varepsilon_{gemlt} \tag{3}$$

where $EXP_{B,1}$ and $EXP_{W,1}$ respectively indicate the share of black and white hires in the

manager's first hiring event for whom the hiring experience was negative or positive. These specifications test how a manager's first experience at the firm affects their subsequent hiring, potentially setting them on persistently different belief-updating paths. Moreover, we can test whether a manager's first hiring outcome with black workers is exogenous to initial department conditions after accounting for store-level factors, providing us with a source of exposure to worker groups which is plausibly exogenous to factors outside of the manager themselves.

3.1 Measuring negative and positive experience

Because our analysis considers hiring decisions as a function of idiosyncratically negative or positive previous experiences, we must distinguish hiring events as either negative or positive versus a manager's expectations for both worker races. Since we observe some performance measures, but not their discrepancy with a manager's expectation, we use different performance measures relative to other workers at the firm, which should inform expectations. We use two approaches to classify experiences as negative negative or positive.

Organizing the data by hiring event, we identify particularly negative and positive experiences of a manager, focusing on specific experiences likely to be most salient. For negative experiences, for each hiring event, we calculate the share of each race that was fired or quit in the first 3 months of employment. As shown in Figure 1, the first three months represent a key period after which the rate of dismissal and quit decreases substantively.[10] Workers hired into permanent positions who leave or are terminated within the first three months account for around a quarter of hires. They are also very costly: workers must be hired, paid during a training period, and provided time to develop tacit skills and a familiarity with the store's protocols, procedures, and products. Workers who depart after short tenures are also costly in terms of their opportunity cost: they filled a spot that could have otherwise been filled by a successful hire.

For positive experiences, for each hiring event, we calculate the share of each race that achieved at least one year of tenure in the position for which they were hired. As shown in Figure 1, after 12 months, the likelihood of a position separation in any given month is fairly low and stable. Long tenure suggests a successful hire and sufficiently good match between the worker and the position. It also reflects a stronger measure of worker performance than using the share of workers that has not quit or been fired after 12 months, since we may be concerned that poorer hires could be transferred or laid off. Approximately 15% of new hires achieve tenure of at least one year in their position. As a complementary measure

[10] Using measures of the performance of black workers relative to white workers or relative to workers in the store's CBSA has limited impact on the results, as shown in Appendix Table C3.

keeping experiences symmetric across negative and positive experiences, we define positive (negative) experiences as the previous hires of a manager being in the top (bottom) quartile of deviations from expected tenure at the firm, which yields similar results as shown in Table C2. Given the potentially forward-looking nature of our measures, we exclude workers hired in the last 3 months (1 year) of our sample for negative (positive) experiences.

Alternatively, organizing the data into a time panel as a robustness check in Table C1, we compare tenure achieved by a manager's hires to expected tenure at the firm. Specifically, we compute deviations in turnover rates by race and tenure at the level of the manager's subordinates from average turnover rates at the firm, cumulatively for every month leading to a given hiring event.[11] The cumulative average of these deviations indicates how a manager's previous hires from each racial group were more or less likely to achieve a given level of tenure than expected.

Table 1 shows summary statistics for our performance measures. Compared to white hires, black hires have a slightly higher 3-month quit or dismissal rate and lower 12-month retention rate. Importantly, most variation in tenure is not explained by race. For instance, both black and white workers have the same median tenure of 4 months. Because managers only hire an average of 5-6 workers per year, and fewer of each race, they are left with relatively few personal observations from which to update beliefs. We argue that this raises the possibility that biased beliefs formed by unlucky initial draws, particularly with black workers, could take a long time to self-correct, especially if they endogenously reduce hiring of these workers.

Figure 3 shows that our experience measures are clearly salient to managers and impact their hiring decisions. Managers whose latest black hire(s) quit or were fired within 3 months of being hired were 10 percentage points or 28% less likely to hire any black workers in their following hiring event. The magnitude of this decrease subsides over subsequent hiring events, but remains statistically significant for the next two events, corresponding to a total period of around 7.5 months on average. In contrast, managers whose latest white hire(s) quit or were fired within 3 months of being hired were marginally statistically significantly more likely to hire black workers in their following hiring event, though the effect is much smaller and subsides more quickly. The figure also shows that positive experiences affect subsequent hiring. The impact is again larger (approximately 30% larger) for experiences with black workers, but the estimates are smaller than for negative experiences and the impacts are more temporary.

Even though managers directly value tenure in a position, we would ideally also have

[11] Results are qualitatively and quantitatively similar comparing to race-specific turnover rates or average turnover rates across racial groups.

a direct measure of productivity that the manager observes. In that case, we would test whether future hiring depends on productivity rather than tenure for a race. Still, standard theories feature a positive relationship between productivity and tenure (such as job search models), and empirical work has established such a relationship with regularity.[12] Some jobs in our sample feature performance metrics based on sales figures, and Appendix A presents evidence that the typical performance-tenure relationship holds for these positions.

By using tenure to classify negative and positive hiring experiences, we are not asserting that objective worker performance is the only factor affecting hiring and retention. Differences in tenure across race, although modest, could be explained by differences in performance, but also differences in average discrimination. Such discrimination could take several possible forms: managers may require higher performance for minorities as a condition for continued employment, managers may put greater effort in training non-minorities, or minorities may shirk under biased managers (Glover et al., 2017). However, our goal is not to assess differences in productivity or hiring in the absence of bias, but rather to examine whether bias evolves on the job based on an employer's potentially subjective experiences. Further, we show that static or pre-existing bias, without involving updating by managers, provides a poor alternative explanation for the patterns of hiring discrimination we document.

4 Main results

4.1 The effect of prior experiences on hiring

Our first proposition is that a manager's previous experiences hiring black workers will influence their subsequent hiring of these workers. Table 2 presents estimates of the relationship between negative and positive previous experiences and the race of subsequent hires. The outcome variable corresponds to the share of hires that are black, but since the sample is restricted to black and white workers, estimates for the fraction of white hires are the same magnitude but opposite sign. The independent variables capture the cumulative impact of previous experiences with each race. Estimated effects in percentages are approximately 50% larger for black than white hiring given that they constitute a minority of workers, indicating that hiring experiences play a disproportionately large role in black hiring. Unless specified otherwise, all our tests refer to a statistical significance level of 5%.

[12] See for example Bycio et al. (1990), Williams and Livingstone (1994), Huang et al. (2006), and Zimmerman and Darnold (2009).

The first three columns of Table 2 present estimates from equation (2) indicating that managers statistically significantly decrease their hiring of black workers by an estimated 6% in column 3 for a one standard deviation increase in the fraction of previous black hires that were dismissed or quit within 3 months. Estimated impacts for experiences with white workers indicate a substantially smaller but still statistically significantly increase of approximately 3% in black hiring in column 3, when accounting for the higher standard deviation of experience measures with black workers.

Columns 3-6 present estimates of the impact of positive previous experiences. Managers statistically significantly increase their hiring of black workers by an estimated 4% in column 6 for a one standard-deviation increase in the fraction of previous black hires who reached at least one year of tenure in their position. Estimated impacts for white workers are much smaller and not statistically significant at conventional testing levels.

The key takeaway from Table 2 is that differences in the cumulative previous experiences of a manager with black workers are associated with different subsequent hiring behavior. Table C1 presents similar results using a time panel with a continuous measure of expected tenure by race. Table C3 shows that firings lead to larger negative impacts than quits, but that managers seemingly want to avoid both (Autor and Scarborough, 2008).[13] Appendix D shows qualitatively similar results when restricting to female workers or black managers, suggesting that both black and white managers respond similarly to their previous experiences with black workers. Lastly, similar to Figure 3, Table C4 shows that a manager's most recent experience also affects their current hiring in the expected direction.[14]

4.2 Greater updating for black workers

Our second proposition is that experiences of managers with black workers disproportionately affect their future hiring compared to those with white workers. In Tables 2 and 3 as well as across different experience measures considered in our robustness checks, estimated coefficients on previous experiences with black hires are larger than those with white hires, for both negative and positive experiences, generally by over 30%, and are all statistically significant. Further, statistical tests reject the null hypothesis that impacts of experiences with black and white workers are equal but of opposite sign, as shown by the p-values presented in Table 2. Overall, evidence of updating is weaker and somewhat

[13] Updating from negative experiences across groups is similar in periods of high versus low labor market tightness, which may influence the relative quality of outside options across race, also suggesting that our results are not driven by differential turnover reasons across race.

[14] Recent experiences may be salient to managers even as they acquire hiring experience, for example if the hiring context changes over time or due to recency bias (Agarwal et al., 2008; Gallagher, 2014; Erev and Haruvy, 2016).

inconsistent regarding previous experiences with white workers, although coefficients are of the hypothesized sign. This suggests a substantial updating gap across races, which is key for generating discrimination.

We interpret this result in light of our theoretical exposition, which adopts a simple Bayesian approach: managers update their beliefs more for black workers because they have weaker priors.[15] Weaker average priors about black worker productivity can arise naturally from the group being a minority and therefore there being less information about them in the labor market. However, greater updating for black workers is also consistent with a set of behavioral biases, including stereotype formation (Allport et al., 1954). Psychologists assert that whiteness is largely invisible; Blacks are judged together while whites are assessed as individuals or along nonracial categories (Sue, 2006). Since managers seemingly update more following both negative and positive experiences with black workers, our results do not appear driven by attribution bias (Sarsons, 2019), although we cannot rule out that such biases also affect updating.

4.3 Early negative experiences and their persistence

Our third proposition is that the rate of learning is asymmetric across negative and positive experiences as well as across worker races. Because early negative experiences deter future hiring, negative biases are slower to self-correct. Moreover, negative biases are particularly persistent among minorities because managers update more from their experiences with those workers and due to lower hiring rates even in the absence of negative biases.

To examine the persistence of biases formed by early experience, we estimate equation (3). Initial experience may be particularly salient because managers presumably have weaker priors. Moreover, these specifications avoid conditioning on an endogenous sequence of hiring experiences, showing instead that first experiences can set employers on persistently different paths of belief-updating and hiring.

Appendix Table C5 shows that the performance of black workers and the fraction of black workers hired in the three months before a manager joins a department do not predict the share of black workers hired in the manager's first hiring event or the performance of black workers hired in that event, respectively. These results suggest that the performance of managers' first hires govern the race of subsequent hiring, rather than departmental or compositional effects that persist after conditioning on store and time fixed effects. Similarly, leveraging a source of manager exposure to black workers that is more plausibly exogenous to

[15] If managers, potentially subjectively, expected that negative (positive) hiring experiences are more (less) likely to arise with black workers, then they should update less (more) following such an experience, in contradiction to our findings.

the manager themselves, we find that the impact of a manager having a negative experience with workers who were already in the department when the manager joined, and as such were not hired by the manager, is similar to the impact of a manager having a negative experience with their first black hire(s) (Appendix Table C3). Accordingly, our analyses exploring the impact of a manager's first experience restrict potential interpretations to factors which vary over time and within individual managers.

Figure 4 shows the effect of first hiring experiences on the race of subsequent hires. As shown in the top left panel, when a manager's first black hire(s) quit or are fired within three months, the manager is persistently less likely to hire black workers over the next 6 hiring events, corresponding to 1.5 year on average.[16] The decrease is strongest immediately following the negative experience, corresponding to a reduction of around 14% versus 5% for events 4-6. The magnitude and persistence of this effect is specific to negative experiences with black workers, rather than white workers or positive experiences.

Figure 5 shows that a first negative experience with black workers sets managers on a persistently different hiring path. The fraction of managers who hire at least one black worker in the hiring event following their first experience is about 15 percentage points lower at around 33% for managers whose first experience was negative. The hiring gap subsides as managers hire more workers, but there remains a non-negligible 5 percentage points difference in the fraction of managers who have hired at least one black worker even after 12 hiring events following their first experience, corresponding to a period of around 2.5 years.

Similar results are shown in Table 3. Estimates from the first three columns indicate a statistically significant decrease of around 2% in black hiring in the current hiring event for a one standard deviation increase in the fraction of the first black hire(s) that were fired or quit within 3 months. These results suggest that early negative experiences with black workers impact hiring over our entire sample period. Columns 4-6 show smaller and statistically non-significant impacts for early positive experiences. Interestingly, these results suggest that the subset of managers who hire black workers had roughly unbiased priors about their performance. If they systematically underestimated their mean performance, then negative experiences may have had a more muted impact on subsequent hiring and positive experiences may have lead to persistent increases. Impacts of a first negative experience with white workers are smaller, statistically non-significant, and we can reject that the coefficient is of the same magnitude but opposite sign to that of a first negative experience with black workers.

Lastly, we relax the first-hires restriction by examining the first three hiring events

[16]These effects are not driven by selection in the number of hiring events or tenure across managers: restricting the sample to managers with at least 10 hiring events yields similar results.

(Appendix Table C5). In principle, additional experiences should solidify managers' beliefs. Consistent with this intuition, more negative experiences over the first three hiring events appear to accumulate into larger negative impacts. More positive experiences also appear to have larger positive impacts, but the coefficients are not statistically significant.

Our results imply that managers disproportionately and persistently reduce their hiring of black workers following negative experiences, consistent with them developing persistent negatively-biased beliefs. Taken together, they imply that hiring responses of managers following their experiences with workers systematically decrease the hiring of black workers at the firm.

5 Additional evidence on learning

5.1 Updating over a manager's career

An intuitive implication of our framework is that employers should be particularly uncertain about the performance of black workers early on in their hiring career and therefore respond more to their initial experiences. Accordingly, we break down the impact of negative experiences with black workers throughout a manager's hiring career.

Table 4 presents estimates of the cumulative impact of previous negative experiences with black workers on current black hiring, separating each manager's hiring events over our sample period into three chronological terciles. We compute the same measure of cumulative previous experiences as in Table 2, but separately within each tercile to see how much experiences in each tercile affect black hiring. We define terciles rather than pooling specific ranges of hiring events together given substantial heterogeneity across managers in the number and timing of hiring events. Still, the results are qualitatively similar if we separate hiring events by whether a manager is in their first, second, or third and above years of hiring at the firm.

The results highlight that the impact of negative experiences that happened in the early, middle, and late segments of a manager's hiring history all affect black hiring. They also highlight that the impact decreases with hiring experience: the relationship between experiences and hiring is strongest early in a manager's hiring career and weakest in the last tercile.

Overall, while earlier results suggest that managers put weight on their most recent experience, this appears to be within a broader learning process through which the weight they put on their experiences decreases as they hire more black workers.

5.2 Positive selection among workers who overcome bias

The theoretical framework proposes that managers condition their beliefs both on a worker's individual signal and their group. As a result, managers who draw low-performers from the pool of black applicants will be biased in their beliefs about that group and should set a higher threshold for a black worker's individual signal when making hiring decisions. Therefore, following a manager's negative hiring experiences with black workers, individuals of that group who are hired anyway should be less likely to yield a negative experience. Conversely, following a positive experience, the manager should lower the hiring bar for black workers, decreasing the probability of future positive experiences.

Consistent with this proposition, Table 5 shows that hiring experiences are negatively serially correlated. Estimates correspond to an approximate 30% decrease in the probability of a positive or negative experience for a one standard deviation increase in the cumulative fraction of previous positive or negative experiences. These results are inconsistent with reversion to the mean, since the quality of a current hire should be independent of the quality of previous hires in the absence of an additional mechanism operating at the manager or department level. As discussed below, this negative correlation is inconsistent with the idea that our previous results are driven by mechanisms which simply reflect persistence in a manager's good or bad experiences with black workers that is correlated with the manager's propensity to hire these workers, like hiring through referral, taste-based discrimination, or endogenous worker performance.[17]

5.3 Other person-specific sources of belief updating

In addition to their own experience hiring for their department, managers may update their beliefs from different sources: their colleagues, their experiences at previous stores, their experiences with workers they "inherit" when joining a new department, and negative experiences unlikely to result from a bad match between the manager and the worker specifically (see Appendix Table C6).

First, managers may update their beliefs from their peers within the store, which would in principle accelerate the rate at which biased beliefs are corrected. To examine this possibility, we add measures of cumulative negative experiences for all other managers within a store to equation (2). The estimated impacts of a manager's own negative experiences with black workers remain largely unchanged, while estimated coefficients on experiences of other managers within the store are smaller and statistically non-significant. Even in a setting

[17]The negative correlation also implies that our measures of previous experiences are endogenous to an employer's beliefs in a way which may mitigate the persistence of negatively-biased beliefs: they decrease the likelihood of a subsequent hire, but increase its expected quality conditional on hiring.

where same-store managers' experiences are fairly easy to observe, the average experiences of other managers have little impact on a manager's hiring after accounting for their own experiences.

Second, incoming managers may update their beliefs based on their own hiring experiences in previous management roles at the firm. To examine this possibility, we estimate equation (2) restricting the analysis to 977 hiring events of new incoming managers for whom we also observe hiring outcomes in their last hiring event at the previous store. This analysis places considerable demands on the data, yielding similar point estimates as our main analysis, though errors are outside conventional testing thresholds.

Our third analysis examines whether incoming managers form beliefs based on the incumbent workers they "inherit," rather than just the ones they hire. To do so, we estimate equation (2) restricting to new incoming managers and defining a negative experience as the share of incumbent black workers who quit or are fired by the time that the manager hires workers for the first time at the department. We find that a more negative experience decreases subsequent hiring of the group by the manager, similarly to their first experience with their own hires, although this estimate is only statistically significant at the 10% level.

Our fourth analysis examines whether negative experiences more plausibly exogenous to a manager's behavior after hiring also decrease hiring, looking at specific reasons for separation. We estimate equation (2) restricting our measure of negative experience to only include dismissals due to dissatisfaction with pay, compensation, or benefits, which are not controlled by the department manager, as well as worker integrity and illegal or unethical behavior. We find that these similarly decrease subsequent hiring, consistent with decreases being driven by managers updating beliefs about groups rather than reflecting their own behavior or learning about their own managing ability.

Put together, our analyses suggest that a manager's belief formation is specific to their own context and somewhat portable across jobs, though the time span of our data is limited (5 years). This sharp degree of specificity largely reflects evidence on experience effects in other contexts (Malmendier, 2021a,b).

6 Alternative mechanisms

Our main proposition is that managers' beliefs about worker groups are shaped on the job, rather than being fully formed by the time they enter the job. Managers develop hiring biases which depend on their experience with worker groups. We have found that hiring experiences with black workers do impact future hiring, and that early negative experiences in particular persistently reduce the rate at which managers hire black workers. Moreover,

we have documented that managers respond to their experiences particularly early on in their hiring career and that hiring outcomes are negatively serially correlated over time, consistent with managers endogenously setting their hiring threshold for workers of different races based on their experiences.

When evaluating threats to interpretation, one set of concerns regards factors correlated with the manager, particularly the manager's team. For instance, if workers refer prospective job candidates of their own race, then idiosyncratic differences in race within a team will be correlated with the race of subsequent hires. Similarly, if workers have a preference for same-race departmental colleagues ("employee discrimination"), then current racial composition will affect future racial composition. These processes, among others, would yield serial correlation in the race of a manager's hires that is not based on any factor specific to the manager.

Our strategy for evaluating these alternatives applies our prior findings, robustness checks, and falsification tests to establish that the effects we identify are specific to the manager and the timing of hires (and thereby the formation of beliefs) within their tenure.

In particular, our results are inconsistent with any mechanism that operates through workers and customers like worker referrals, worker complementarities, and co-worker or customer discrimination. Table 4 highlights that the impact of negative experiences with black workers in a given department varies specifically with the timing of a manager's experiences. These results effectively act as a time placebo, showing that the largest impacts of negative experiences with black workers are at the beginning of a manager's career and decrease with hiring experience. Table C7 presents another time placebo investigating the impact of a more negative experience with black workers at a department in the 3 months before a manager begins in their position, which has little impact on the manager's hiring, unlike their own first experience. Similarly, Appendix Table C8 highlights that there is but a negligible negative relationship (2% decrease for a one standard deviation increase) between the existing fraction of black workers in a department and the fraction of black workers hired in a given event. That is, a higher (lower) fraction of black workers, by itself, is not associated with a subsequent increase (decrease) in black hiring by a manager.

Moreover, several alternative mechanisms predict that hiring experiences should be positively serially correlated, for example if high (low) productivity workers tend to refer other high (low) productivity workers from racially-homogeneous networks (Montgomery, 1991; Burks et al., 2015).[18] Yet, Table 5 shows that they are in fact negatively serially

[18]Previous work suggests that black workers are proportionally less likely to be hired through referral (Kirnan et al., 1989; Taber and Hendricks, 2003), inconsistent with the larger hiring responses that we document following experiences with black workers.

correlated, consistent with managers updating their beliefs about worker group productivity and adjusting their hiring thresholds accordingly. Regarding the specific hiring patterns we document, these alternative mechanisms at best provide little rationale for the relative persistence of early negative experiences with black workers in particular, rather than early positive experiences with black workers or early experiences with white workers, and at worse are inconsistent with it. Lastly, since departments are staffed with relatively few workers at any given time and draw from a fairly homogeneous pool of workers and customers, these alternative mechanisms likely play a larger role at the store than department level.

A second set of concerns is that the effects we identify are specific to the hiring manager, but do not arise from them updating beliefs about the performance of worker groups from experience. In the presence of prejudice, negative (positive) experiences could reflect a bad (good) working climate for minority workers which translates to less (more) hiring. Even if we are interested in the manager's perception rather than the worker's objective performance, the subjective assessment of a manager as to what constitutes a positive or negative experience may itself be biased and vary across groups. Pre-existing bias against a group could affect both their expected tenure, for example by affecting how they are evaluated by the manager, and the likelihood of the manager hiring from the group. Such bias could also generate what appears to be a persistent impact of negative experiences on subsequent hiring. Several of our results are inconsistent with this class of alternatives, particularly those based on static pre-existing biases or prejudice.

First, columns 3-4 of Table C7 show that the share of black hires by a manager in their first or last hiring event does not help predict the likelihood of having negative experiences with future black hires, consistent with hiring decisions being distorted by biased beliefs caused by experience rather than reflecting a fundamental manager bias associated with both less black hiring and more negative experiences with black workers. Second, if the nature of hiring experiences is driven by underlying bias which correlates with subsequent hiring, then both negative and positive experiences should have a similar persistence, contrary to our results. Importantly, negative and positive experiences would also have to be positively serially correlated, in contrast to evidence presented above. Third, these alternatives provide little rationale for the decreasing impact of hiring experiences over a manager's career or the fading impacts of experiences over subsequent hiring events shown in Figures 3, 4, and 5. Fourth, it seems unlikely that negative experiences with white workers reflect hostility against white workers in predominantly white departments with white managers. Yet, we find that experiences with white workers in recent hiring events do seem to impact hiring. Similarly, coefficients from Table D1 suggest if anything *stronger* responses by black managers following experiences with black workers (an 11% decrease in black hiring for a one standard deviation

increase in the fraction of previous black hires who quit or were fired within 3 months). Fifth, Table 1 shows that the rate of negative experiences with black and white workers at the firm is in fact fairly similar, indicating that much of the difference appears to lie in how managers respond to their experiences with these groups. Sixth, Appendix C shows that experiences with black workers who were fired or quit for reasons unlikely to be related to the manager's behavior also decrease black hiring, suggesting that evolving group perceptions play a role.[19] Seventh, several of our specifications include manager fixed effects to account for time-invariant differences in group hiring across managers.

To be clear, we do not interpret our results as an indication that managers are not biased against black workers in ways beyond that which arise through learning about their performance from experience. In fact, insofar as other sources of bias such as that documented in Glover et al. (2017) and Sarsons (2019) can be seen as arising from previous interactions with groups, they are largely complementary and consistent with our primary proposition that hiring experiences create group associations which lead to self-sustaining discriminatory behavior. Rather, we interpret our results as indicating that time-invariant, pre-determined biases provide a poor alternative explanation for the specific novel patterns of hiring we document, and that considering biased belief which evolve based on managers' experiences, in particular through learning, greatly helps rationalize the hiring discrimination we observe. This is especially true since we focus on biased beliefs arising from experience, so we are studying managers who were at least willing to hire and manage black workers over our sample period, which may represent employers with less initial bias.

Lastly, we focus on a manager's own endogenous hiring decisions since they should be most salient. Hiring is fundamentally a selective process, and we want to understand how it is influenced by experience. We may worry that the effects we document could then be influenced by worker and manager sorting. Yet, much of the previous reasoning applied against other alternatives applies to workers selectively applying for positions with managers based on their hiring record. In addition, Appendix C shows that negative experiences with black workers inherited, rather than hired, by the manager also decrease subsequent black hiring. More fundamentally, workers apply for a job at the store or area level, typically do not know their manager until the interview, and are unlikely to observe information about the manager's hiring record until they are employed. Our results regarding the impact of other managers' experiences within a store, along with institutional details gathered through manager interviews, also suggest that workers are not assigned to a department manager

[19] Along with other evidence presented above, these results are also inconsistent with managers learning about their own ability or evolving managing/screening ability over time as alternative explanations for our findings.

based on their previous experiences with worker groups, especially since we exclude transfers.

To summarize, the explanation which best jointly rationalizes our results is managers learning about the performance of black workers through their own hiring experiences with these workers. This learning could be quite broad, potentially including subjective productivity components and match quality. Still, the key takeaway is that managers aim to repeat experiences perceived as successful and avoid those perceived as unsuccessful. When they attribute some of the discrepancy between a worker's expected and realized productivity to potential differences between worker groups, then our theoretical framework predicts the creation and persistence of biased beliefs which generate the hiring patterns that we document.

7 Conclusion

Our analysis is motivated by the basic question of whether discriminatory beliefs among hiring managers are fully formed by the time they reach their position of hiring authority, or whether individual variation in the race of their hires results from their individual experiences on the job. Using data on a major retailer, we find evidence of the latter: whether experiences hiring minority workers are positive or negative seeds the race of future hires. Results are most pronounced for managers' initial black hires. When a black worker hired for a permanent position is fired or quits within three months, the likelihood that the manager hires another black worker drops sharply and persistently. Positive hiring experiences with black workers, in contrast, increase black hiring though the effects are relatively short lived. Results for white workers largely mirror those for black workers, but are far weaker in magnitude and persistence.

Although our study focuses on one firm, much of the fundamental mechanism that we observe appears to be a product of managers having broad hiring authority within a screening process typical among large organizations. Our results suggest that delegating such authority to individual managers is not only prone to bias, but also inefficient, as managers draw from relatively little experience and information when making hiring decisions. Moreover, the firm's organization and the labor market in general appear to provide little corrective information to managers with individual idiosyncrasies in their minority hiring fueled by personal experience. As a result, policies aimed at centralizing hiring, aggregating learning as is implicitly done with pre-employment testing and algorithmic hiring, or encouraging minority hiring through policies like affirmative action, may both enhance efficiency and reduce biased beliefs.

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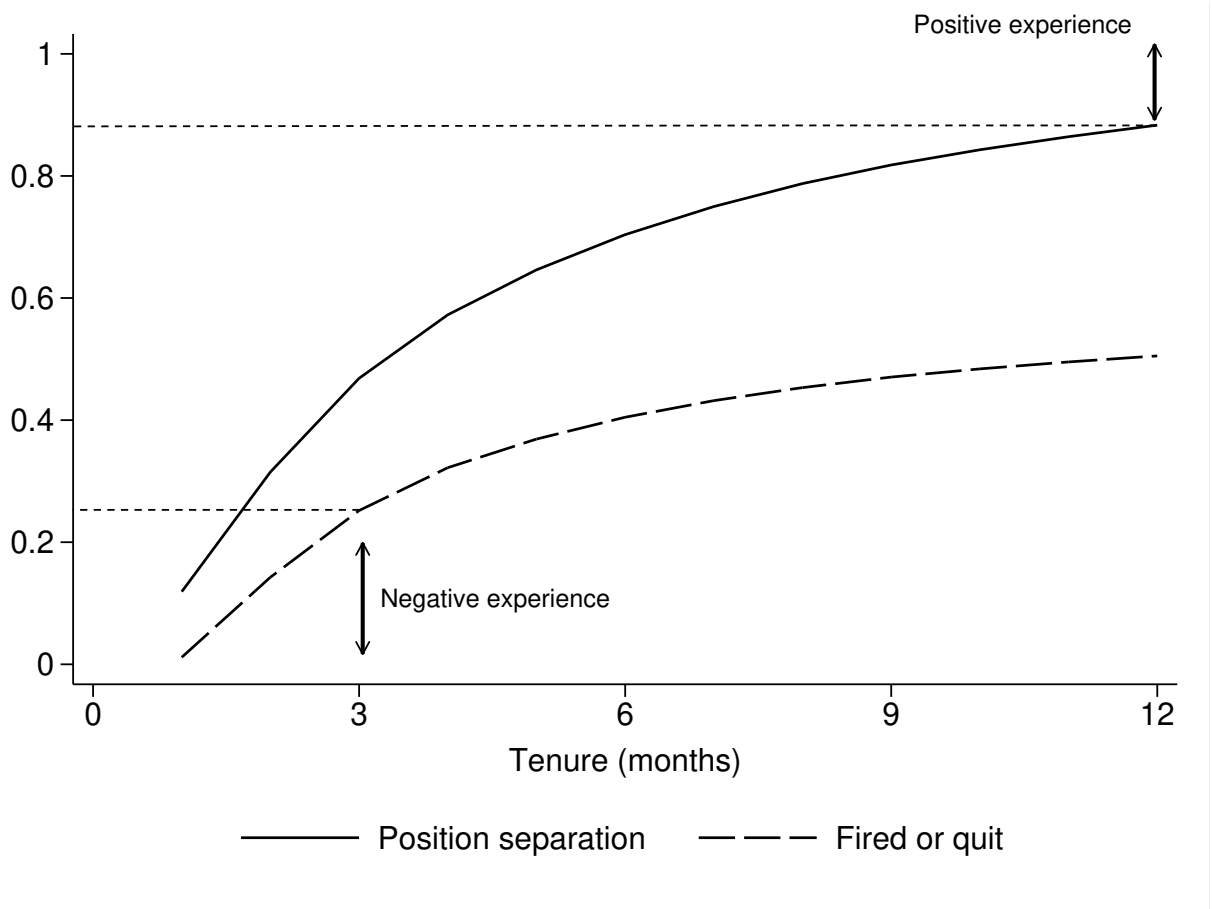
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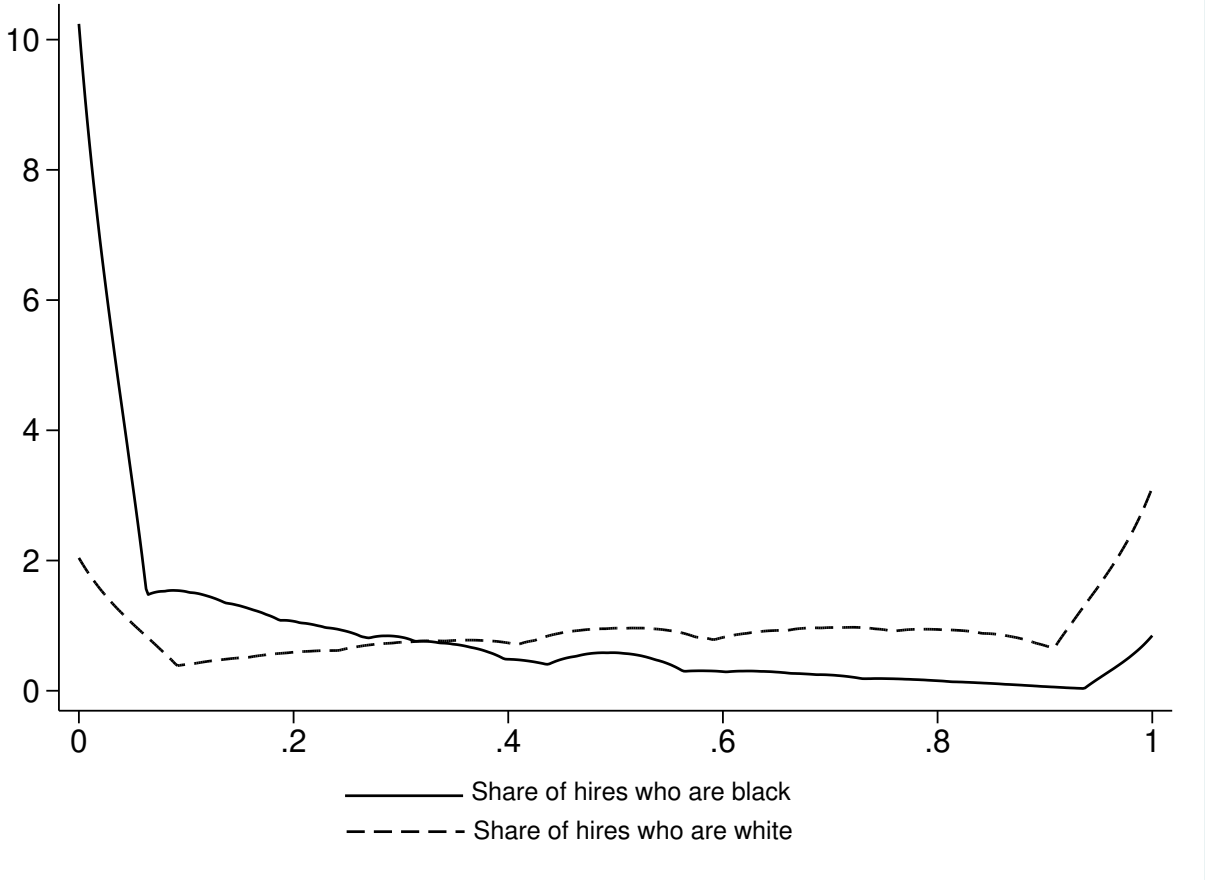
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Figure 1: Cumulative turnover by tenure



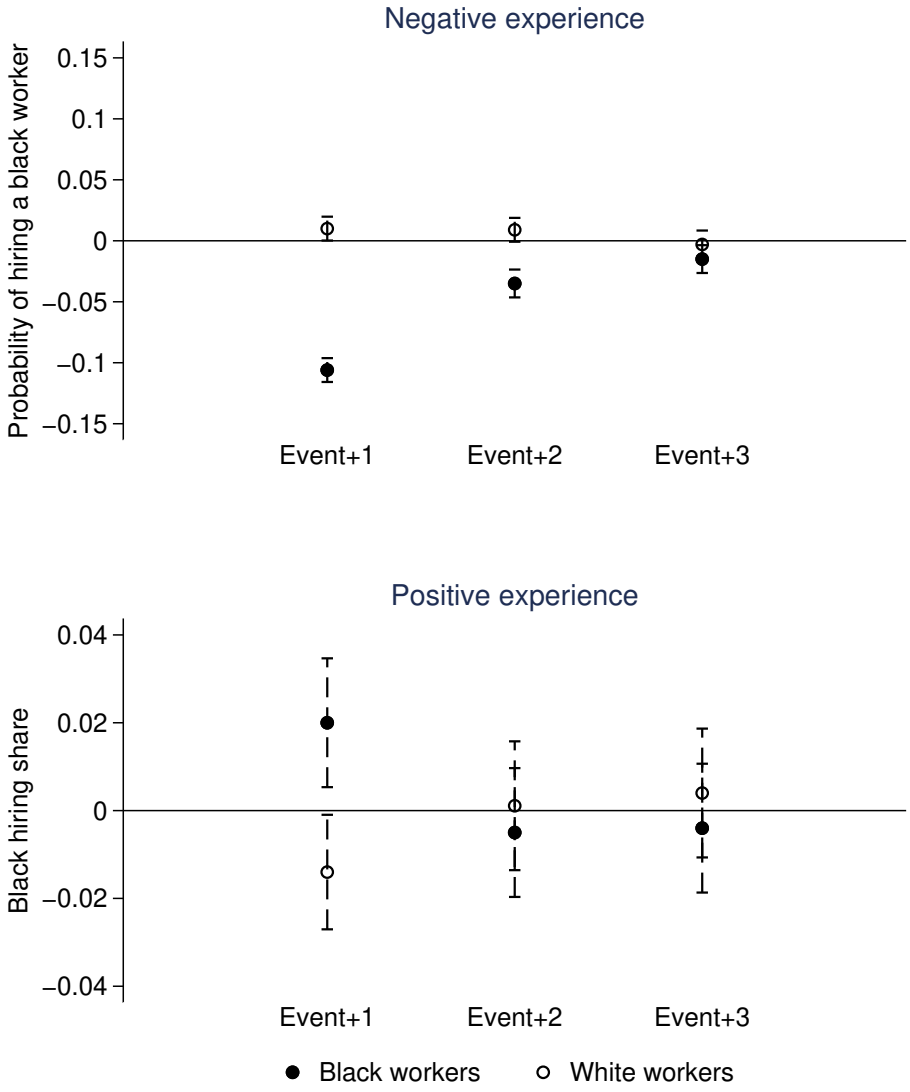
NOTE. "Position separation" refers to the worker no longer working in the position for which they were hired, including dismissals and quits but also department or store transfers, layoffs, promotions, and retirement/disability/death. The sample is restricted to workers hired at least one year before the end of our sample period.

Figure 2: Kernel density estimates of the shares of black and white hires, by manager



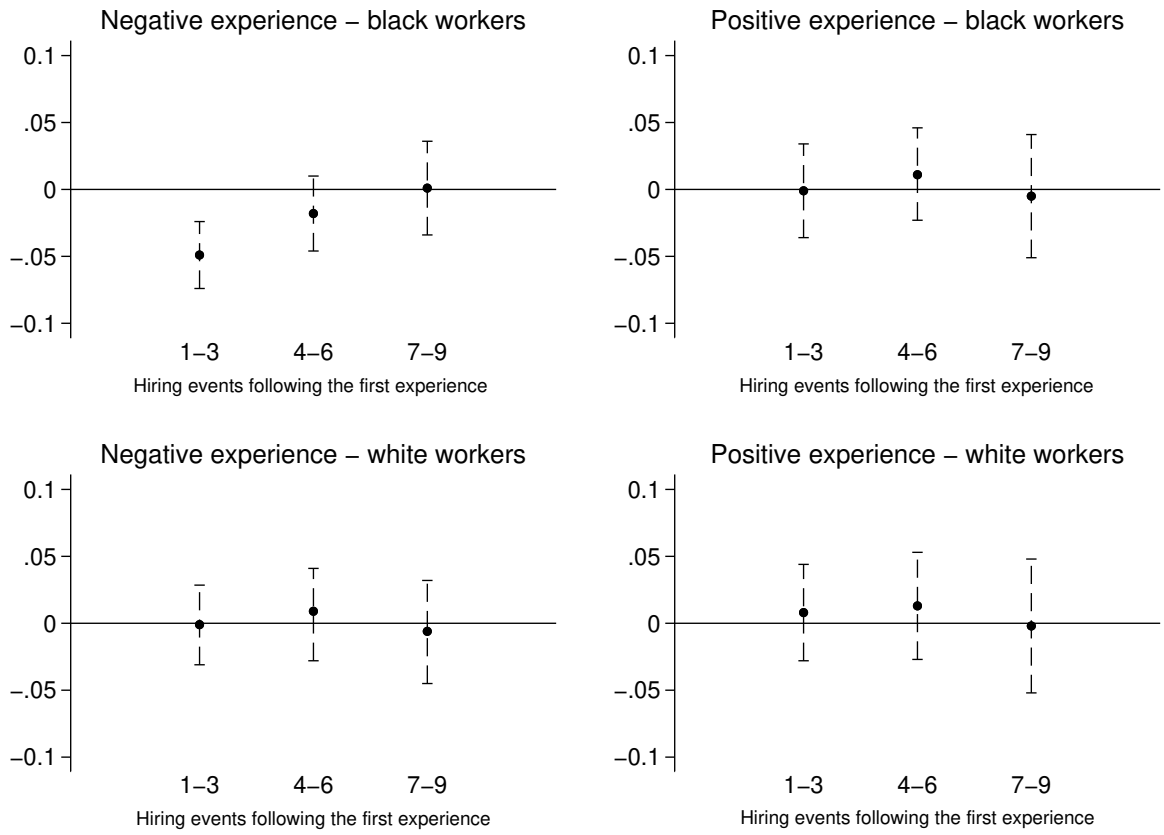
NOTE. Black share bandwidth: 0.066. White share bandwidth: 0.091.

Figure 3: Impact of a manager's latest hiring experience with black and white workers on their subsequent hiring



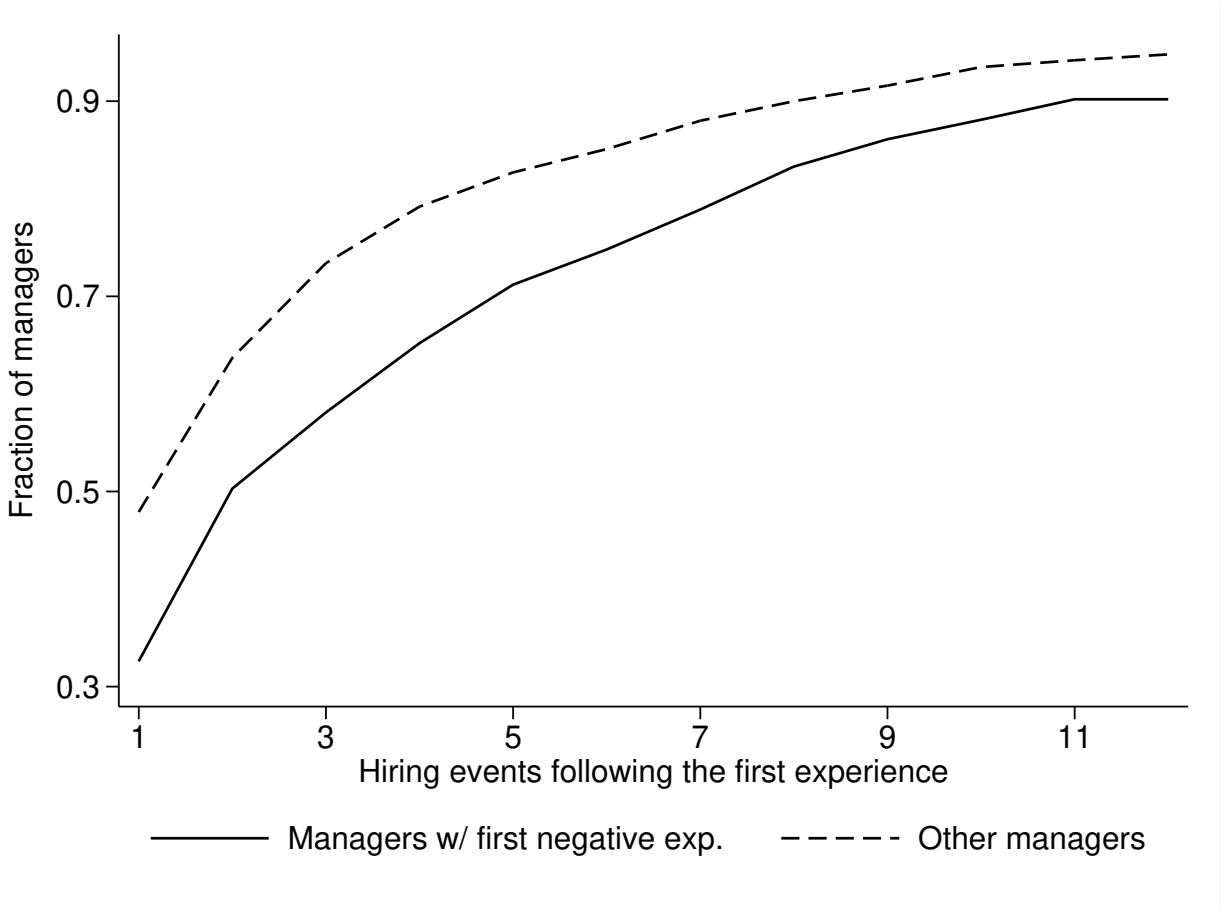
Note. 95% confidence intervals from clustered standard errors at the manager level are presented using dashed lines. A negative experience corresponds to a manager's hires from a racial group in the last hiring event being fired or quitting in the first 3 months of employment. A positive experience corresponds to a manager's hires from a racial group in the last hiring event achieving tenure of at least one year in their position. Regressions include the fraction of full-time and female hires, average age of hires, total number of workers hired in the event, number of previous hiring events, time since the last hiring event, yearly unemployment and college attainment rates in the state, month and year, manager, and store fixed effects. Given the potentially forward-looking nature of our measures, we exclude workers hired in the last 3 months (1 year) of our sample for negative (positive) experiences.

Figure 4: Impact of a manager's first hiring experience with black and white workers on their subsequent black hiring share



NOTE. 95% confidence intervals from clustered standard errors at the manager level are presented using dashed lines. See Figure 3 for additional details.

Figure 5: Fraction of managers who have hired at least one black worker following their first experience with black workers



NOTE. See Figure 3 for additional details.

Table 1: Summary statistics and performance measures

	Workers		Managers	
	Mean	Std. dev.	Mean	Std. dev.
Age	31.01	(14.14)	41.82	(11.39)
Female	0.56	(0.50)	0.37	(0.48)
White	0.55	(0.50)	0.73	(0.44)
Black	0.22	(0.41)	0.11	(0.31)
Tenure	33.73	(71.68)	122.75	(125.17)
Full time	0.18	(0.37)	0.99	(0.09)
N. hires			30.16	(65.75)
N. persons	1,067,682		27,470	
N. person-months	17,445,003		684,218	
Fired or quit within 3 months (Black)	0.270	(0.444)		
Fired or quit within 3 months (White)	0.250	(0.432)		
Tenure above 1 year (Black)	0.116	(0.321)		
Tenure above 1 year (White)	0.145	(0.352)		

NOTE. Performance measures are calculated at the individual hire level. Tenure corresponds to tenure in the position for which the worker was hired. The absence of a worker quitting or being fired within one year does not imply that the worker has achieved a year of tenure, given transfers and layoffs.

Table 2: OLS estimates of the cumulative impact of previous experiences with black and white workers on current black hiring, negative and positive experiences

Black fraction hired	(1)	(2)	(3)	(4)	(5)	(6)
Black fraction quit/fired $\leq$ 3 months	-0.053	-0.073	-0.072			
	(0.009)	(0.016)	(0.017)			
White fraction quit/fired $\leq$ 3 months			0.044			
			(0.022)			
Black fraction tenure $\geq$ 12 months				0.029	0.057	0.058
				(0.014)	(0.022)	(0.024)
White fraction tenure $\geq$ 12 months						-0.001
						(0.027)
Manager FE		Y	Y		Y	Y
Worker and event controls		Y	Y		Y	Y
Store FE	Y	Y	Y	Y	Y	Y
Hiring month and year FE	Y	Y	Y	Y	Y	Y
Outcome mean	0.367	0.367	0.348	0.366	0.366	0.347
Standard deviation black	0.295	0.294	0.294	0.229	0.229	0.229
Standard deviation white	0.189	0.188	0.188	0.205	0.205	0.205
P-Value: B = -1 * W			0.060			0.090
Observations	34,496	33,971	31,911	28,879	28,456	26,655

NOTE. Clustered standard errors at the manager level are presented in parentheses. One observation corresponds to a manager-month in which at least one worker was hired. When indicated, regressions include the fraction of full-time and female hires, average age of hires, total number of workers hired in the event, number of previous hiring events, time since the last hiring event, yearly unemployment and college attainment rates in the state, as well as month and year, store, and manager fixed effects. Given the potentially forward-looking nature of our measures, we exclude workers hired in the last 3 months (1 year) of our sample for negative (positive) experiences.

Table 3: OLS estimates of the impact of a manager's first experience with black and white workers on current black hiring, negative and positive experiences

Black fraction hired	(1)	(2)	(3)	(4)	(5)	(6)
Black fraction quit/fired $\leq$ 3 months	-0.024	-0.021	-0.019			
	(0.007)	(0.007)	(0.007)			
White fraction quit/fired $\leq$ 3 months			-0.009			
			(0.008)			
Black fraction tenure $\geq$ 12 months				-0.010	-0.007	-0.010
				(0.010)	(0.010)	(0.011)
White fraction tenure $\geq$ 12 months						-0.003
						(0.011)
Worker and event controls		Y	Y		Y	Y
Store FE	Y	Y	Y	Y	Y	Y
Hiring month and year FE	Y	Y	Y	Y	Y	Y
Outcome mean	0.410	0.387		0.411	0.387	0.366
Standard deviation black	0.405	0.405		0.327	0.327	0.327
Standard deviation white	0.348	0.348		0.342	0.342	0.342
P-Value: B = -1 * W			0.006			0.375
Observations	39,143	36,816	35,613	32,969	30,908	29,869

NOTE. Robust standard errors are presented in parentheses. See Table 2 for additional details.

Table 4: OLS estimates of the cumulative impact of negative experiences on black hiring throughout a manager's hiring history

Black fraction hired	Early experiences (1)	Middle experiences (2)	Late experiences (3)
Black fraction quit/fired $\leq$ 3 months	-0.096	-0.082	-0.068
	(0.037)	(0.036)	(0.036)
Manager FE	Y	Y	Y
Store FE	Y	Y	Y
Hiring month and year FE	Y	Y	Y
Worker and event controls	Y	Y	Y
Outcome mean	0.382	0.419	0.428
Standard deviation	0.335	0.324	0.313
Observations	6,999	7,347	6,272

NOTE. Each manager's previous hiring events are separated chronologically into three experience terciles. See Table 2 for additional details.

Table 5: OLS estimates of the serial correlation of negative and positive experiences with black workers

	Fraction quit/fired $\leq$ 3 months (1)	Fraction tenure $\geq$ 12 months (2)
Lagged fraction quit/fired $\leq$ 3 months	-0.343	
	(0.032)	
Lagged fraction tenure $\geq$ 12 months		-0.369
		(0.036)
Manager FE	Y	Y
Store FE	Y	Y
Hiring month and year FE	Y	Y
Worker and event controls	Y	Y
Outcome mean	0.231	0.111
Standard deviation	0.227	0.202
Observations	13,222	11,208

NOTE. See Table 2 for additional details.

Appendix A Worker performance and tenure

Our main results use short and long tenures to measure negative and positive experiences hiring workers of different races. In actuality, negative and positive experiences would be governed by a large number of factors, many of which are not observed, and our use of turnover is based on the proposition that departures can be used as "revealed preference" for whether the supervisor and worker would like to continue the employment relationship, given their underlying preferences. In this way, our approach follows canonical models that imply that the duration of an employment spell is largely governed by the match quality.

Our data also permit us to validate our turnover-based approach with other markers of whether the manager had a positive or negative hiring experience, which we explore in Table A1. First, for a subset of 7,606 commissioned salespeople hired during our sample period, we observe the monthly revenue associated with their sales divided by their sales targets, which is the main performance measure for these positions. To account for skewness and leverage, we winsorize this variable and take its logarithm. For the 102,746 person-month observations among salespeople, we regress sales performance as a function of our tenure-based experience measures: whether the worker was quit of fired within 3 months or achieved at least one year of tenure in their position, as well as location and month fixed effects. Workers who achieved tenure of at least 12 months had about 11 percent higher monthly sales versus their target compared to workers who were fired or quit within three months; not only did these hires last longer, they were more likely to outperform their targets while employed. This outcome conforms to the standard proposition that higher match qualities will beget both longer job tenures and greater productivity, both desirable outcomes for the hiring manager.

We also observe the HR manager's reported reason for which the worker turned over. For this variable, turnover is categorized as voluntary or involuntary, and these broad categories further include detailed subsets of classifications suggesting whether the employment relationship was positive or negative. Although the distinction between types of turnover can be subjective, our approach relies on the assumption that involuntary turnover generally suggests a more negative experience, particularly terminations for poor performance. For these analyses, we return to the full sample of jobs considered in the main analysis, but restrict the sample to 240,176 workers who left within 3 months or after 12 months. Among observed departures, we then examine the reasons for turnover as outcomes. We find that 22.8% of workers who left within 3 months were involuntarily terminated, versus 16.2% who those who achieved at least 12 months tenure. More strikingly, workers who depart within 3 months are twice as likely to have been reportedly terminated for poor performance. These statistics suggest short tenures are more likely to reflect a negative

experience for the manager.

Finally, we evaluate separations classified as an employee-initiated voluntary departures for better opportunities under the premise that such employee-initiated separations are more likely to correspond to a positive experience for the period that the worker was employed. Workers who leave within 3 months are substantially less likely to be classified as quits for better opportunities compared to those who had tenures of at least 12 months.

Put together, evidence from the sales and turnover reason data corroborate that short or long tenures can be used as a measure of negative or positive experience quality in the broader sample.

Table A1: Worker performance and experience measures

Related performance outcomes	Mean	Std. error	P-value
(a) Sales performance relative to target			
Among workers who quit or were fired within 3 months	-0.023	0.013	< 0.0001
Among workers who achieved tenure of at least 12 months	0.090	0.013	
(b) Worker was involuntarily terminated			
Among workers who quit or were fired within 3 months	0.228	0.001	< 0.0001
Among workers who achieved tenure of at least 12 months	0.162	0.001	
(c) Worker was terminated for unsatisfactory performance			
Among workers who quit or were fired within 3 months	0.116	0.001	< 0.0001
Among workers who achieved tenure of at least 12 months	0.058	0.001	
(d) Worker quit for better opportunities			
Among workers who quit or were fired within 3 months	0.068	0.001	< 0.0001
Among workers who achieved tenure of at least 12 months	0.169	0.002	

NOTE. This table shows alternative performance measures and their relation to our two main measures of good and bad experiences. Outcome (a) restricts the data to commissioned salespeople who were hired and either fired or quit within 3 months or achieved at least 12 months of tenure in the position for which they were hired. Each worker's sales performance is calculated monthly, corresponding to 102,746 person-month observations. The measure corresponds to the log of monthly commissioned sales in dollars divided by the worker's sales target and is also purged of store and month effects. A value of zero means that the worker exactly hit their target. Outcomes (b), (c), and (d) use all jobs represented in our main analysis, but restrict the sample to 240,176 individuals who were hired and terminated during our sample period, either because they were fired or quit within 3 months or because they separated from their position after achieving at least 12 months of tenure. Turnover reasons are reported by HR representatives, and include involuntary reasons and voluntary reasons; outcome (b) includes all involuntary reasons, whereas outcome (c) focuses on a subset of involuntary terminations relating to unsatisfactory performance and attendance. Outcome (d) includes voluntary separations for the worker's career advancement or return to studies. Robust standard errors are presented in the second column. P-values are for the test that the two adjoining means are equal.

Appendix B Variation in black hiring across managers

We describe heterogeneity in the hiring of black workers across managers and examine how much of it is due to idiosyncratic variation across individual managers versus external factors. Theories of discrimination fundamentally differ along this dimension. Under classical statistical discrimination, managers discriminate similarly around the true productivity distribution of each group; they are not idiosyncratically biased. In stark contrast, idiosyncratic prejudice or bias are at the center of taste-based and belief-based discrimination.

Many factors presumably contribute to this heterogeneity, such as store location. To estimate how much heterogeneity in black hiring is explained by manager effects net of other factors that may vary by store, department, job, time period, or economic condition, we take Abowd et al. (1999)'s approach of analyzing connected sets of workers.[20] Over a quarter of managers hire in more than one store, around 8% hire in more than 2 stores, and the majority of managers hire for multiple job types, generating substantial variation to separately identify manager fixed effects. Indeed, the largest connected set of managers and stores covers over 90% of new workers hired at the firm during our sample period.

We implement this approach using a linear probability model of the form

$$Black_{imjlt} = X_{mjlt}\beta + \gamma_m + \alpha_j + \lambda_l + \theta_t + \varepsilon_{imjlt} \tag{4}$$

where the dependent variable indicates that worker i hired by manager m for job j in location l at time t is black. X_{mjlt} includes whether the worker was hired for a part-time or full-time job, the manager's cumulative number of hires, the yearly state unemployment rate, and the fraction of the state population with at least some college education. γ_m, α_j, λ_l, and θ_t correspond to manager, job, store, and month and year fixed effects.[21] We compute the predicted value for each individual hire and average predicted values at the manager level to obtain the predicted share of black hires for each manager. This procedure yields higher predicted shares for managers recruiting in jobs, locations, periods, and market conditions associated with more black hires.

Figure B1 contrasts the predicted black hiring shares across managers with the actual values. By construction, predicted shares approximate the middle of the distribution. Especially without manager fixed effects, they fail to capture much of the bottom of the distribution, predicting that too many managers hire 10-30% black workers and too few hire less. Beyond manager fixed effects, the majority of the explanatory power comes from

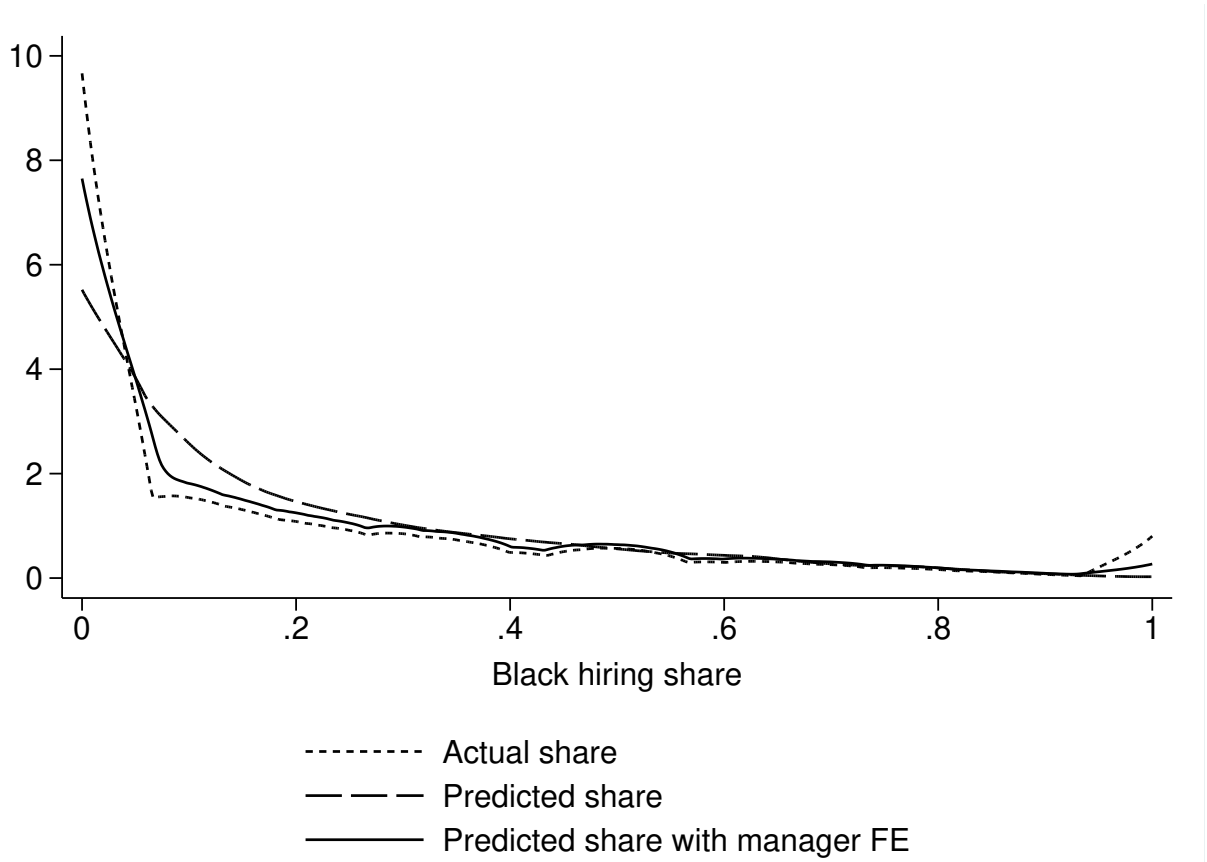
[20] Several recent papers have also applied this approach to estimate manager fixed effects net of sets of highly correlated covariates e.g. Lazear et al. (2016) and Benson et al. (2019)

[21] The results are similar when including department fixed effects as well as worker demographics including age and gender.

the store fixed effects, which capture store and area-level characteristics. Manager fixed effects alone explain 4-5% of the total variation in black hiring and roughly a third of the discrepancy between actual shares and those predicted by the model without manager fixed effects. Qualitatively, the model with manager fixed effects still under-predicts the share of managers who hire very few or no black workers, but the discrepancy is substantively smaller. This exercise suggests that, beyond store and contextual factors, the specific identity of the hiring manager is an important predictor of black hiring in a department. Figure B2 presents analogous results for white hiring while Figure B3 presents results restricted to managers who hire at least 5 workers over our sample period, highlighting that manager fixed effects explain a particularly large share of residual variation in black hiring for that subset of managers.

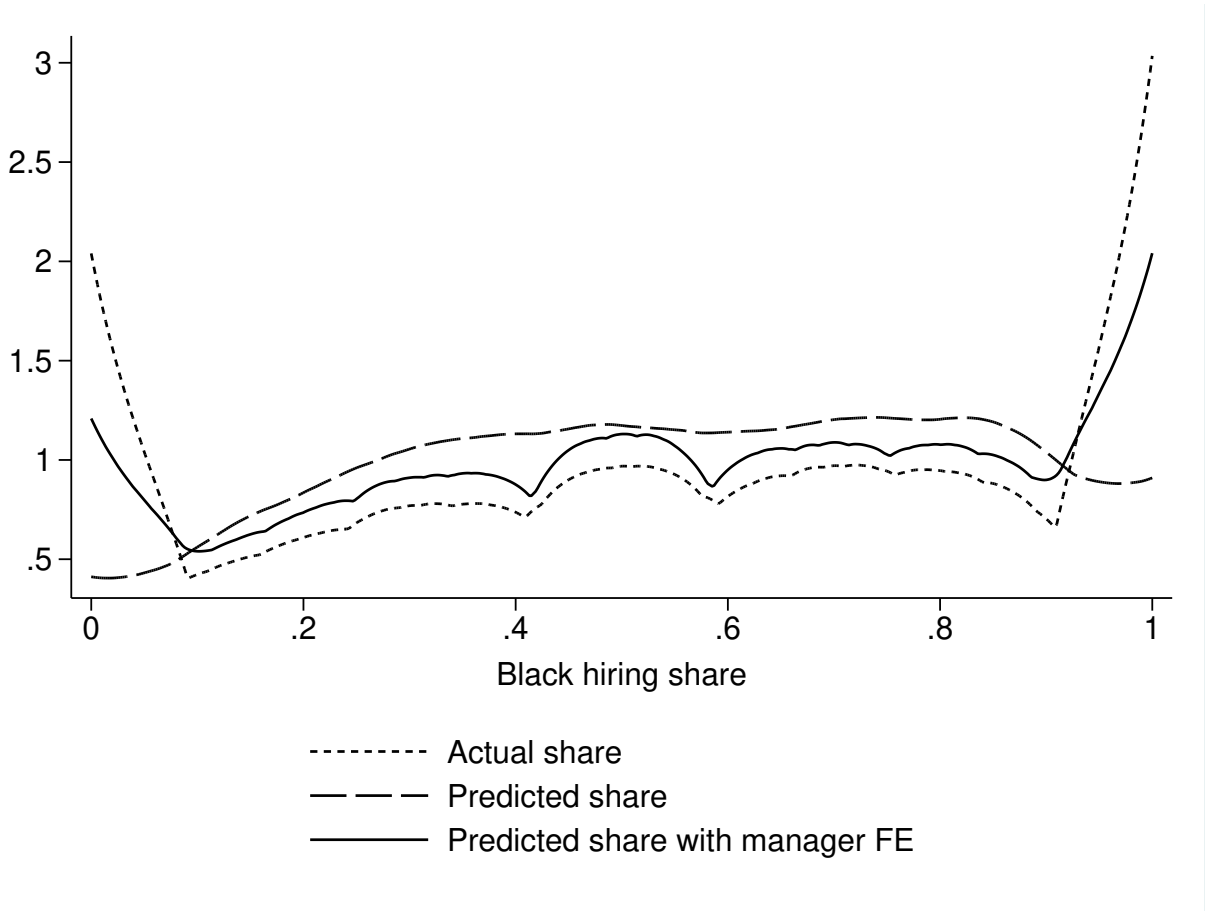
The distribution of manager fixed effects is shown in Figure B4. To adjust the estimated fixed effects based on their precision from the total number of hires by each manager, we apply an empirical Bayes shrinkage procedure, although its impact on the estimates is negligible (Morris, 1983; Guarino et al., 2015). The distribution appears fairly symmetric. As shown in Figure B5, the analogous distribution for white workers exhibits a slight positive skew. Simple correlation analyses indicate that the fixed effects for black hiring are negatively correlated with turnover of black workers, suggesting that they capture something concrete about the ability or willingness of managers to successfully hire and manage these workers. In contrast, there is little correlation between the fixed effects and the state-level prejudice measure from Stephens-Davidowitz (2014) after controlling for the fraction of black population in the Core-Based Statistical Area (CBSA).

Figure B1: Kernel density estimates of predicted black hiring shares



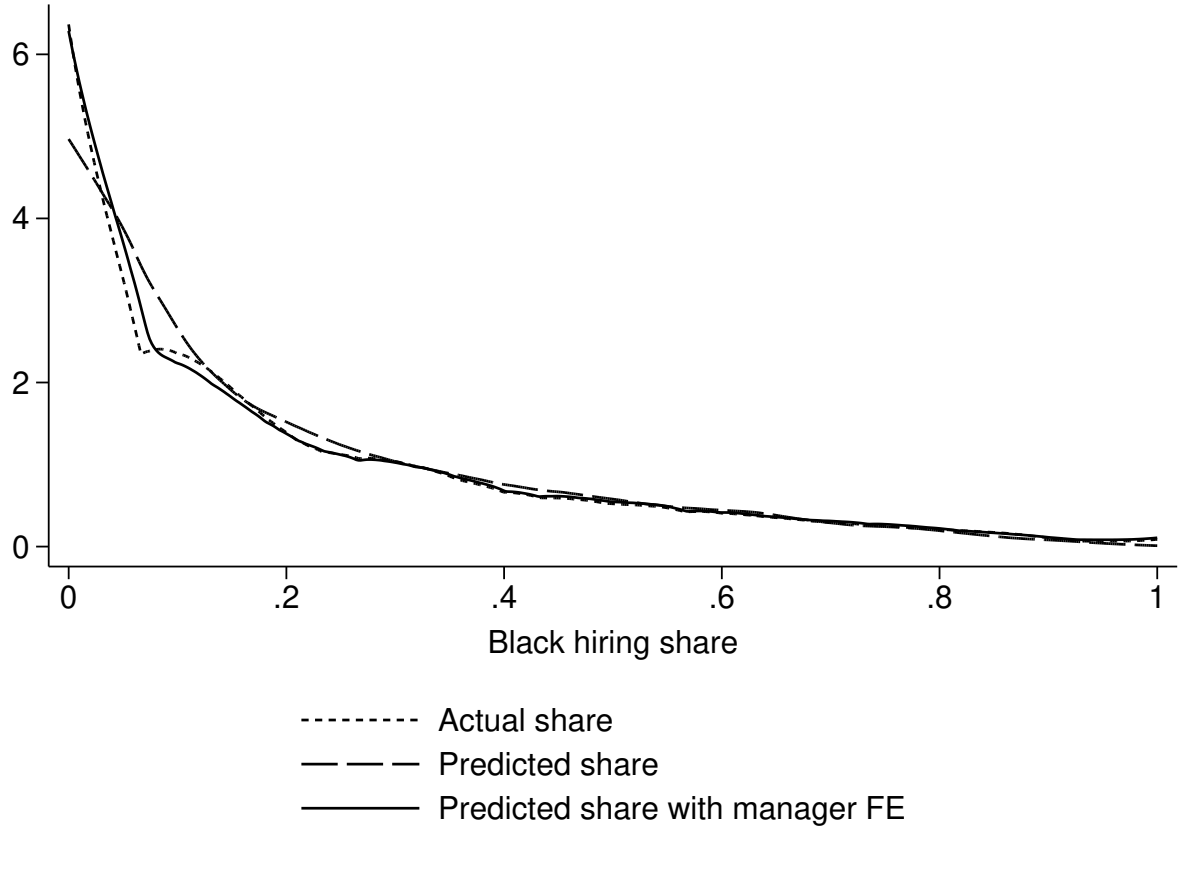
NOTE. Predicted shares are obtained by averaging predicted values for each manager from an individual hire level linear probability model regression including whether the worker was hired for a part-time or full-time job, the manager's previous number of hires at the time that the current worker is hired, yearly state unemployment rate and fraction with at least some college education, and month and year, store, job title, and individual manager fixed effects. A small fraction of predicted values outside of the 0-1 range were replaced with values of 0 or 1 for ease of visualization. Actual share bandwidth: 0.066. Predicted share bandwidth: 0.059. Predicted share with manager FE bandwidth: 0.068.

Figure B2: Kernel density estimates of manager predicted white hiring shares



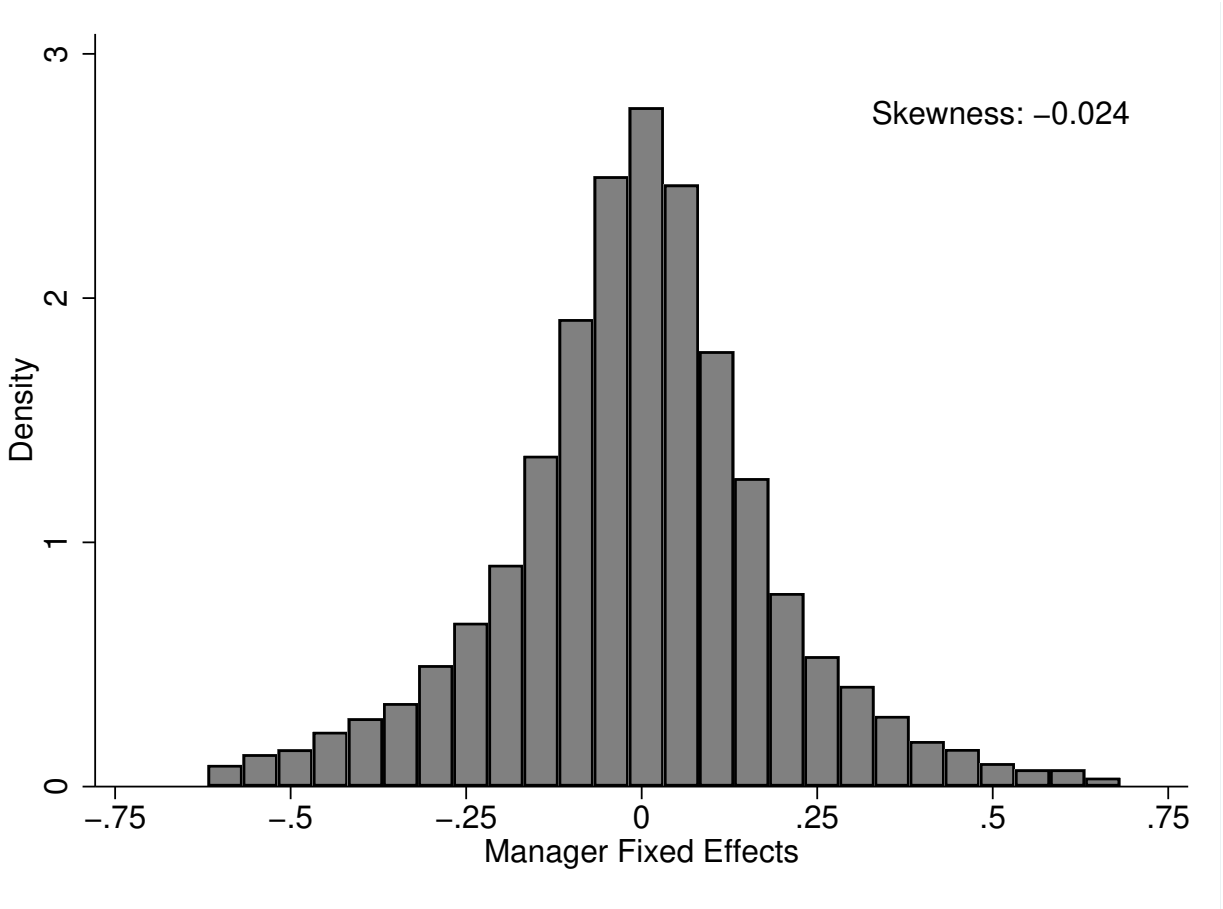
NOTE. See Figure 2 for details. Actual share bandwidth: 0.091. Predicted share bandwidth: 0.074. Predicted share with manager FE bandwidth: 0.086.

Figure B3: Kernel density estimates of manager predicted black hiring shares, managers with over 5 hires



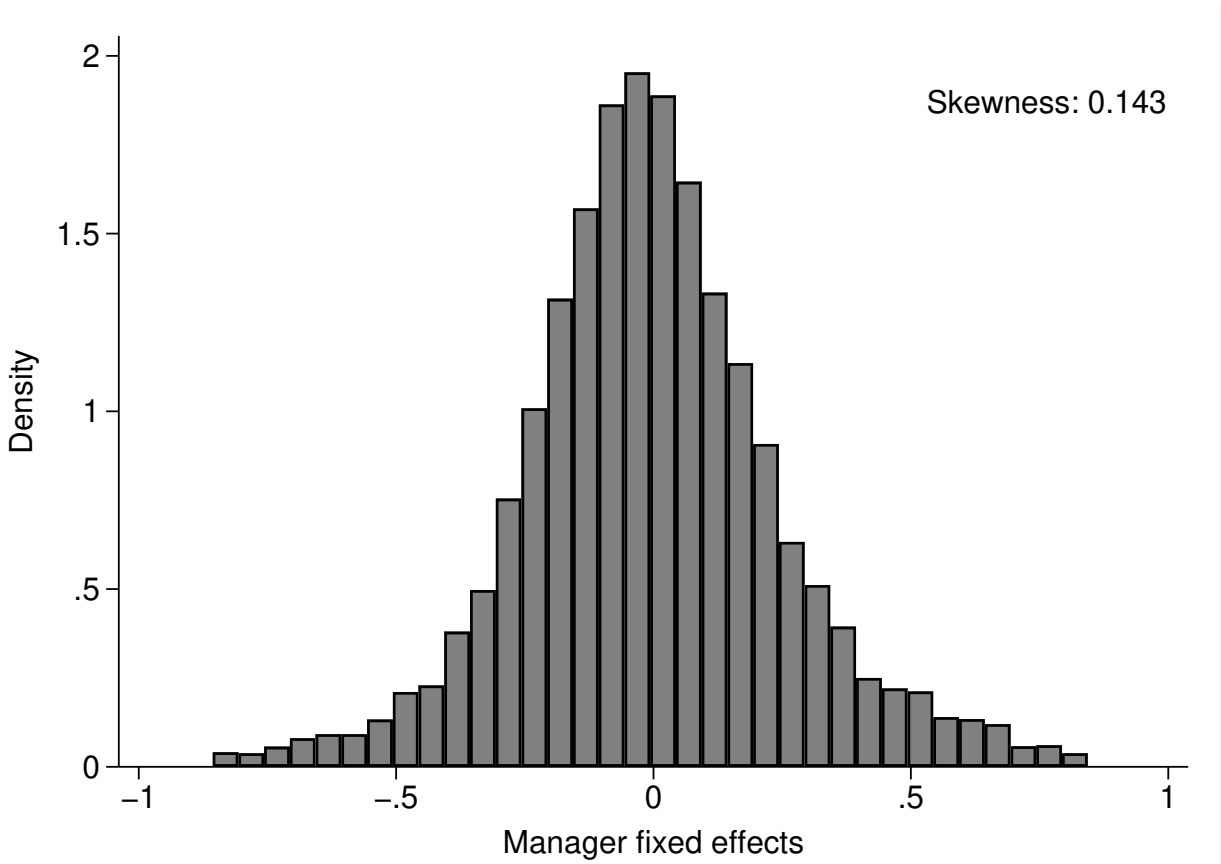
NOTE. See Figure 2 for details. Actual share bandwidth: 0.066. Predicted share bandwidth: 0.063. Predicted share with manager FE bandwidth: 0.068.

Figure B4: Distribution of manager fixed effects for black hiring



NOTE. See Figure 2 for specification details. Fixed effects are estimated for the largest connected sample of stores and managers following Abowd et al. (1999) and adjusted using empirical Bayes shrinkage.

Figure B5: Distribution of manager fixed effects for white hiring



NOTE. See Figures 2 and 3 for details.

Appendix C Additional results on the impact of hiring experiences

Table C1: OLS estimates of the cumulative impact of previous experiences with black and white workers on current black hiring, expected tenure

Black fraction hired	(1)
Black expected months of tenure	0.050
	(0.011)
White expected months of tenure	-0.009
	(0.011)
Manager FE	Y
Store FE	Y
Hiring month and year FE	Y
Worker and event controls	Y
Outcome mean	0.380
P-value: B = -1 * W	0.023
Standard deviation black	0.524
Standard deviation white	0.555
Observations	35,937

NOTE. Clustered standard errors at the manager level are presented in parentheses. Expected months of tenure corresponds to the cumulative average deviation from expected tenure at the firm for workers hired by the manager. See Table 2 for additional details.

Table C2: OLS estimates of the cumulative impact of previous experiences with black and white workers on current black hiring, bottom and top quartiles of tenure

Black fraction hired	(1)	(2)
Black expected tenure in the bottom quartile	-0.050	
	(0.007)	
White expected tenure in the bottom quartile	0.022	
	(0.007)	
Black expected tenure in the top quartile		0.065
		(0.007)
White expected tenure in the top quartile		0.026
		(0.007)
Manager FE	Y	Y
Store FE	Y	Y
Hiring month and year FE	Y	Y
Worker and event controls	Y	Y
Outcome mean	0.380	0.380
Observations	35,883	35,883

NOTE. Clustered standard errors at the manager level are presented in parentheses. Expected tenure corresponds to the cumulative average deviation from expected tenure at the firm for workers hired by the manager. See Table 2 for additional details.

Table C3: OLS estimates of the cumulative impact of previous experiences with black workers on current black hiring, additional experience measures

Black fraction hired	Fired (1)	Quit (2)	Relative to white (3)	Relative to CBSA (4)
Black fraction quit/fired $\leq$ 3 months	-0.087	-0.057	-0.068	-0.079
	(0.027)	(0.018)	(0.014)	(0.016)
Manager FE	Y	Y	Y	Y
Store FE	Y	Y	Y	Y
Hiring month and year FE	Y	Y	Y	Y
Worker and event controls	Y	Y	Y	Y
Outcome mean	0.367	0.37	0.348	0.369
Observations	33,971	33,971	31,911	33,675

NOTE. Clustered standard errors at the manager level are presented in parentheses. See Table 2 for additional details.

Table C4: OLS estimates of the impact of the latest experience with black and white workers on current black hiring, negative and positive experiences

Black fraction hired	(1)	(2)	(3)	(4)	(5)	(6)
Black fraction quit/fired $\leq$ 3 months	-0.041	-0.040	-0.041			
	(0.005)	(0.006)	(0.006)			
White fraction quit/fired $\leq$ 3 months			0.035			
			(0.006)			
Black fraction tenure $\geq$ 12 months				0.014	0.022	0.022
				(0.008)	(0.009)	(0.009)
White fraction tenure $\geq$ 12 months						-0.016
						(0.008)
Manager FE		Y	Y		Y	Y
Worker and event controls		Y	Y		Y	Y
Store FE	Y	Y	Y	Y	Y	Y
Hiring month and year FE	Y	Y	Y	Y	Y	Y
Outcome mean	0.367	0.367	0.348	0.366	0.366	0.347
Standard deviation black	0.409	0.409	0.174	0.296	0.296	0.296
Standard deviation white	0.352	0.352	0.409	0.297	0.297	0.297
Observations	34,496	33,971	31,911	29,511	29,064	27,249

NOTE. Clustered standard errors at the manager level are presented in parentheses. See Table 2 for additional details.

Table C5: OLS estimates of the impact of the first three experiences with black and white workers on current black hiring, negative and positive experiences

Black fraction hired	(1)	(2)	(3)	(4)	(5)	(6)
Black fraction quit/fired $\leq$ 3 months	-0.043	-0.049	-0.042			
	(0.013)	0.013	(0.014)			
White fraction quit/fired $\leq$ 3 months			-0.013			
			(0.017)			
Black fraction tenure $\geq$ 12 months				0.035	0.009	0.020
				(0.018)	(0.017)	(0.018)
White fraction tenure $\geq$ 12 months						0.018
						(0.020)
Manager FE		Y	Y		Y	Y
Worker and event controls		Y	Y		Y	Y
Store FE	Y	Y	Y	Y	Y	Y
Hiring month and year FE	Y	Y	Y	Y	Y	Y
Outcome mean	0.405	0.404	0.402	0.400	0.430	0.401
Standard deviation black	0.200	0.239	0.239	0.200	0.200	0.200
Standard deviation white	0.214	0.205	0.205	0.214	0.214	0.214
Observations	34,136	31,772	27,829	29,300	25,041	23,527

NOTE. Clustered standard errors at the manager level are presented in parentheses. Experience measures refer to the average hiring outcome over the first three hiring events with black and white workers (excluding managers who hired less than three times from either group). See Table 2 for additional details.

Table C6: OLS estimates of the impact of previous experiences with black workers on current black hiring, other sources of updating

Black fraction hired	Avg. exp. versus others' (1)	Store change (2)	"Endowed" workers (3)	"Exogenous" separation (4)
Black fraction quit/fired $\leq$ 3 months	-0.069	-0.067	-0.044	-0.063
	(0.023)	(0.045)	(0.027)	(0.032)
Other managers at the store				
Black fraction quit/fired $\leq$ 3 months	-0.016			
	(0.025)			
White fraction quit/fired $\leq$ 3 months	-0.004			
	(0.037)			
Manager FE	Y	Y	Y	Y
Store FE	Y	Y	Y	Y
Hiring month and year FE	Y	Y	Y	Y
Worker and event controls	Y	Y	Y	Y
Outcome mean	0.352	0.356	0.328	0.367
Observations	30,985	977	11,659	33,971

NOTE. Clustered standard errors at the manager level are presented in parentheses. "Avg. exp. versus others'" includes a term for a manager's own experiences with black workers as well as terms for the experiences of other managers at the same store. "Store change" indicates that the manager changed store between their previous experience with black workers and the current hiring event. "Exogenous separation" restricts fires and quits to dissatisfaction with pay, compensation or benefits, worker integrity, illegal or unethical behavior, or violation of rules and policies. "Endowed workers" corresponds to workers already in the department at the manager's arrival. See Table 2 for additional details.

Table C7: Placebo tests

	Negative experiences before manager DV: Frac. hired (1)	Black hiring before manager DV: Neg. exp. (2)	Hiring in event t-1 and neg. exp. t DV: Neg. exp. (3)	Hiring in event 1 and neg. exp. t DV: Neg. exp. (4)
Black fraction quit/fired $\leq$ 3 months	0.018			
	(0.022)			
Black fraction hired		0.010	0.0001	-0.009
		(0.033)	(0.006)	(0.014)
Manager FE			Y	
Store FE	Y	Y	Y	Y
Hiring month and year FE	Y	Y	Y	Y
Worker and event controls	Y	Y	Y	Y
Outcome mean	0.478	0.219	0.265	0.225
Observations	9,741	7.827	36,256	19,200

NOTE. Robust standard errors are presented in parentheses for columns 1-2 and clustered at the manager level for column 3. The first column presents results of a time placebo test investigating the impact of a worse performance by black hires in the 3 months before a manager begins in their position at the department on the hiring of black workers by the manager in subsequent hiring events. The second column presents results of a time placebo test investigating the impact of more black hiring in the 3 months before a manager begins in their position at the department on the likelihood of a negative experience with black workers in subsequent hiring events. The third column presents results of a placebo test investigating whether the share of black hires in the previous hiring event predicts the likelihood of a negative experience with black workers in the current hiring event. See Table 2 for additional details.

Table C8: OLS estimates of the correlation between the existing share of black workers in a department and the black hiring share

Black fraction hired	(1)
Lagged share of black workers in the department	-0.039
	(0.017)
Manager FE	Y
Store FE	Y
Hiring month and year FE	Y
Outcome mean	0.285
Observations	110,449

NOTE. Clustered standard errors at the manager level are presented in parentheses. See Table 2 for details.

Appendix D Additional groups

Table D1: OLS estimates of the cumulative impact of previous experiences on current hiring, negative and positive experiences

Black or Hispanic fractiong hired	Black managers (1)	Female workers (2)	Hispanic workers (3)	Black managers (4)	Female workers (5)	Hispanic workers (6)
Black fraction quit/fired $\leq$ 3 months	-0.266	-0.057				
	(0.054)	(0.022)				
Hispanic fraction quit/fired $\leq$ 3 months			-0.025			
			(0.019)			
White fraction quit/fired $\leq$ 3 months	0.084	0.031	0.029			
	(0.072)	(0.027)	(0.023)			
Black fraction tenure $\geq$ 12 months				0.203	0.072	
				(0.081)	(0.031)	
Hispanic fraction tenure $\geq$ 12 months						0.003
						(0.024)
White fraction tenure $\geq$ 12 months				0.048	-0.047	-0.016
				(0.074)	(0.038)	(0.027)
Manager FE	Y	Y	Y	Y	Y	Y
Store FE	Y	Y	Y	Y	Y	Y
Hiring month and year FE	Y	Y	Y	Y	Y	Y
Worker and event controls	Y	Y	Y	Y	Y	Y
Outcome mean	0.556	0.403	0.293	0.551	0.402	0.290
Standard deviation black	0.237	0.291	0.294	0.210	0.2221	0.253
Standard deviation white	0.240	0.232	0.205	0.225	0.205	0.209
Observations	3,396	19,546	27,349	2,825	16,198	22,482

NOTE. Clustered standard errors at the manager level are presented in parentheses. See Table 2 for details.