

RESEARCH REPORT

Search and Matching in Modern Labor Markets

A Landscape Report

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WorkRise



WorkRise is a research-to-action network on jobs, workers, and mobility based at the Urban Institute. WorkRise connects workers, employers, researchers, and advocates to build evidence to inform and shape policies and practices that bring economic security and upward mobility for all US workers—opening new opportunities for workers to thrive at work and in life.

About This Series

WorkRise is a research-to-action network on jobs, workers, and mobility based at the Urban Institute. This publication is one in a series of reports WorkRise has commissioned from the nation's preeminent social scientists and economic mobility researchers. These reports map out the current frontiers of knowledge across six channels that influence workers' economic mobility and advancement in the US labor market: macroeconomic and labor market contexts and policies; employer practices; worker power, voice, and representation; job search and matching; skills, training, and human capital; and the social determinants of work.

The purpose of these reports is twofold: to identify areas where existing empirical evidence can inform current policy and practice and to characterize knowledge gaps in order to inform a set of priorities for advancing research, building the evidence base, and motivating action in policy and practice. As part of the research process, WorkRise convened a cross-sector group of advocates, practitioners, and experts to assess the relevance and value of knowledge-building priorities proposed by study authors.

Each report examines root causes and potential solutions for reversing the decades-long decline in mobility and enduring racial and gender disparities in the labor market. These reports take a broad view of the market, institutional, political, and social forces that shape worker outcomes. By delineating questions with the most important implications for worker well-being, these reports will inform WorkRise's research agenda and broader debates on creating new pathways for mobility in the labor market.

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Introduction

The labor market affects individuals and communities in many ways. Jobs are the primary income source and a major use of time for most individuals. When good jobs are plentiful, individuals and communities are better able to thrive. However, jobs are not simply created. Instead, jobs arise from the *matching* of individuals and employers who find each other through a diverse set of strategies, pursued with varying degrees of intensity, which we refer to as *search*. The search and matching process has broad consequences. For example, a substantial portion of earnings growth over individuals' careers arises from moving to better-paying jobs (Topel and Ward 1992). This type of job mobility declines during recessions (Haltiwanger et al. 2018), reducing the earnings of some workers for many years (Kahn 2010; Oreopoulos, von Wachter, and Heisz 2012). Moreover, declines in employment have broad negative effects, as demonstrated by the long-lasting decrease in earnings and increase in mortality after individuals lose their jobs (e.g., Davis and von Wachter 2011; Sullivan and von Wachter 2009) and long-term reductions in education and income for children who grow up during a recession (Stuart 2022). At the same time, the joint processes of job destruction and creation lead to higher productivity growth (e.g., Foster, Haltiwanger, and Syverson 2008). Search and matching is key for understanding labor market conditions and developing policies that promote more efficient and equitable outcomes.

This paper discusses what we know and what we need to learn about search and matching in modern labor markets, where a variety of real-world factors—referred to as *frictions*—prevent individuals from matching instantaneously with suitable employers.¹ We focus on empirical evidence from high-income countries, with particular emphasis on the lower-wage labor market within those countries. A vast body of research exists on search and matching, and we do not attempt to provide a comprehensive review of the literature. Instead, we synthesize various approaches, results, and challenges, with the hope of stimulating additional work by researchers, practitioners, and policymakers.

We begin by discussing how individuals search for jobs. Both employed and unemployed individuals search for jobs in a variety of ways, and job search effort varies considerably across people and over time. Job search is difficult, and there are reasons to think that some individuals do not search for jobs in the most effective manner. Individuals must make a variety of decisions, such as how much time to devote to each job search

activity, which jobs to apply to, and whether to accept a job offer. There is considerable uncertainty about the returns associated with each decision. Surveys reveal that the average job seeker spends less than two hours per day searching for a job. Most of this time is spent reviewing and responding to job postings online, and only a small share of job applications lead to an interview or job offer. Research has documented that job seekers' decisions are influenced by a wide range of frictions, such as imperfect information, time-inconsistent preferences, the failure to attend to all possible options, and other behavioral biases. Search behavior also reflects the fact that job seekers attach different levels of importance to various job characteristics, such as schedule flexibility. The monetary and nonmonetary costs of switching jobs tends to decrease mobility.

We then discuss how individual job search behavior is shaped by a range of policies, including publicly provided job search assistance, unemployment insurance (UI), and legal restrictions on occupational mobility. Job search assistance, including information about relevant labor market opportunities, stands out as a promising option for enhancing the effectiveness of individuals' job search. Eliminating barriers created by noncompete agreements and occupational licensing also could provide new opportunities.

Employers also face several decisions in the search and matching process. Like job seekers, employers vary the methods and intensity of their search. Although fewer descriptive studies focus on how employers fill openings, the available evidence indicates that they face sizable recruiting costs. Employers increasingly use algorithms to evaluate job applications, which can enhance opportunities for job seekers by reducing managers' bias but can also exclude nontraditional candidates from the interview process. Firms devote more resources to the evaluation of candidates for positions that require greater pre-hire education or greater post-hire training. Firms also adjust the desired characteristics of job applicants in response to the availability of workers and economic conditions. Hiring subsidies have been shown to increase the number of vacancies that are filled, but the effectiveness of this policy could depend on whether it is permanent versus temporary and expected versus unexpected.

Besides individuals and employers, intermediaries like social networks, educational institutions, and online job platforms play a central role in the job search process. Intermediaries address a core issue in the search and matching process by facilitating the flow of information about job seekers and openings. The distribution of benefits depends on whether the intermediary is openly accessible, such as publicly funded American Job Centers or online marketplaces, or more restricted, such as social networks or colleges.

Motivated by the long-standing labor market discrimination faced by people of color and women, we focus on some of the distinct issues in the search and matching process for these groups. Studies show that many employers respond less positively to job applications from nonwhite candidates. In response, people of color appear to exert greater effort on job search and apply to a wider range of positions. Policies that aim to improve prospects for nonwhite job seekers by restricting information about applicants' criminal or credit history have tended to backfire, likely because in the absence of this information, employers rely on negative stereotypes of nonwhite candidates or are more uncertain about those candidates' suitability. The impacts of antidiscrimination laws are generally positive but have proven more difficult to study. Several studies point to the role of social networks, which are often segregated by race, as a determinant of racial disparities in labor market outcomes.

The labor market opportunities available to women have improved considerably over recent decades. However, there remain important gender differences in job search, such as women's desire (or need) to commute shorter distances, and the fact that women are more likely to be provided with information about work-life balance, even if they do not ask for this information. Gender differences can arise from a complex interaction of individual preferences and expectations, household decisions, social norms, and employer behavior. There is little indication that paid family leave mitigates the career penalty faced by mothers, but the effects of subsidized childcare are promising. Antidiscrimination laws have also proved beneficial in narrowing gender gaps in the labor market.

Although much has been learned about search and matching, additional research is needed in several key areas. We highlight knowledge gaps throughout this report and conclude with three areas that deserve broad funding and experimentation. First, additional data should be collected on individual job search (such as how individuals decide how much effort to put into their search) and, especially, how employers fill job openings (where data are sparse). Second, research should prioritize the evaluation of general equilibrium effects of policies. Many policies have positive effects on some individuals, but these benefits could come at the expense of other job seekers, which would lower the attractiveness of these policies. Third, the nature of search and matching has changed rapidly in recent years, which raises many questions for researchers and policymakers. Specific areas include increases in online job search, computer-based hiring algorithms, alternative employment arrangements like temporary independent contractor positions, and individuals' desire to work from home.

Conceptual Framework: Search and Matching in Frictional Labor Markets

This section describes a simple conceptual framework of search and matching in the labor market. Our focus on search and matching is motivated by two features of real-world labor markets. First, job seekers must search for open positions, and employers must search for available candidates. Second, an individual and employer need to match for a job to be filled. The private value of a match, also known as the match-specific surplus or *match quality*, equals the total net benefits that an individual and employer receive from entering an employment relationship. These benefits can comprise output (e.g., an employer valuing the goods or services produced by an employee) and amenities (e.g., an employee valuing the opportunity to interact with coworkers).² Frictions play a central role in search and matching. In our view, frictions represent a broad set of real-world phenomena that cause the labor market to differ from an (unrealistic) benchmark model, which would involve perfect information among individuals and employers, instantaneous matching, no pecuniary or nonpecuniary costs to changing jobs, and no behavioral biases.

Individuals make a series of interrelated decisions as part of their job search. First, they decide how much effort to exert (if any) along a variety of dimensions, such as researching career pathways and submitting job applications. The most important cost of searching for a job is the time spent on often unenjoyable activities. The benefit of search effort depends on the probability of getting a job offer and the value of the job offer. In turn, the value of a job offer depends on wages and amenities in the new job relative to the value of remaining in the current employment situation (either unemployment or employment in the current job). One particularly important decision is which job applications to submit. In making this choice, individuals consider the perceived probability of receiving a given job offer, the perceived value of a job conditional on receiving an offer, and the cost of applying for a job (e.g., time or travel costs). After receiving job offers, individuals decide whether to accept a job based on forward-looking beliefs and, in some cases, negotiate over compensation and job conditions.

A variety of frictions affect individuals' job search. The basic frictions in search and matching models are the time required to find a job opening and uncertainty about whether a job will be found. Other frictions include imperfect information about job opportunities, behavioral biases that lead individuals to repeatedly think that they will search for a job "tomorrow" or fail to account for all possible options, and monetary and nonmonetary costs associated with starting a new job. These frictions can affect decisions made by individuals throughout the search and matching process. The consequences of frictions could be permanent and could even grow over time (e.g., if having a worse job today reduces opportunities for future advancement).

Employers also face several decisions around hiring. In choosing whether to fill a job opening, they trade off the cost of recruiting (e.g., advertising expenses or staff time) against the expected benefit, which depends on the probability of filling the opening and the surplus if the opening is filled. Employers then must choose a set of applicants to interview, which depends on the perceived probability that an applicant will accept a job offer, the perceived surplus of hiring an applicant, and the cost of the interview. After the interview stage, employers decide whether to make an offer, using previously formed views of workers and information acquired in the interview.

Employers' decisions also depend on frictions. Analogous to the frictions faced by individuals, employers must wait to match with an applicant and face uncertain outcomes. Employers also have imperfect information about candidates, are subject to behavioral biases of managers and recruiters, and must pay the costs of recruiting workers.

The equilibrium in the labor market depends on how job seekers and employers behave, in addition to market conditions (such as whether the economy is in a recession or booming), market structure (such as the extent of employers' market power), institutional features (such as the share of workers who are union members), and a range of policies (such as UI and occupational licensing).³ Formal theoretical models characterize whether an equilibrium is efficient and make predictions about the effects of policy changes. However, theoretical results depend on specific assumptions, such as how wages are determined and how frictions affect the search and matching process. This is an active area of research, and adequately addressing its nuances is beyond the scope of this paper. For comprehensive reviews, see work by Rogerson, Shimer, and Wright (2005) and Wright and colleagues (2021).

Empirical investigations of the matching process generally find evidence of positive sorting, in which individuals with higher earnings potential tend to work for employers that pay higher wages overall (Bonhomme et al. 2020; Card, Heining and Kline 2013; Song et al. 2019). One natural explanation for this sorting is that more productive firms share some of their profits with workers and produce output in a way that disproportionately requires workers with specialized, well-compensated skills (e.g., Card et al. 2018). More generally, the matching of individuals and employers depends on benefits other than salaries (such as parental leave), work styles (such as autonomy), and organizational culture.

Search and matching is only one aspect of the labor market. For example, workers invest in human capital (through schooling and on-the-job training), and employers organize their production processes (in part, by investing in equipment and machines). This paper largely takes these decisions as given, though we briefly return to them later. We do not cover many issues which arise after a job is filled, such as whether workers and firms maintain the employment relationship and how wages evolve over time within a job.

Labor Supply: Individuals

This section describes what is known about search and matching from the perspective of individuals. We focus on how individuals search for jobs and how this behavior depends on a range of policies.

How Individuals Search for Jobs

Research sheds light on several aspects of how individuals look for jobs within the multidimensional job search process. This evidence comes from surveys fielded by the Bureau of Labor Statistics and by researchers, as well as administrative data from job search websites.

Time Spent on Job Search

Time use surveys reveal that unemployed individuals spend a modest amount of time on job search. Using the 2003–2006 American Time Use Survey, Krueger and Mueller (2012) find that unemployed individuals spend about 30 minutes a day on job search.⁴ A key explanation for this modest amount of time is that only 20 percent of unemployed individuals report searching for a job on a given day. Unemployed individuals who search for a job spend about 2.6 hours a day doing so. For a sample of individuals receiving UI benefits in New Jersey in 2009, Krueger and Mueller (2011) find that the average amount of time spent on job search each day is 65 minutes according to daily time diary data and 100 minutes according to weekly recall surveys. Data from the Federal Reserve Bank of New York’s Survey of Consumer Expectations indicates that unemployed individuals (nearly all of whom are searching for a job, by the survey’s definition) spend about 80 minutes per day looking for a job (Faberman et al. 2021). All of these measures show that unemployed individuals spend less than two hours a day searching for a job on average.⁵

We interpret these results as indicating that job search is best understood along a continuum. Many unemployed individuals who satisfy the standard definition of “actively searching for work” do not engage in any search on a given day. Instead, the amount of

time devoted to job search varies greatly. This view of job search also naturally incorporates individuals who are employed, as we discuss below.

The survey in Krueger and Mueller (2011) also provides information on how individuals allocate their time across different job search methods. Individuals spend about 40 percent of their time sending out applications or responding to job ads and 25 percent looking at job postings. About 20 percent of time is spent contacting friends, relatives, and employers; less than 5 percent is spent contacting public or private employment agencies. Job interviews make up less than 5 percent of the total time spent on job search. We are not aware of research assessing whether the total amount of time spent on job search or the amount of time spent on each activity is optimal from individuals' standpoints.

Job Applications and Job Offers

A critical early step in the job search process is submitting applications. Faberman and colleagues (2021) estimate that unemployed job seekers submit about 10 applications a month on average, while employed individuals (including those not actively looking for work) submit about 1 application a month on average.⁶ Individuals tend to submit more applications to postings with higher wages, all else being equal (Banfi and Villena-Roldán 2019; Belot, Kircher, and Muller 2018; Marinescu and Wolthoff 2020).⁷ Individuals are less likely to apply to jobs requiring longer commutes or moves (Faberman and Kudlyak 2019; Manning and Petrongolo 2017; Marinescu and Rathelot 2018). As their job search period extends longer, individuals are willing to accept lower-paying jobs (Krueger and Mueller 2016; Marinescu and Skandalis 2021).

The main goal of submitting a job application is to get a job offer. Measuring the conversion of applications to job offers is challenging, but the available evidence indicates that the vast majority of applications are unsuccessful. In audit studies, researchers experimentally manipulate the characteristics of résumés and record the share of submitted applications that receive a call or email with an interview invitation. To take one recent example, Deming and colleagues (2016) find that only 8 percent of applications to jobs in the business and health fields receive a callback. Because employers generally interview multiple candidates for each open position, the share of applications that lead to a job offer is even lower. The Survey of Consumer Expectations asks individuals how many job applications they submitted over the prior four weeks and how many job offers they

received. About 3 percent of job applications result in an offer for unemployed job seekers, but the yield is around 10 percent for those searching while employed (Faberman et al. 2021). Belot, Kircher, and Muller (2019) find that from a sample of job seekers recruited from local public unemployment agencies in Scotland, less than 1 percent of job applications result in an offer. These surveys aim to measure all job applications, including situations where individuals are personally invited to apply. Moreover, the surveys are consistent with administrative data from France, which indicates that about 3 percent of online job applications result in a new job (Marinescu and Skandalis 2021). For many individuals, the expected benefits of submitting a job application are low, although the cost of applying for a job can be low as well.

Accepting a Job Offer and Bargaining

Once individuals have a job offer in hand, their final decision is whether to accept it. Individuals will accept an offer if the expected value of doing so exceeds the expected value of declining the offer. For example, if individuals expect a better job offer next week, they might readily decline a job offer today. The value of a job consists of both wage and nonwage characteristics.

Although there is less research on workers' choice of whether to accept a job offer, evidence on their valuation of job characteristics is relevant. Mas and Pallais (2017) embed a hypothetical choice experiment in an actual job application process, which allows them to estimate the distribution of applicants' willingness to pay for more flexible job schedules. Although the average worker is not willing to sacrifice much of their pay to gain job flexibility, the amount that individuals value different job characteristics varies considerably. Heterogeneity in the valuation of job characteristics can explain why seemingly similar individuals make different decisions. When asked about hypothetical job choices at age 30, New York University undergraduates express a willingness to accept a lower salary in return for greater job security and job flexibility, although these preferences differ markedly by gender, as we discuss in the Differences by Race and Gender section.

Maestas and colleagues (2018) measure reported preferences over a wider range of job characteristics for a wider range of individuals. Their results underscore the importance of nonwage characteristics for the value of jobs while also providing evidence that the valuation of job characteristics varies by an individual's gender, race, age, education, and

wage level. Those with higher education and higher wages are more likely to work in jobs with better nonwage characteristics. Other evidence quantifies the extent to which individuals are willing to accept lower pay in return for greater workplace safety (e.g., Viscusi 1993). The COVID-19 pandemic led individuals to place higher value on the ability to work from home, and initial evidence suggests that this valuation could persist to some degree beyond the pandemic (Barrero, Bloom, and Davis 2021).

Individuals might also attempt to bargain with an employer over job conditions. Evidence on the extent of bargaining comes from Hall and Krueger (2012), who analyze a survey of individuals who began a job within the last 10 years. About one-third of individuals bargained over pay before accepting a job offer, but there is considerable variation in who bargains. Bargaining is higher among individuals with more education and lower among individuals who accept a part-time, union, or government job. These results partly reflect differences in individual bargaining power (which is higher among those with more education and those seeking a full-time job) and differences in the extent of centralized negotiation (which is more common for union and government jobs).

Job Search among Employed Individuals

Employed individuals also search for jobs. Evidence from the Survey of Consumer Expectations indicates that about 20 percent of employed individuals engage in some form of job search over a given four-week period (Faberman et al. 2021). The survey analyzed by Hall and Krueger (2012) shows that 42 percent of individuals could have kept their prior job before accepting a new one. As seen from employers' perspective, about 40 percent of new hires are recruited from another job (Fallick and Fleischman 2004).

The incentives and behavior of employed individuals differ from unemployed individuals in notable ways. Having a job increases individuals' baseline level of well-being, which means that employed job seekers can be more selective in their job search. Evidence from Faberman and colleagues (2021) indicates that employed job seekers spend fewer hours on their job search and send out fewer applications than unemployed job seekers. Employed individuals could engage in intermittent or opportunistic job search when attractive options come around. Besides having better outside options, employed job seekers also could benefit from preferential treatment by employers (who might view employed individuals as higher-quality candidates) and access to networking

opportunities as part of their job (e.g., learning about new opportunities from work associates or other firms that they interact with through their jobs). Consistent with these benefits, Faberman and colleagues (2021) find that employed job seekers receive more offers per job application submitted and receive job offers with higher wages (conditional on observed individual characteristics). Nonetheless, a variety of frictions influence the job search of employed individuals, as we discuss shortly.

The Internet

The most consequential change in recent decades to how individuals search for jobs is the rise of the internet, which is now used by nearly all job seekers (Pew Research Center 2015). Current Population Surveys between 1998 and 2000 reveal that after controlling for observed characteristics, unemployed individuals who searched for jobs online were no more likely to find a job (Kuhn and Skuterud 2004). However, evidence from 2005 to 2008 indicates the opposite: those who used the internet for their job search found jobs more quickly (Kuhn and Mansour 2014). These papers suggest that the effectiveness of internet job search might have increased during the 2000s, perhaps because employers posted a greater share of openings online. However, this conclusion is tempered by the possibility that individuals who used the internet to search for a job during this period differed from those who did not. Evidence that sidesteps these individual-level selection concerns comes from Bhuller, Kostøl, and Vigtel (2021), who study the rollout of broadband internet in Norway in the 2000s and find that high-speed internet access led to higher rates of employment and higher wages for job seekers. Of course, the internet has also changed how employers post and fill job openings—a topic we discuss shortly.

Frictions

Many frictions cause the job search process to vary from the simplest possible model of consumer choice. First, individuals have imperfect information about job opportunities. Unemployed individuals are overly optimistic about how quickly they will find a job, which can lead to less job search effort and higher rates of long-term unemployment (Mueller, Spinnewijn, and Topa 2021; Spinnewijn 2015). Individuals also have inaccurate beliefs about the wages they could earn at other jobs, with lower-paid workers underestimating the potential gains from switching jobs (Jäger et al. 2021). Some individuals search in a

narrow set of occupations because they are not aware of opportunities in other types of jobs (Belot, Kircher, and Muller 2019). At a more granular level, individuals are uncertain about the working conditions at specific employers, and the voluntary provision of this information (such as through employer review sites like Glassdoor) is limited by incumbent and former workers' fears that employers might retaliate if negative information is posted (Sockin and Sojourner 2021). Some aspects of jobs (such as how a manager behaves under pressure) are largely unknowable beforehand, but there is scope for improved information provision, especially for occupations and industries. More accurate information could increase employment and earnings (e.g., by helping individuals find good jobs in fields they did not previously consider) or lower them (e.g., by causing workers to think there are fewer job opportunities available). The effects depend on both the type of information provided and on individuals' perceptions absent the additional information.

The second set of frictions consist of behavioral biases in how individuals allocate their search effort. DellaVigna and Paserman (2005) provide evidence for job seekers having time-inconsistent preferences in the form of hyperbolic discounting. This type of behavioral bias causes individuals to place especially low value on the benefit of job search (higher income in the future) relative to the cost (exerting effort now). Other work is consistent with individuals choosing their job search effort to avoid losses relative to their recent consumption level (DellaVigna et al. 2017, 2020). Such reference dependent preferences can explain increases and decreases in search effort within an unemployment spell because of changing eligibility for UI benefits. Individuals' beliefs about the effectiveness of job search—their locus of control—also influences how much effort they exert (Caliendo, Cobb-Clark, and Uhlendorff 2015; McGee and McGee 2016). The share of the employed engaged in any explicit job search activities could also be affected by opportunity-cost neglect (Frederick et al. 2009), which may cause workers to ignore the potential gains from moving to a different job. Behavioral biases and imperfect information could be closely related, for example, if individuals spend less time acquiring information because of hyperbolic discounting or opportunity-cost neglect.

Two additional frictions do not reflect imperfect information or behavioral biases. First, preference heterogeneity can lead individuals to make different decisions. This preference heterogeneity can arise when individuals place different weights on a set of common characteristics (e.g., if Joan cares more about wages and less about work

flexibility than John) or when the value of a job is match specific (e.g., if Dave gets along particularly well with a supervisor).⁸ A second friction is switching costs, which can be monetary (e.g., the cost of moving people and belongings to a new location or of acquiring new housing) and nonmonetary (e.g., the emotional cost of establishing a new routine or making new friends). Such costs lower individuals' propensity to search for and accept different jobs. The empirical identification of these costs is difficult because nonmonetary costs are largely unobservable. However, research finds that individuals are systematically reluctant to change jobs, industries, occupations, and places of residence (e.g., Autor et al. 2014; Bartik 2018; Kennan and Walker 2011; Yagan 2019), which is consistent with the presence of substantial switching costs.

Quantifying the relative importance of each type of friction is difficult because many of the underlying factors are not directly observed in most datasets and different frictions can have observationally equivalent predictions. For example, individuals might be reluctant to search for a job because they believe that the available jobs offer low wages, disproportionately discount the benefits of job search, or perceive high switching costs. Recent work has made progress by attempting to directly measure information, preferences, and expectations, and there remains considerable scope for future work in this vein. Different frictions may also interact with one another. For example, imperfect information may exacerbate frictions due to preference heterogeneity as individuals may find it particularly hard to identify job opportunities that satisfy their idiosyncratic preferences. The appropriate policy response depends on the importance of various frictions. For example, heterogeneous preferences can lead individuals to not search for a higher-paying job, but this does not mean that individuals are behaving suboptimally. Other frictions, such as imperfect information, can more directly lead to negative impacts on some workers, which could be mitigated with policy interventions.

How Policies Affect Individuals' Job Search

Many different policies affect how workers search for jobs. We begin by discussing policies that more directly aim to influence job search, then turn to policies that affect job search less directly.

Job Search Assistance

Providing publicly funded job search assistance is a widespread policy. In the US, the Wagner-Peyser Act of 1933 established public employment offices across the country that aim to connect job seekers with employers. Subsequent legislation modified the so-called Employment Service, with the most recent changes from the Workforce Innovation and Opportunity Act of 2014 focused on centralizing activities in about 2,400 American Job Centers. These centers provide a range of services to job seekers, including job search counseling and advice; access to computers, printers, and other resources; assistance applying for unemployment benefits; résumé and job interview workshops; and connections to training programs, educational institutions, and social service programs. Some of these services are available online, especially after the COVID-19 pandemic changed American Job Centers' operations. Although some services (such as access to computers) are universally available, far fewer individuals benefit from the most intensive services. For example, the relatively intensive Trade Adjustment Assistance program only assists individuals that experience job losses determined to be caused by increases in imports.

Many credible evaluations of publicly funded job search assistance programs have been published. Meyer (1995) summarizes the results of five job search experiments conducted in the US between 1977 and 1987, while Card, Kluve, and Weber (2018) provide a meta-analysis of job search assistance programs conducted over several decades in many different countries. Both surveys conclude that job search assistance generally leads to higher employment and earnings. Evidence from experimental evaluations in 2008 and 2009 also suggests that job search assistance leads to positive effects on UI recipients' earnings in the short run (McConnell et al. 2016) and the long run (Manoli, Michaelides, and Patel 2018).

The exact form of job search assistance can vary widely both within and between studies, which makes it difficult to identify the forms of job search assistance that prove most effective. The importance of understanding mechanisms is underscored by the results of Black and colleagues (2003), who show that many of the positive effects of reemployment services (in Kentucky from 1994 to 1996) arise because individuals exit UI when they learn that they must receive such services. In this situation, mandatory job search assistance was effective because it encouraged individuals to get a job and avoid

receiving the assistance. Changes in the nature of job search over time (such as the rise of the internet) further highlight the need to understand mechanisms.

Information Provision

Job search assistance frequently provides individuals with information about labor market opportunities. However, the bundled nature of most programs makes it difficult to know how much of the benefits of job search assistance arise from improved information. Researchers have recently sought to isolate the benefits of information by designing and evaluating interventions that feature a narrower set of services. Altmann and colleagues (2018) mailed a brochure to over 50,000 unemployed individuals in Germany. The brochure contained general information about the state of the labor market, the consequences of unemployment, and effective job search strategies, in addition to language meant to motivate job seekers. Although the overall effects are small and statistically indistinguishable from zero, there are larger positive effects for individuals at risk of long-term unemployment. Belot, Kircher and Muller (2019) brought 300 Scottish job seekers into a computer lab to search for a job for at least 30 minutes a week for 12 weeks. The researchers evaluate the impacts of providing tailored information about relevant occupations and labor market tightness using a custom-built website. Gaining access to this information led individuals to apply to a wider variety of jobs and increased the number of job interviews, but evidence on any increase in job finding is limited by the study's sample size. Given the relatively low cost of providing information to job seekers, additional evidence would be valuable. The results from Jäger and colleagues (2021) suggest that the benefits of information provision could extend to individuals who already have a job.

Unemployment Insurance

More generous UI benefits tend to moderately increase the duration of unemployment by lowering the incentive to search for a job (see Schmieder and von Wachter 2016 for a recent review). UI benefits can also increase labor force participation because individuals are required to actively search for a job to receive benefits (e.g., Rothstein 2011). In addition, UI benefits affect reemployment wages through two offsetting channels: UI allows job seekers to spend more time searching for a better job (leading to higher wages), but the extended

unemployment duration also can lower wages because workers' skills depreciate or because employers view individuals with a longer unemployment history as less qualified (e.g., Kroft, Lange, and Notowidigdo 2013). Although many papers find little effect of UI benefits on reemployment wages, Nekoei and Weber (2017) find positive impacts of UI benefits on wages in Austria, apparently because of limited impacts on unemployment duration.

UI could affect job search in several ways. In general, individuals must actively search for a job to receive benefits, but the work search requirement is difficult to enforce. UI recipients typically must submit information on employer contacts, although these contacts are not always verified with employers. Work search requirements could lead individuals to search for jobs more intensively or encourage individuals to leave UI because of the additional hassle. Researchers have studied experiments in Washington from 1986 to 1987 and Maryland in 1994 in which UI claimants were randomly assigned to different work search requirements.⁹ The evidence indicates that more stringent work search requirements lead to reductions in UI benefits but little change in employment or earnings (Johnson and Klepinger 1994; Klepinger, Johnson, and Joesch 2002). One interpretation of these results is that work search requirements do not increase the intensity of job search (which could lead to better jobs), but instead make UI receipt less attractive. However, Lachowska, Meral, and Woodbury (2016) find that work search requirements in the Washington experiment improved the labor market outcomes of individuals who were permanently laid off (as opposed to those who were temporarily laid off or quit with reason). Additional evidence on how work search requirements affect job search behavior would be valuable.

Besides the work search requirement, UI could affect job search behavior through the provision of income support to unemployed individuals. A well-established pattern shows job finding rates of UI recipients increasing in the run-up to benefit exhaustion, then declining afterward. Recent work has used novel data to study how UI benefits affect job search behavior. DellaVigna and colleagues (2020) report the results of surveys completed by unemployed job seekers in Germany about the amount of time spent searching for a job, while Marinescu and Skandalis (2021) use administrative data from an online job search platform in France. Both papers find that search effort increases in the run-up to benefit exhaustion and declines afterward. Both papers also note that a model with reference-dependent preferences can explain the rise and fall of search effort. According to this

model, individuals increase their search effort in anticipation of UI benefit exhaustion because the resulting decrease in consumption will be especially costly; in other words, individuals have a reference level of consumption based on their income level including UI benefits. After UI benefits are exhausted, individuals gradually become accustomed to a lower level of consumption, which causes them to decrease their search effort.¹⁰

Reemployment Bonuses and Financial Incentives

Motivated by the desire to lower unemployment rates, governments have experimented with bonuses that pay workers to find a job. Meyer (1995) reviews four experiments conducted in the US between 1984 and 1989, and Bloom and colleagues (2001) discuss an experiment between 1995 and 1998 in four Canadian provinces. Although there are differences in the incentives offered to job seekers, the evidence indicates that reemployment bonuses have led to negligible or small increases in employment among UI recipients. At the same time, other research shows that financial incentives provided to lower-income individuals (including welfare recipients) can increase employment rates (Blank, Card, and Robins 2000; Card and Hyslop 2005; Nichols and Rothstein 2016; Riddell and Riddell 2020). One possible explanation for these findings is that financial incentives have larger effects when incentives are higher relative to individuals' income level. Although a larger reemployment bonus could increase employment rates, it also generates an undesirable incentive: individuals might be more likely to become eligible for the bonus by losing their job (Meyer 1995). Targeting reemployment bonuses to the long-term unemployed is one strategy for limiting this moral hazard, since it requires individuals to be unemployed for an extended period before being eligible for the bonus.

Direct Job Placement

Recognizing the challenges associated with job search, governments have also sought to directly provide jobs to individuals. Autor and Houseman (2010) find that welfare recipients who were placed in long-term positions with employers saw sizable increases in employment and earnings. By contrast, there are no positive impacts of being placed in a job at temporary help firms, which are among the largest employers of welfare recipients. These results highlight the importance of connecting job seekers with stable jobs.

Noncompete Agreements and Occupational Licensing

Job mobility is affected by noncompete agreements, which prohibit individuals from taking another job in the same industry during a specified period. Noncompete agreements apply not only to executives or technical workers with access to trade secrets but also to workers who make sandwiches or care for dogs. Starr, Prescott, and Bishara (2020) find that noncompete agreements are associated with lower job mobility, and Lipsitz and Starr (2021) find that Oregon's ban on noncompete agreements in 2008 increased the wages of low-wage workers, as would be expected if lower job mobility depressed wages.

Occupational licensing, which requires individuals to have specific certifications to work in certain types of jobs (ranging from registered nurses to auctioneers), can also affect job search. In particular, individuals without a certification might avoid licensed occupations, while individuals with a certification might target these occupations (which can offer wage premiums). Consistent with these mechanisms, prior research finds that occupational licensing reduces mobility across occupations (Kleiner and Xu 2020) and states (Johnson and Kleiner 2020).

Transportation Infrastructure

Better transportation infrastructure could increase job seekers' employment options by lowering commuting costs. In the US, highway construction has reduced population and employment in central cities as suburbs became more accessible (Baum-Snow 2007, 2020). The decentralization of jobs has widened the racial gap in employment rates because Black individuals are less likely to work in the suburbs (Miller 2021). This evidence underscores the importance of access to jobs. Holzer, Quigley, and Raphael (2003) show that people of color in the San Francisco Bay Area benefited from gaining access to suburban jobs through public transit expansion. However, the gains were concentrated among Hispanic workers, possibly because these workers lived closer to the public transit route or because these workers had access to referrals from social connections who were already employed. Evidence from Sweden finds that improved labor market access caused by a bridge opening especially benefited individuals with higher education (Bütikofer, Løken, and Willén 2020). These results show that although transportation infrastructure can benefit lower-wage workers, the benefits depend critically on the specifics of a given transportation project and the extent of equilibrium responses.

Health Insurance

Health insurance reforms also could affect job search and mobility through two offsetting channels. First, expanded health insurance coverage could generate a positive income effect, leading to a reduction in labor supply. Second, expanded public health insurance or the elimination of coverage limitations based on preexisting conditions could reduce “job lock,” which motivates workers to stay with their current employer and health insurance plan. Many recent papers study the effects of the 2006 Massachusetts health care reform, 2008 Medicaid expansion in Oregon, and 2010 Affordable Care Act, generally finding little impact on employment or job transitions (Baicker et al. 2014; Duggan, Goda, and Jackson 2019; Heim and Lurie 2015; Heim, Lurie, and Simon 2018; Kaestner et al. 2017; Leung and Mas 2018). However, Dague, DeLeire, and Leininger (2017) find that childless adults were less likely to work after receiving access to Medicaid in Wisconsin, highlighting the potential importance of heterogeneous effects.

Human Capital Investments

Although the focus of this paper is on the search and matching process, taking individuals’ human capital as given, we briefly discuss education and skills here. The amount and type of individuals’ formal schooling shapes their job prospects, which in turn could influence job search. For example, Darolia and colleagues (2015) and Deming and colleagues (2016) use randomized audit studies to examine whether employers are more or less likely to call back job applicants with different types of education. Deming and colleagues (2016) find that callbacks are lower for résumés that are randomly assigned to have a bachelor’s degree from an online, for-profit college compared with a nonselective public college, a finding that highlights the potential importance of differences in the quality of education. Deming and colleagues (2016) also find that the disadvantage associated with attending an online for-profit college disappears in health care jobs that require an external credential, which suggests the importance of job seekers credibly conveying their skills to employers. These studies do not identify the causal effect of education on job search, but they highlight one mechanism that might underlie such an effect. Education also could affect job search by providing individuals with access to career placement offices and social networks.

Research shows that task-specific skills are an important determinant of wages and job transitions (e.g., Gathmann and Schönberg 2010; Guvenen et al. 2020). As a result, job seekers might gain from searching for jobs that require similar skills but offer higher pay (e.g., Belot, Kircher, and Muller 2019; Blair et al. 2020). Open questions include the extent to which job seekers can actually benefit from these types of transitions as well as whether job seekers understand the task distance between different occupations.

Labor Demand: Employers

We now turn to the other side of the labor market: employers. We discuss evidence on how they post and fill job openings, how government policies influence these practices, and how their production decisions influence search and matching.

How Employers Post and Fill Jobs

We start by outlining evidence on how employers post and fill job openings and the key frictions employers face in hiring. Evidence comes from a range of sources, including data from public and private surveys of firms (most notably the 1980 and 1982 Employment Opportunities Pilot Project Surveys, the 1992–1995 Multi-City Study of Urban Inequality, and the 1997 and 2000 National Employers Surveys), administrative data from job boards (such as CareerBuilder, Indeed, and Monster) and aggregators of job boards (such as Burning Glass Technologies), and publications of human resources organizations. As noted by previous reviews (Faberman 2010; Oyer and Schaefer 2011), the literature and data on how employers find employees is thinner than that on how employees find employers, particularly for the low- and middle-income workers we focus on in this report.

Posting Job Openings and Recruiting Job Applicants

Firms spend substantial amounts of money on recruiting; one survey in the US in the late 1990s reports an average recruiting cost for all types of job openings of more than \$4,000 per hire, or almost 3 percent of labor costs (Villena-Roldan 2012). Employers can fill a job opening in two primary ways: by reassigning or promoting an existing employee (possibly leading to an opening in that employee’s previous position) or by searching for a new employee. Our discussion focuses on the latter scenario.¹¹

Employers recruit new employees using a variety of methods, such as posting a public vacancy on an external job board or a physical location outside of the place of business, hiring through informal referrals from social or professional networks, and using internal recruiters, outside headhunters, and electronic tools (Barron, Bishop, and Dunkelberg 1985; Breagh 2009; DeVaro 2005). In recent years, employers have increasingly posted

public vacancies online instead of in newspaper ads, especially for white-collar jobs (Carnevale, Jayasundera, and Repnikov 2014; Kroft and Pope 2014). Although much research has focused on public job postings, which are easier to measure, more informal recruitment through social networks is also important (Davis, Faberman, and Haltiwanger 2012; DeVaro 2005).¹² We discuss evidence on the role of informal hiring and social networks as a labor market intermediary in the section *How Intermediaries Affect Matching*.

Vacancy postings can contain a variety of information, including desired skill and experience levels, tasks to be performed, compensation, benefits, and job amenities. Employers must make important decisions about how much to pay for the position (either when posting the vacancy or when negotiating wages, if applicable) and what benefits and amenities to provide. Employers also choose their recruiting intensity (e.g., by specifying the amount of staff time allocated to reviewing applicants or the amount of money allocated to advertising). Finally, firms' willingness to hire applicants that do not meet all of their specified standards, as well as the choice of those standards, will affect the difficulty of the search.

Recent research has started to document the effectiveness of different recruiting strategies, with a focus on the vacancy yield (i.e., the number of hires per posted vacancy) and duration (i.e., the amount of time required to fill a vacancy). Studies by Carrillo-Tudela, Gartner, and Kaas (2020) and Mueller and colleagues (2020) both find that differences in posted wages do not play a big role in explaining differences in vacancy yields across labor markets in Germany and vacancy durations across establishments in Austria, respectively. Carrillo-Tudela, Gartner, and Kaas (2020) show that employers' search effort and hiring standards help explain variation in vacancy yields across labor markets, with hiring standards playing a larger role. Further research could provide a more nuanced understanding of the effectiveness of different recruiting strategies. We discuss some evidence on the use and effectiveness of labor market intermediaries in the section *How Intermediaries Affect Matching*.

Screening Applicants and Making Hiring Decisions

Employers use a variety of methods to screen job candidates and decide who to hire, such as reviewing résumés, having candidates take tests or complete sample work assignments,

conducting interviews, contacting references, conducting background checks, and reviewing work samples. These different pieces of information are often referred to as *signals* in the economics literature, reflecting the fact that they provide information to employers about candidates' productivity, probability of accepting the job, expected job tenure, and outside options. Hiring decisions are sometimes made in several rounds, where an initial coarse screening of candidates is followed by more in-depth assessments.¹³ Employers increasingly use applicant tracking software and algorithmic hiring tools to manage hiring processes and to screen and evaluate candidates. Screening methods are most important in settings where employers have imperfect information about potential hires. We discuss the role of imperfect information and other frictions that make finding and hiring appropriate workers challenging for firms, along with employer practices for evaluating candidates, in more detail later.

Frictions

As is the case for workers, one of the key frictions faced by employers in search and matching is imperfect information (Rees 1966; Stigler 1962). Employers have imperfect information about individuals' level of interest in the job as well as their skills and preferences.

A large body of work examines how employers use some of the screening tools discussed above to reduce these information challenges. For example, Kroft, Lange, and Notowidigdo (2013) use an audit experiment to study how the length of an individual's current unemployment spell affects callback rates. They find that employers are less likely to invite applicants for a job interview when their résumé has a longer reported length of unemployment, even though all other aspects of the résumé are identical. They interpret this result as evidence that employers view individuals with longer unemployment spells as less qualified. However, many of these papers are unable to determine precisely what employers care about.

Some evidence suggests that common evaluation approaches allow employers to hire individuals who are a better match for the job. Autor and Scarborough (2008) find that the introduction of job testing in a large, national retail firm led to hires with longer job tenures. Evidence also indicates that employers can identify better matches through social networks, as we discuss in the section *How Intermediaries Affect Matching*. However,

recent work suggests that firms do not always optimally use the signals available to them. Within a sample of firms employing less educated service workers, managers who make hiring decisions that conflict with job tests hire workers who have shorter average job tenures (Hoffman, Kahn, and Li 2018). For a Fortune 500 professional services firm, selecting candidates for job interviews using an algorithm that explores the potential of nontraditional candidates improved both hiring quality (measured by share of interviewees being hired) and diversity (Li, Raymond, and Bergman 2021).

Finding appropriate candidates can be especially difficult for employers that demand unique skills (Lazear, Stanton, and Shaw 2018). Barron, Berger, and Black (1997) find that firms interview more extensively (conducting more interviews and considering more applications per posting) and intensively (dedicating more hours per interview and applicant) for positions requiring more pre-hire education or post-hire training, possibly reflecting the greater importance of specialized skills in these positions. The challenge of finding workers with the appropriate skills results in firms sometimes training workers (i.e., *making* the skills they want) rather than hiring workers with the exact required skills (i.e., *buying* the skills they want). When deciding whether to make or buy these skills, employers consider the relative costs of training and recruitment, along with the expected job tenure (Wolter and Ryan 2011). Some types of training are especially costly for smaller employers to provide.¹⁴ Evidence suggests that local community colleges have played an increasingly important role in training workers, as manufacturers choose to buy skills because of rising worker turnover and declining firm size (Weaver and Osterman 2017).

In addition to these information frictions, firms also face onboarding, training, and other hiring costs, as well as firing costs (Hammermesh 1993; Kuhn and Yu 2021). Hiring costs lead firms to adjust their employment less frequently in the short and medium run. For example, forward-looking firms may be hesitant to hire when uncertain about future demand for their output and be reluctant to lay off workers during downturns because of the challenges of finding workers (e.g., Barth et al. 2017; Rotemberg and Summers 1990).

Heterogeneity in Recruitment and Screening Strategies

The extent and nature of frictions vary across different types of employers and jobs. In this section, we highlight some of the most salient dimensions of heterogeneity.

Employers face particular challenges in assessing the suitability of job applicants with limited prior work experience. In response to this limited information, employers might hire fewer entry-level workers, ultimately depressing opportunities for these workers across the board (Terviö 2009). Pallais (2014) provides evidence consistent with this prediction, using a field experiment in which some inexperienced workers on oDesk (an online labor market that is now part of Upwork) were randomly hired and given performance evaluations with varying levels of detail. Pallais finds substantial benefits to inexperienced workers from getting their first job, which included a coarse evaluation. Workers with previous experience did not receive lasting benefits from getting an additional employment opportunity but did benefit from detailed performance evaluations. Consistent with the signaling role played by entry-level hiring, Heller and Kessler (2021) find that providing a letter of recommendation to high school students who participated in a summer jobs program led to increases in employment in subsequent years, especially for students of color. An implication of these findings is that subsidizing the hiring and public evaluation of entry-level workers could increase labor market efficiency and equity. The difficulty of evaluating entry-level workers has led some employers to institute initial tryout periods (Sterling and Merluzzi 2019). The welfare effects of such tryouts and the impacts of extending them to additional industries or occupations presents an interesting topic for future work.

There is also substantial heterogeneity in hiring approaches and intensity across employers. Firms with labor market power (because of labor market concentration, search frictions, or idiosyncratic job features) may hire fewer workers, bargain more aggressively, or offer lower wages. Consistent with some of these models, several recent papers have estimated firm-level labor supply elasticities that imply some degree of firm labor market power (e.g., Dube et al. 2020; Azar, Berry, and Marinescu 2019; Kroft et al. 2022; Lamadon, Mogstad, and Setzler 2022), while another line of research has found a negative relationship between labor market concentration and wages (e.g., Prager and Schmidt 2021; Azar, Marinescu, and Steinbaum 2022; Marinescu, Ouss, and Pape 2021; Rinz 2022).¹⁵ Card (2022) provides a broader overview of this evidence on labor market power. Fast-growing businesses hire many more workers per vacancy than slow-growing firms, suggesting that these fast-growing firms have some combination of economies of scale in hiring (i.e., finding it easier to hire an additional worker if they are already doing more hiring), lower hiring standards, better applicant pools, or larger recruiting effort (Davis, Faberman, and Haltiwanger 2013). Smaller firms tend to interview fewer applicants, make

more offers per interviewee, and spend less time recruiting per hire (Barron, Black, and Loewenstein 1987; Faberman 2010).

Another source of heterogeneity comes from labor supply conditions. For example, Modestino, Shoag, and Ballance (2020) provide evidence that during the Great Recession, employers raised hiring standards and demanded higher education and experience levels in labor markets with a larger increase in the supply of available workers. We discuss evidence on the effects of macroeconomic policy and conditions on search and matching in the labor market later in this section, under Macroeconomic Policy.

How Policies Affect Employers' Posting and Filling of Jobs

Government policies affect how employers post and fill job openings. Most directly, governments can subsidize or tax new employment or regulate how firms can advertise openings or make hiring decisions. Less directly, government policies can influence employers' hiring practices through contract regulations and macroeconomic conditions. (See the Differences by Race and Gender section for a discussion of laws that regulate posting, screening, or hiring by race and gender.)

Hiring Subsidies

Governments sometimes directly subsidize hiring. Several papers have discussed the effects of these hiring subsidies and how these effects vary with program design and timing. In studies of the 1977 New Jobs Tax Credit, which subsidized up to 50 percent of payroll costs for increases in employment of more than 2 percent of the previous year's level, Perloff and Wachter (1979) and Bishop (1981) find moderately positive effects, even though over 40 percent of firms did not know about the existence of the credit. Katz (1998) presents a model of the effect of hiring subsidies, reviews previous evidence, and offers new evidence from the Targeted Jobs Tax Credit (TJTC), which replaced the New Jobs Tax Credit in 1978. The Targeted Jobs Tax Credit subsidized 50 percent of first-year wages and 25 percent of second-year wages for newly hired workers from certain disadvantaged economic and social groups.¹⁶ Katz (1998) finds that the Targeted Jobs Tax Credit increased employment rates for disadvantaged groups roughly 3 percent. Van Reenen (2003) studies the 1998 British New Deal for Young People, which provided hiring subsidies to employ

people ages 18 to 24 who claimed UI benefits, and finds that the program increased employment of eligible youth by 20 percent, driven both by increased job search and greater labor demand for eligible workers.

In more recent work, Neumark and Grijalva (2016) study state hiring tax credits from the late 1990s through the Great Recession and find some positive effects, particularly for credits targeting unemployed workers or job creation during the Great Recession. However, some evidence shows that the credits had a bigger impact on new hires than on employment levels, suggesting that the credits may have incentivized employers to engage in high-turnover employment strategies. Cahuc, Carcillo, and Barbanchon (2019) study temporary and unexpected hiring credits enacted during the Great Recession in France and find that the credits increased the employment growth rate of targeted firms by 0.8 percentage points. They then calibrate a search and matching model and argue that the positive effects of the hiring tax credit hinged on the temporary and unexpected nature of the credit in France and that costs per job created would be significantly higher with permanent or expected countercyclical policies. These permanent or expected policies would lead to less labor market slack and higher equilibrium wages, which would dampen hiring and reduce the positive impact of the credits on employment, lowering their cost effectiveness. Across these different settings, these studies generally find moderate positive effects of tax credits on employment that are larger during recessions; there is less consensus on the efficiency and distributional consequences of the credits.

Regulation of Information Used in Hiring

Falling costs of transmitting and storing information in recent decades has facilitated the use of an increasing amount of information during the hiring process. Governments have responded in some cases by regulating the use of particular types of information that employers may want to collect from applicants, including salary history, criminal background, and credit history. Because these policies tend to be motivated by racial or gender inequities in the labor market, much of the literature has focused on measuring their impacts on these inequities rather than aggregate labor market outcomes. (We discuss the effects of these laws on racial and gender equity in more detail in *Differences by Race and Gender*) However, a small set of papers have investigated the aggregate effects of credit check restrictions during hiring and have found null or negative effects on vacancy creation, average employment, and wages (Bartik and Nelson 2021; Cortes, Glover, and

Tasci 2018). Evidence on the impacts of salary history bans on aggregate labor market outcomes is more mixed, with some papers finding positive effects on aggregate employment and wages (Bessen, Meng, and Denk 2020), others finding negative effects (Agan, Cowgill, and Gee 2021; Davis, Ouimet, and Wang 2021), and still others finding mixed outcomes where hiring probabilities rose but wages fell (Barach and Horton 2021). The literature has not reached a consensus on why the estimated effects of salary history bans differ.

Governments also have imposed regulations on the information that employers must reveal in job postings. For example, in 2019, Colorado passed the Equal Pay for Equal Work Act, which mandated that job postings include information on the salary range, benefits, and other features of the posted job.¹⁷ Evidence on how this type of regulation affects search and matching would be valuable.

Unemployment insurance

In addition to the direct effects of UI on labor supply decisions of job seekers that we discussed previously in Labor Supply: Individuals, UI could affect labor demand through equilibrium responses. Several equilibrium forces could cause UI to affect labor demand as well as labor supply. First, the reduction in labor supply could raise equilibrium wages and vacancy durations, causing firms to create fewer job openings (Mitman and Rabinovich 2015). Second, firms rationing jobs could create a “rat-race” effect, where a reduction in the number of job seekers causes employers to make job offers more quickly (Landais, Michailat, and Saez 2018). Third, the decrease in labor supply caused by UI could provide employers with an incentive to create job openings, because the decrease in labor supply lowers the amount of *congestion* faced by employers; when fewer people are being hired, the marginal product of a new hire is greater, which increases job creation (see the model presented by Mercan, Schoefer, and Sedlacek [2021]).¹⁸ Fourth, there may be Keynesian demand spillovers from UI benefits during recessions that increase vacancy creation. The last three of these mechanisms would tend to reduce the negative effects of UI generosity or duration on employment (and some of them could even make the effect positive); the first mechanism would make this relationship more negative.

Recent empirical work has generated conflicting evidence on these equilibrium effects of UI on employment outcomes, with several studies finding that the first force (the

vacancy creation effect) dominates, while the aggregate employment effects of UI are more negative than the micro-level employment effects (Hagedorn, Manovskii, and Mitman 2016; Hagedorn et al. 2019; Johnston and Mas 2018). Conversely, research in France by Lalive, Landais, and Zweimuller (2015) and in the US by Chodorow-Reich, Coglianese, and Karabarbounis (2019), Marinescu (2017), and Boone and colleagues (2021) estimate small aggregate effects of UI on employment (although they do not all explicitly separate out the parts caused by the micro-level labor supply effects in their setting and those caused by equilibrium spillovers). An important topic for future work is investigating extent to which these different findings are driven by different empirical strategies or different relative weights on the forces described above in different settings and time periods.

Macroeconomic Policy

More broadly, macroeconomic policy and the resulting labor market conditions may influence how firms post or fill vacancies. Research has found that during recessions, employers recruit less intensely while raising hiring standards (e.g., Davis, Faberman and Haltiwanger 2012, 2013; Forsythe and Weinstein 2021). This suggests that during periods when job seekers are more plentiful, firms can exert less effort to attract quality candidates and find it less costly to wait until they find a strong candidate. During periods of growth, these patterns reverse.

Employers' Production Decisions

Employers' decisions regarding how to produce goods and services are a key precursor to search and matching. During the late 1990s and early 2000s, some academics and policymakers became increasingly concerned that outsourcing would reduce opportunities for workers in the middle and bottom of the wage distribution in the US (Bhagwati, Blinder, and Friedman 2009). Goldschmidt and Schmieder (2017) provide evidence from German data that highlights this concern, finding that outsourcing has increased dramatically over the past few decades and that wages within a job declined after outsourcing.

Employers' production decisions also affect the desirable skills of job applicants. Even within an occupation, there is considerable variation across employers in the skills requested in job postings (Deming and Kahn 2018). Hershbein and Kahn (2018) show that

skill requirements in job postings increased during the Great Recession in local areas where the recession was more severe. Moreover, the same areas saw higher capital investments, consistent with employers moving toward more capital- and skill-intensive production technologies in response to the recession.

How Intermediaries Affect Matching

A variety of labor market intermediaries also play an important role in the search and matching process. We define an intermediary as a third party that connects job seekers with employers. Our discussion of intermediaries distinguishes between informal intermediaries, which are social connections or institutions whose primary purpose is not search and matching, and formal intermediaries, which are focused on the labor market.

Informal Intermediaries

Personal contacts appear to play a role in about half of all hires (for recent reviews, see Ioannides and Loury 2004; Topa 2011). Social networks serve four functions in search and matching. First, personal contacts provide information to job seekers about job openings and working conditions. Second, employees provide information to employers about the potential productivity and job suitability of job candidates (sometimes in the form of referrals and recommendations). Third, candidates recruited through social networks may be more productive, either because they work well with existing employees or will be monitored by their referrers and consequently work harder. Finally, in some cases, employers and referrers may place value on filling job openings with someone socially close in some sense to the referrer or employer.

Job seekers use a variety of social connections. Existing research documents the importance of neighborhood-based social networks (Bayer, Ross, and Topa 2008; Hellerstein, McInerney, and Neumark 2011; Schmutte 2015), former coworkers (Caldwell and Harmon 2019; Saygin, Weber, and Weynandt 2021), immigrants or refugees of the same nationality (Beaman 2012; Egger, Auer, and Kunz 2022), friends and classmates from college (Michelman, Price, and Zimmerman 2021; Zimmerman 2019), and even parents (Kramarz and Skans 2014) in helping individuals obtain employment and higher earnings. Individuals who lack access to well-connected social networks can be disadvantaged by this process.

Several papers examine the role of employee referrals in more detail. The benefits to job seekers who receive a referral from an employee already working for the employer include an increased probability of being hired and higher initial wages (Fernandez and Weinberg

1997; Brown, Setren, and Topa 2016; Dustmann et al. 2016). Referrals may be particularly valuable for job seekers without other labor market signals, such as those who are young, moving to different regions, or changing industries (Barwick et al. 2021).

Employers also benefit from referrals in several ways. For example, research finds that recruitment through employee referrals is associated with shorter vacancy periods (reflecting fewer interviews, more offers per interview, and a higher probability of an offer being accepted) and longer-lasting employment relationships (Brown, Setren, and Topa 2016; DeVaro 2008). This reflects, in part, that referred candidates are better fits for the job opening than candidates without referrals (Fernandez and Weinberg 1997), and that individuals who are referred to the employer may also be more productive and profitable employees (Burks et al. 2015).

The benefits of referrals to job seekers and employers arise from all four of the functions outlined above, though information provision appears to be especially important (Burks et al. 2015; Brown, Setren, and Topa 2016; Fernandez and Weinberg 1997; Pallais and Sands 2016). In some cases, employers' reliance on social networks for hiring can reduce labor market efficiency by lowering the number of jobs and the amount of information available about job candidates, though in other cases social networks can enhance efficiency (Chandrasekhar, Morten, and Peter 2020).

Lester, Rivers, and Topa (2021) document heterogeneity in referrals based on individuals' relationship with the referrer and the type of job. Referrals from friends and family are used more frequently for lower-wage jobs, while referrals from business contacts are used more frequently for higher-wage jobs. Their results also suggest that referrals from business contacts are especially helpful in providing employers with information about a candidate's suitability for the job. Other related research investigates the extent to which weak or strong social ties are more important for job search, with different conclusions in different settings (e.g., Gee, Jones, and Burke 2017; Granovetter 1973).

Some research finds that employees tend to refer applicants that look like them on several dimensions, such as race and age. In the section Differences by Race and Gender, we provide more detail on the implications of this homophily in referrals, and in social networks more generally for racial and gender inequality in search and matching.

Formal Intermediaries

Public and Private Employment Services Providers

Publicly provided employment services match job seekers and employers through job boards, in-person recruiting events, and direct referrals. Although evidence suggests that these services benefit workers (see the section Labor Supply: Individuals), the literature on the effects of these services on employers is much more limited. Private companies also provide intermediation services, but the effects can differ from public provision. For example, Behaghel, Crepon, and Gurgand (2014) find French job seekers are more likely to take up privately provided job search assistance, even though publicly provided assistance is more effective in their setting. There are also a wide variety of private companies that provide job employment services to individuals and employers. Commercial staffing agencies, which help firms handle temporary (and sometimes longer-term) staffing needs, provide one type of private employment service. We discuss evidence on their effects on employment outcomes of job seekers in Labor Supply: Individuals.

Educational Institutions

Educational institutions also facilitate the search and matching process. Career counselors at universities, community colleges, and high schools provide job search assistance to individuals and, in some cases, facilitate direct matching with employers. Some of these services, such as job fairs, appear to benefit students (e.g., Weinstein 2022), but there is less evidence on the general equilibrium effects of these policies. These general equilibrium effects could be positive (if the services provided by educational institutions encourage employers to hire more workers) or negative (if these services reduce opportunities for individuals who do not attend a specific school). Estimating these general equilibrium effects of educational institutions' job search assistance remains an important topic for future work. More broadly, educational institutions influence the social networks that, as discussed, play an important role in job search.

Centralized Assignment Mechanisms

Centralized assignment mechanisms are used to allocate jobs in some settings, such as the medical school match (Agarwal 2015), the army (Greenberg, Pathak, and Sonmez 2021), and union hiring halls.¹⁹ These mechanisms can improve match quality for both sides of the market if they allow employers and individuals to make more informed search and matching decisions. For example, some markets have seen employers compete to hire workers earlier and earlier, which forces job seekers to quickly accept an offer or risk having it expire. This type of “unraveling,” which can lead to worse matches, is particularly prevalent in occupations where information frictions are substantial and employers have difficulty adjusting the number of job openings (Niederle and Roth 2009).

Online Search and Matching Tools

The expansion of the internet in recent decades has facilitated the rise of online search and matching tools. Online job boards such as Monster and Indeed substantially decrease the costs to employers of posting vacancies and the costs to individuals of searching for and applying to jobs. Although lowering search costs has direct benefits to job seekers and firms, there may be costs as well. For example, the reduction in costs could lead individuals to submit more job applications, leaving employers with an even larger set of applications to review. In turn, employers might face greater challenges identifying the most suitable applicants.

Several papers have examined how online job boards affect search and matching. Bhuller, Kostøl, and Vigtel (2021) find that the expansion of broadband internet in Norway, which provided access to online job search tools (among other things), led to faster rates of employers filling job vacancies and individuals finding jobs, higher wages, and longer-lasting employment relationships. Overall, the authors estimate that the rollout of broadband lowered the equilibrium unemployment rate from 5 to 4 percent. There is little evidence that the rollout of Craigslist jobs ads in the US lowered metro area unemployment rates (Kroft and Pope 2014), but this is perhaps not surprising given the modest nature of the intervention.

Labor platforms such as Upwork, TaskRabbit, Uber, and Lyft constitute a second form of online search and matching tools. Platforms connect workers and employers for short-term tasks or gigs, rather than formal, long-term employment. Research finds that these

online labor platforms can help inexperienced workers gain new opportunities (Stanton and Thomas 2016) and help workers more flexibly smooth negative shocks to income from formal jobs (Kousta 2018, 2019), but they also might harm workers by diminishing traditional employment relationships. So far, these nonemployee relationships within the gig economy have grown but do not represent a substantial share of many workers' incomes. The share of the labor force with some income from alternative, nonemployee work arrangements rose by 1.9 percentage points from 2000 to 2016, but the majority of these workers earn less than \$2,500 from these nontraditional arrangements (Collins et al. 2019). Furthermore, occupations such as taxi cab driving, where competition from the gig economy has risen dramatically and where there is evidence for displacement, were already disproportionately done by independent contractors even before the development of online labor platforms (Abraham et al. 2021). Continuing to monitor whether work within the gig economy displaces traditional workplace relationships is an important topic for future research.

Differences by Race and Gender

People of color and women have faced long-standing discrimination in the labor market. Motivated by these disadvantages and attempts to close remaining disparities, this section discusses evidence on unique aspects of the search and matching process by race and gender.

Differences by Race

Clear evidence shows that people of color face discrimination in the labor market (Neumark 2018). Quantifying the extent of discrimination is challenging, and researchers have made the most progress in examining whether employers treat individuals differently during the early stages of the matching process. In one approach, researchers coordinate in-person applications and interviews done by study participants who have similar characteristics except for their race (e.g., Pager, Bonikowski, and Western 2009). Another approach involves submitting résumés (by mail or email) with characteristics that are randomly assigned (e.g., Bertrand and Mullainathan 2004). Results from both types of studies tend to show that people of color are less likely to receive job interviews and offers. One notable (and more recent) exception is work from Deming and colleagues (2016), who do not find differences in callback rates by race for job applications that were submitted online in 2014. An intriguing explanation is the increasing use of applicant tracking system software to review résumés, which may minimize bias at this stage of hiring by using algorithms to identify qualified applicants.²⁰ Consistent with this hypothesis, Kline, Rose, and Walters (2021) find that firms with more centralized human resources practices are less likely to discriminate against Black job applicants at the callback stage. Although human resources practices can reduce opportunities for employer bias in the hiring process, significant scope for discrimination remains at later stages, though studying this type of discrimination is more difficult.

Much of the US-based literature on this issue has focused on differences between Black and white job seekers. Several papers have used the survey data of New Jersey UI recipients from Krueger and Mueller (2011). Fryer, Pager, and Spenkuch (2013) find that Black individuals spend more time looking for jobs, are more likely to accept a job offer, are less

likely to bargain over wages, and have a lower reservation wage (i.e., the minimum wage necessary for individuals to choose to work).²¹ Some of these differences are not statistically significant. Using the same data set, Pager and Pedulla (2015) find that Black individuals apply to a broader set of jobs, and the researchers use an additional survey to show that higher self-reported exposure to discrimination in the workplace is correlated with broader job search. One interpretation of these results is that Black individuals expand the breadth of their job search to adapt to discrimination that is difficult to identify beforehand.²² From the Survey of Consumer Expectations, Faberman and colleagues (2021) find that nonwhite individuals apply to more jobs but receive fewer job offers per application.

A longstanding concern is that residential segregation limits the labor market opportunities of nonwhite individuals. This disadvantage could arise because employers use applicants' addresses to infer individual characteristics (such as race or skill level) or because people of color live in neighborhoods with worse access to jobs. For example, Miller (2021) finds that shifts in the location of jobs to the suburbs between 1970 and 2000 led to reductions in Black employment rates relative to white employment rates. Residential segregation also influences individuals' access to jobs through social networks, which could disadvantage nonwhite job seekers (Bayer, Ross, and Topa 2008; Hellerstein, McInerney, and Neumark 2011; Schmutte 2015). More broadly, evidence suggests that segregated social networks—caused by residential segregation or other forces—may play an important role in persistent labor market inequities by race (Calvo-Armengol and Jackson 2004; Peterson, Saporta, and Seidel 2000). Moreover, research suggests that employed Black individuals may be less willing to provide information about job openings to individuals in their social network because they fear employer backlash if referred candidates are unsuccessful (Smith 2005).

A wide array of nominally race-neutral employer practices and policies could have different impacts on nonwhite workers, given the presence of complex economic and social differences. Kuka and Stuart (2021) find that Black individuals are less likely to receive UI benefits than white individuals, even when adjusting for differences in eligibility. One implication of this finding is that Black individuals who lose their jobs receive less income support than white individuals, which could contribute to racial differences in job search behavior and employment outcomes noted previously.

Particular attention has focused on which information can be used by employers during the hiring process. If an employer's estimate of a worker's productivity is biased or uncertain, adding or removing information available to an employer can have beneficial or detrimental effects on people of color. Autor and Scarborough (2008) find that the introduction of a computer-based test in the applicant screening phase for one large retail firm did not negatively affect employment of people of color, even though they received lower average scores on the test. They argue that these results are consistent with a lack of racial bias in both the firm's informal screening and the test. In other settings, researchers tend to find that reducing the information available to employers disadvantages people of color. For example, employment prospects of nonwhite workers have been harmed by laws preventing employers from asking about criminal history (Agan and Starr 2018; Doleac and Hansen 2020) and credit history (Bartik and Nelson 2021), while laws that permit drug testing increased employment and wages among Black workers (Wozniak 2015).²³ In general, these studies suggest that limiting the information available to employers can have undesirable consequences because many employers discriminate against nonwhite workers, especially when less information is available.

Many policies also explicitly address employment practices by race. Title VII of the Civil Rights Act of 1964 outlawed discrimination in employment on the basis of race, color, religion, sex, or national origin. This legislation charged the Equal Employment Opportunity Commission with investigating discrimination claims and punishing employers found to be in violation of federal law. In 1965, Executive Order 11246 further required firms contracting with the federal government to take "affirmative actions" to prevent discrimination. The enforcement of antidiscrimination legislation, which also plays a key role, has evolved over time, partly in response to judicial decisions.

Existing evidence suggests that antidiscrimination laws improved the economic outcomes of Black workers, but evaluating these policies has proven challenging (e.g., Donahue and Heckman 1991; Leonard 1990; Wright 2015; Kurtulus 2016). Miller (2017) finds that firms' exposure to even temporary affirmative action requirements led to permanent increases in the hiring of Black workers. Miller interprets this as firms investing in "screening capital" that allows them to more effectively evaluate workers from traditionally disadvantaged groups. More broadly, antidiscrimination laws could affect every part of the search and matching process, from job seekers' expectations and job application decisions (e.g., causing nonwhite individuals to expect better treatment and

apply for more jobs), to how firms evaluate candidates (e.g., causing firms to adopt less-biased evaluation practices). The effects of antidiscrimination legislation could vary with the business cycle and market structure, but we are not aware of research on these issues.

Differences by Gender

Women continue to earn considerably less than men (Blau and Kahn 2017). Although audit studies generally find little discrimination against women on average, there is evidence of discrimination concentrated in certain parts of the labor market, consistent with persistent occupational segregation by gender (Kline, Rose, and Walters 2021; Neumark 2018).

Recent work sheds light on differences in how men and women search for and accept jobs. Le Barbanchon, Rathelot, and Roulet (2021) show that women report lower reservation wages and less willingness to commute to jobs. There is also evidence that women earn lower salaries in situations where negotiations are more important (e.g., Biasi and Sarsons 2022; Roussille 2022). In a survey of undergraduate business majors, Cortés and colleagues (2021) find that women accept jobs earlier than men, in part because women are more risk averse and in part because men are overly optimistic about future offers. Among undergraduate students at New York University asked about hypothetical job choices at age 30, women place higher value on work flexibility and job stability (Wiswall and Zafar 2017). Gallen and Wasserman (2021) find that female college students are more likely to receive information about work-life balance from professionals, even when they do not ask for such information. These gender differences could arise from individual preferences and expectations, household decisions, social norms, and employer responses.

In the US, government efforts to address gender inequities in the labor market accelerated with passage of the Equal Pay Act of 1963 and Title VII of the Civil Rights Act of 1964. This legislation led to sizable increases in women's wages, with little impact on employment in the short run (Bailey, Helgerman, and Stuart 2022). Additional evidence on the ability of government intervention to improve women's labor market opportunities comes from Austria, where almost half of job postings illegally stated a gender preference in 2004, and subsequent efforts at enforcing antidiscrimination laws led to greater employment opportunities for women (Card, Colella, and Lalive 2021).

The fact that women continue to earn less than men has prompted growing interest in whether changing the information available to individuals and employers can close gender pay gaps. In a study of university professors in Canada, Baker and colleagues (2019) find that public access to individual salary information led to a reduction in the gender earnings gap at universities where faculty are unionized. Several papers find that salary history bans, which prevent employers from asking about applicants' previous earnings, increased the earnings of some groups of women relative to men (Agan, Cowgill, and Gee 2021; Bessen, Meng, and Denk 2020; Hansen and McNichols 2020), although Davis, Ouimet, and Wang (2021) do not share this finding. Such findings have raised the question of why salary history bans might achieve their goal of reducing gender salary gaps while bans on credit checks, drug testing, or criminal record checks do not benefit their intended population. One potential explanation is that recruiters perceive salary histories as conveying information not just about productivity but also about outside options (Agan, Cowgill, and Gee 2021), which may differ from other labor market signals.

Because women spend more time raising children and face long-lasting declines in earnings and employment after having children, policymakers also have looked to paid family leave as a method for reducing gender pay gaps. However, evidence from California finds that paid family leave actually decreased women's earnings and employment over a 10-year period (Bailey et al. 2019). These results are broadly consistent with the lack of an overall beneficial effect of paid family leave in other settings; however, evidence shows that subsidized child care leads to increases in mothers' employment and earnings (Olivetti and Petrongolo 2017).

Conclusion: Key Next Steps

The preceding discussion identifies several areas where additional research would be valuable. We conclude here by summarizing three areas that deserve broad-based funding and experimentation. Our first recommendation is that additional data be collected. The Survey of Consumer Expectations exemplifies how asking individuals about their job search can yield new insights into search and matching. Several aspects of individuals' job search remain understudied (such as why individuals do not spend more time searching for jobs). Moreover, little information is available on how employers post and fill job openings. A parallel Survey of Employer Expectations could provide descriptive statistics for a representative set of employers and identify the relative importance of different frictions.²⁴ This survey would be particularly valuable if it were maintained permanently. Moreover, a government-run survey of firm hiring practices (akin to the Census of Manufactures that has long been conducted by the Census Bureau) could be linked to administrative data from both public and private sources on employers, job postings, and workers.

Our second recommendation is that researchers, policymakers, and funders prioritize evaluations that identify the general equilibrium effects of policies. There has been considerable progress in identifying how policies affect specific types of individuals and employers, but the equilibrium effects are especially critical for policies that affect search and matching. For example, Crepon and colleagues (2013) find that public employment services provided to job seekers in France benefit the individuals who received services while harming individuals who did not (because they faced greater competition), such that net benefits were close to zero. It remains an open question whether these findings hold in the long run or for public employment services of different types or in different settings. These kinds of evaluations are typically more expensive and require greater collaboration between policymakers and researchers, but the benefits of these evaluations can be especially large.

Our third recommendation is that research should have a special focus on ongoing trends in the labor market. Given the importance of imperfect information as a search and matching friction, changes to the way individuals and employers share information can have especially large consequences for how workers and employers find each other. As a result, the substantial changes to the labor market information and search environment—because of the growth of online job search tools, hiring tools, online labor platforms, and

broader electronic communication technologies more generally—suggest that the process of search and matching and the effects of different policies may be changing particularly rapidly right now. Additionally, the rise of alternative employment arrangements such as independent contractors and temporary workers, the increased desire of individuals to work from home and willingness of firms to allow work from home following the COVID-19 pandemic, and the potential growth of the role of artificial intelligence in the labor market may also change how workers and employers match with one another. All of these areas could affect the efficiency of the labor market and change inequality in wages and well-being. Understanding how search and matching is changing will require researchers to partner with governments, nonprofits, and companies that are trying out new tools as well as with funders to finance work on new ideas or in unproven areas. Well-designed policies should also respond to these changes in the labor market.

Notes

- ¹ In particular, we use frictions to denote phenomena that cause the labor market to differ from an (unrealistic) benchmark model in which there is perfect information among individuals and employers, instantaneous matching, no pecuniary or nonpecuniary costs to changing jobs, and no behavioral biases. A textbook example of a market without these frictions is a commodity market, such as the market for crude oil that meets the West Texas Intermediate standards.
- ² The amount of match-specific surplus is conceptually distinct from how the surplus is divided between the employer and employee. Depending on relative bargaining positions, the surplus could mostly be received by one party. Match quality is difficult to measure, and economists often proxy for match quality using job duration and wages. However, these measures are confounded by bargaining power and other factors, which creates challenges for studying match quality.
- ³ It is usually most accurate to think of the labor market as containing several submarkets that are segmented but possibly interrelated. For example, the market for construction laborers is related to the market for carpenters, both of which are related to the market for retail salespeople. A key feature of each submarket is the degree of skill specificity.
- ⁴ Krueger and Mueller (2012) focus on individuals between ages 20 and 54 that are unemployed, which means that these individuals report actively looking for work in the past four weeks and being available to start work. The American Time Use Survey asks individuals to account for all of their activities in the prior day.
- ⁵ Krueger and Mueller (2012) find that unemployed individuals spend about 23 minutes a day on education—double the amount of time spent on education by employed individuals. However, the sum of time spent on job search and education is still less than one hour a day in their sample.
- ⁶ Employed individuals who are looking for work submit about four applications per month on average.
- ⁷ Marinescu and Wolthoff (2020) show that the relationship between the number of job applications and the posted wage on CareerBuilder.com is *negative* within six-digit Standard Occupational Classification codes but positive once also controlling for job titles. Job titles convey additional information about the job, such as the required level of experience, and individuals respond to this information.
- ⁸ As discussed by Manning (2005), Card and colleagues (2018), and others, preference heterogeneity can generate wage dispersion, slower labor market transitions, and monopsony power among employers.
- ⁹ These experiments did not randomize the type of job search assistance, which makes it possible to isolate the impact of work search requirements.
- ¹⁰ Marinescu and Skandalis (2021) also document the importance of duration dependence (e.g., when individuals apply to lower-wage jobs as their unemployment spell lengthens) and dynamic selection (e.g., when individuals who remain unemployed tend to be those who search less intensively).
- ¹¹ There is a long literature on the theory and empirics of *internal* labor markets which, although obviously related to external labor markets, we do not focus on in this paper. See Lazear and Oyer (2004), DeVaro and Morita (2013), and DeVaro, Kauhanen, and Valmari (2019) for more details.
- ¹² See Rees (1966) for an early discussion of the difference between informal and formal recruiting.

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- ¹³ “Screening and Evaluating Candidates,” Society for Human Resource Management, accessed April 4, 2022, <https://www.shrm.org/resourcesandtools/tools-and-samples/toolkits/pages/screeningandevaluatingcandidates.aspx>.
- ¹⁴ In the simplest competitive model, employers will *make* firm-specific skills and *buy* (or be paid to provide the training for) general skills (Becker 1962). The intuition behind these models is that workers will accept lower wages in the short run at jobs where general training is provided by the employer. In more realistic labor market models, employers may still provide some general skills training if the exact combination of skills is firm specific (Lazear 2009) or if the employer has some monopoly power (Acemoglu 1997; Acemoglu and Pischke 1998).
- ¹⁵ See also David Arnold, “Mergers and Acquisitions, Local Labor Market Concentration, and Worker Outcomes,” working paper, last updated October 29, 2021, <https://darnold199.github.io/madraft.pdf>. There is an active discussion about what types of evidence are more useful for quantifying market power, with some arguing that regressions of prices on measures of concentration are not necessarily informative about the degree of market power under many circumstances (e.g., Berry, Gaynor, and Morton 2019; Miller et al. 2022).
- ¹⁶ Both the New Jobs Tax Credit and Targeted Jobs Tax Credit subsidies applied to a capped amount of payroll costs or wages.
- ¹⁷ Michelle Muhleisen and Chelsea Hutchinson, “Colorado Enacts Sweeping Equal Pay Legislation After Decades of Failed Attempts,” *National Law Review*, May 30, 2019, <https://www.natlawreview.com/article/colorado-enacts-sweeping-equal-pay-legislation-after-decades-failed-attempts>.
- ¹⁸ Another implication of this model is that even though UI depresses individual search behavior, the reduction in aggregate employment is smaller because of congestion (which is higher during recessions, when UI is used more).
- ¹⁹ Union hiring halls typically use some combination of seniority and first-come-first-serve ordering. For some legal history and discussion of hiring hall practices, see Craig (1958) and Yale Law Journal (1961).
- ²⁰ Other explanations include differences in the types of jobs, locations, and characteristics of applicants.
- ²¹ By contrast, Hall and Krueger (2012) find that Black and Hispanic individuals are *more* likely to bargain over pay. The underlying samples differ: Fryer, Pager, and Spenkuch (2013) study differences in bargaining among individuals who received UI benefits in New Jersey and subsequently received a job offer during the survey period, while Hall and Krueger (2012) examine whether individuals bargained over a job offer that they ultimately accepted, for a nationally representative sample. Both surveys used similar bargaining questions and were administered in 2008.
- ²² By contrast, if Black individuals perceived discrimination in only certain occupations, they might apply to a narrower set of jobs.
- ²³ Contrasting evidence comes from Craigie (2020), who finds that laws preventing employers from asking about criminal history led to an increase in public sector employment. Impacts on public sector employment could differ from impacts on private sector employment (studied by other researchers) because of differences in hiring practices or equilibrium shifts in labor supply in response to declining private sector opportunities.
- ²⁴ The Atlanta Federal Reserve Bank Survey of Business Uncertainty asks employers about broad expectations about the economy but is not focused on the issues related to hiring and screening that we focus on here.

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