Hiring Subsidies for the Disadvantaged: Evidence from the Work Opportunity Tax Credit*

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Abstract

The US spends billions of dollars annually on policies to promote upward economic mobility. This paper studies the effectiveness of one such approach: targeted wage subsidies. We examine a large federal program, the Work Opportunity Tax Credit (WOTC), which covers up to 40% of wages for certain categories of disadvantaged workers and subsidizes over two million hires annually. Using linked administrative data, we apply four complementary quasi-experimental approaches to assess WOTC's impact on labor market outcomes, including age-based eligibility discontinuities, eligibility expansions, and changes to program participation costs. We find precise null effects on hiring, employment, and earnings across all specifications, where we can rule out effects on hiring as small as 0.2 percentage points. Instead, employers hire the same workers as in the absence of subsidies, and subsidies operate as a pure transfer to the firms, where most of the benefits accrue to a small number of large firms. To understand these results, we collect original data on the hiring processes of WOTC-utilizing firms. These data suggest that firms often silo information on candidates' subsidy eligibility from managers making hiring decisions, with some evidence that this is due to concerns about legal liability.

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1 Introduction

The US spends billions of dollars each year on policies to promote employment and upward economic mobility among disadvantaged groups. Much of these efforts go to programs and policies focused on providing incentives to individuals to find work, such as the Earned Income Tax Credit and vocational training programs (Barnow and Smith, 2015). An alternative demand-side approach is wage subsidies, in which the government subsidizes the wages paid to certain types of workers to encourage firms to hire them (Katz, 1996).

This paper studies the largest such program in the US, the federal Work Opportunity Tax Credit (WOTC), which provides wage subsidies to encourage the hiring of groups typically disadvantaged in the labor market. Firms can apply for WOTC when making new hires and receive tax credits for up to 40% of the hire's wages in their first year in a job. WOTC was created in 1996 and initially subsidized the wages of approximately 400,000 individuals annually, most of whom were recipients of cash welfare. Over time, eligibility has expanded and now includes ten categories of individuals, the largest of which is Supplemental Nutrition Assistance Program (SNAP) recipients. The number of jobs subsidized by WOTC has grown to over 2.5 million annually (Department of Labor, 2023b), and in 2022, approximately 4% of all new hires in the US had their wages subsidized by WOTC (Bureau of Labor Statistics, 2023b). That is more than double the number of workers earning at or below the federal minimum wage (Bureau of Labor Statistics, 2023a), a policy that has received considerably more academic and policy attention.

In standard economic models, wage subsidies increase employment or wages by lowering the effective cost of labor to employers. If targeted to particular groups, they may encourage the hiring of workers from those groups by lowering the cost of these workers as compared to workers ineligible for subsidies. Temporary wage subsidies like WOTC can encourage firms to accept the risks of hiring workers whom they might otherwise be unwilling to hire (Pallais, 2014). Targeted wage subsidies may also affect non-employment outcomes, such as reducing reliance on public benefit programs or the likelihood of engaging in criminal activity.

While promising in theory, many have voiced concerns that subsidies do not encourage hiring or retention of workers in practice. Instead, employers may only apply for wage subsidies for workers whom they would have hired anyway, and so the subsidies have minimal effects on the employment of targeted populations (Bartik, 2001; Hamersma, 2005). Others have expressed concern that hiring subsidies may lead to "churning" of workers, in which subsidized employees are fired after the subsidy is exhausted (GAO, 2001), or that targeted wage subsidies may stigmatize eligible workers and make them less likely to be hired (Burtless, 1985).

To estimate the effect of WOTC on labor market outcomes, we use administrative data from over 13 million individuals in the state of Wisconsin over the past two decades. Our data links quarterly employment and earnings records to a host of social program data, including SNAP, Temporary Aid to Needy Families (TANF), unemployment insurance, and criminal justice records. We additionally link this to individual-level records of over 800,000 applications for WOTC subsidies, which allows us to characterize which types of firms and workers receive WOTC benefits.

Our empirical focus is on SNAP recipients, which comprise approximately two-thirds of all workers whose wages are subsidized by WOTC (Department of Labor, 2024).[1] We use four complementary empirical approaches to establish the effects of WOTC on labor market outcomes. Each approach provides insights into different elements of the program, but the results are remarkably similar, reinforcing the robustness of the findings. The first strategy is based on a major WOTC expansion among SNAP recipients in 2007. Prior to 2007, SNAP recipients aged 18-24 had been eligible for wage subsidies, while in 2007, eligibility was expanded to ages 18-39. We use a difference-in-differences approach, measuring how labor market outcomes change for SNAP recipients just below the new age threshold of 40 (newly eligible) as compared to those just above (ineligible). We also examine how outcomes change for those just above age 25 (newly eligible) as compared to those just below age 25 (always eligible).

Second, we exploit these sharp age-based eligibility criteria for WOTC among SNAP recipients at age 25 prior to 2007 and age 40 beginning in 2007. Using a regression discontinuity design around those age thresholds, we test how labor market outcomes differ for those who are just eligible for the subsidies as compared to those who are just ineligible. This approach provides a larger sample for exploring potentially heterogeneous effects of eligibility and allows us to estimate the consequences of WOTC eligibility throughout the sample period rather than just around 2007.

Third, Wisconsin instituted electronic filing of WOTC applications in June 2017. This decreased the (implicit) cost to firms of applying for WOTC subsidies and led to a large increase in WOTC utilization. We examine the effect of e-filing on labor market outcomes by using the same WOTC-eligible and ineligible age groups among SNAP recipients as in the first empirical approach (around age 40), but with a difference-in-differences approach around June 2017. This approach provides a conceptually different treatment effect estimate, as it evaluates the effect of a policy change that lowers the cost of firm access to wage subsidies rather than individual-level eligibility.

Across all three approaches, we find no evidence that WOTC increases employment of eligible workers. These estimates are extremely precise: for example, using a precision-weighted average of these three approaches, the upper bound of the 95% confidence interval around the (null) estimate on hiring is 0.2 percentage points. These results hold even when we focus on employment at firms that are the largest users of WOTC. This implies that WOTC eligibility is not influencing firm hiring decisions, and so firms are receiving subsidies for workers whom they would have hired in the absence of WOTC, a phenomenon known as "windfall wastage" (Bartik, 2001). To quantify the extent of windfall wastage, we revise each specification so that the outcome is whether the worker is hired into a WOTC-subsidized job; this measures the effective difference between the eligible and ineligible group in program uptake. We divide the bounds on our hiring estimates by these uptake estimates to establish bounds on the fraction of WOTC-subsidized hires whose hiring could be attributable to WOTC. Our estimate implies that 97% of WOTC-subsidized hires are windfall wastage, where we cannot reject the null that all WOTC hires are windfall wastage.

[1]Other categories include TANF recipients, Supplemental Security Income (SSI) recipients, individuals with a felony conviction, and the long-term unemployed. SNAP is by far the largest target group: the next largest group (long-term unemployed) comprised only 6.8% of WOTC certified hires in 2023 (Department of Labor, 2024).

Even if hiring decisions are unchanged by wage subsidies, they could still benefit targeted workers if bringing the subsidy to the firm allows them to negotiate for higher wages or if employers retain workers for longer to receive subsidies. Either of these channels would imply that eligibility conveys higher earnings. Using the same empirical approaches, but instead using earnings as the outcome variable, we find no evidence of this. These null estimates are quite precise, where the upper bound of the 95% confidence interval implies that we can rule out positive effects on quarterly earnings as little as $20 per quarter.

Some proponents argue that wage subsidies can reduce usage of public benefit programs and discourage engagement in criminal activity. Indeed, WOTC lobbyists claim that these effects are meaningful and results in WOTC creating a large net savings for the government (Cappelli, 2012). Using administrative data on these outcomes and the same empirical approaches, we find no evidence of WOTC eligibility affecting the dollar value of public benefits received or any of a broad set of outcomes related to criminal activity.

Our fourth empirical approach analyzes the data at the firm-level rather than worker-level. We exploit the staggered adoption of WOTC by firms over time in a triple-differences design, examining how firm hiring practices changes around the time of WOTC adoption relative to firms that have not yet adopted WOTC. In particular, we focus on changes in firm hiring of SNAP recipients who are eligible for WOTC (i.e., just below age 40) relative to SNAP recipients who are just ineligible (i.e., just above age 40). After adoption, there is an immediate and persistent spike in firm receipt of WOTC subsidies for eligible hires relative to ineligible ones, meaning that the firm faces a lower wage bill when hiring a WOTC-eligible worker. However, as in the previous three analyses, we find that they do not respond to this incentive: they are no more likely to hire eligible workers relative to ineligible workers.[2]

While we find no effect on hiring, an oft-cited concern with capped wage subsidy programs is that firms may fire subsidized employees after the subsidy is exhausted to hire a new batch of subsidized workers, a phenomenon labeled as "churning"(GAO, 2001). If this were the case, hiring subsidies may reduce the availability of stable jobs in low-wage labor markets. We investigate this possibility using discontinuities in the WOTC subsidy schedule, checking for bunching or kinks in separations after both subsidy exhaustion and other discontinuous changes in subsidy amount. We find no evidence of churning, including when we focus on particular categories of firms that are more attentive to WOTC or within particular time periods.

The final section of the paper investigates the puzzle of why firm hiring behavior does not respond to a sizable subsidy like WOTC. We begin by testing and ruling out more conventional explanations grounded in canonical models of labor supply and demand or the negative signal value of WOTC eligibility. We then collect and analyze original data on the hiring processes of a representative sample of 170 WOTC-using firms, where these firms jointly account for over half of WOTC applications in Wisconsin. These data provide a straightforward explanation: even among

[2]We also find no evidence of aggregate effects at the firm level. Using a strategy that compares firms that are more or less "exposed" to the 2007 policy change, more exposed firms are no more likely to hire more workers on aggregate or increase wages than less exposed firms.

these firms, which eventually file for and receive WOTC subsidies for their hires, fewer than 20% of their job applications collect information that would allow them to determine if an applicant was WOTC eligible. Even among the subset of firms whose applications collect this information, many still silo it from individuals making hiring decisions. As a result, hiring decisionmakers typically lack information about applicants' WOTC eligibility and therefore cannot factor it into their hiring decisions.

To understand why firms do not integrate WOTC eligibility into hiring, we conduct a separate survey of hiring professionals at WOTC-participating firms. Respondents cited two main concerns: first, that preferring WOTC-eligible applicants could risk lawsuits over hiring discrimination, and second, that explicit screening may discourage applications. These institutional and informational frictions, which are typically absent from models of hiring and job search, appear central to understanding why subsidies may fail to influence employer behavior.

Put together, our results imply that hiring subsidies through WOTC operate as a pure transfer to firms. We show that these transfers are heavily concentrated, with half of WOTC subsidies in Wisconsin going to just 48 firms, far in excess of these firms' share of employment (9% of all hires). The Work Opportunity Tax Credit will be up for renewal by Congress in December 2025. While our empirical results focus on SNAP recipients, who make up two-thirds of WOTC-subsized hires, the informational constraints that we identify likely also apply to other WOTC-subsidized groups. Our results imply that either reforms are needed to make WOTC benefit disadvantaged workers or that the billions spent annually on WOTC could be spent more impactfully on other programs.

This paper contributes to three main literatures. First, it adds new evidence to the literature on hiring and wage subsidy policies in the United States. An older literature used survey data to study early federal wage subsidy programs such as the New Jobs Tax Credit (e.g., Perloff and Wachter, 1979; Bishop, 1981) and the Targeted Job Tax Credit (e.g., Burtless, 1985; Hollenbeck and Wilke, 1991; Bishop and Montgomery, 1993; Lorenz, 1995; Katz, 1996), but Katz (1996) suggests concerns with the empirical designs of many of these studies, concluding that "much uncertainty" remains about the efficacy of wage subsidies. More recent research has turned to smaller state tax credits (e.g., Bartik, 2001; Bartik and Erickcek, 2014; Neumark and Grijalva, 2017), tested how employers respond to wage subsidies within the context of an employer survey or field experiment (e.g., Holzer et al., 2007; Hunt et al., 2018; Cullen et al., 2023; Bushway and Pickett, 2024), or examined subsidies packaged with other interventions like training (e.g., Bell and Orr (1994); Gelber et al. (2016)).[3] We leverage linked administrative data on workers, firms, and subsidy claims and provide precise estimates for a large federal program targeted at individuals with disadvantages in the labor

[3]Outside of the US, recent studies report mixed results. Cahuc et al. (2019) finds that hiring credits for French firms during the Great Recession increased employment without affecting wages, Boockmann et al. (2012) finds that hiring subsidies for older workers in Germany only increase the hiring of some types of workers, and studies in other European countries have found modest or no effects (e.g., Huttunen et al., 2013; Schünemann et al., 2015). Fenizia et al. (2025) finds a precise null effect of wage subsidies for hiring apprentices in Italy, but shows that this results from a different underlying mechanism than this paper (inelastic demand for apprentices among firms). Recent evaluations of wage subsidy programs in developing countries using randomized controlled trials typically find short-term employment gains that do not persist in the long-run (e.g., Galasso et al., 2004; Groh et al., 2016; Abel et al., 2021).

market. Our findings contrast with standard predictions that wage subsidies should increase hiring or wages by lowering the effective cost of labor, and show that even a relatively generous subsidy may have no effect.

Second, our paper contributes to the literature on labor markets and job search, and in particular, work highlighting mechanisms typically absent from standard models. While many recent papers have examined worker-side factors such as lack of information or incorrect beliefs (e.g., Spinnewijn, 2015; Krueger and Mueller, 2016; Cullen and Pakzad-Hurson, 2023; Roussille, 2024; Jäger et al., 2024), our paper aligns more closely with papers looking at firm-side factors, such as information or pay equity constraints (e.g., Altonji and Pierret, 2001; Pallais, 2014; Burks et al., 2015; Saez et al., 2019). Our findings add to a literature on how legal constraints shape labor market outcomes, finding evidence for unintended consequences of legislation intended to prevent discriminatory hiring (e.g., Acemoglu and Angrist, 2001; Agan and Starr, 2018).

Third, we contribute to a smaller literature that has studied WOTC specifically. These papers either focus on an earlier time period when the program was relatively small and focused on TANF recipients (Hamersma, 2008) or are descriptive in nature (Gunderson and Hotchkiss, 2007; Hunt et al., 2018; Hamersma and Heinrich, 2008; Hamersma, 2011). The lack of academic consensus on WOTC is well-illustrated by a February 2023 release by the Department of Labor containing a list of open questions about the program, including "does the tax credit influence employer hiring decisions?" (Department of Labor, 2023a). Our results expand and often differ from the findings in existing work, providing an overall more negative assessment of the program.[4]

2 Institutional Background

Active labor market policies, such as job search assistance, job training, and job subsidies, are a large part of government spending in most developed countries: OECD countries spend an average of 0.58% of GDP on these policies annually (Crépon and Van Den Berg, 2016). While a large literature on job search assistance and job training programs suggests that the former can sometimes be helpful and the latter is often not, there is much less evidence on employment subsidies, particularly in the US context.[5]

The US has a long history of experimenting with wage subsidy programs, including Job Opportunities in the Business Sector in the late 1960s, the WIN tax credit in the 1970s for AFDC recipients, and the New Jobs Tax Credit from 1977-1978 (see, e.g., Perloff and Wachter, 1979; Bishop, 1981). The most extensive of these programs was the Targeted Job Tax Credit, which was in effect between 1979 to 1994 and primarily subsidized the employment of beneficiaries of public

[4]To the best of our knowledge, the only other paper that attempts to causally identify the labor market consequences of WOTC, Hamersma (2008), estimates that WOTC eligibility generates a meaningful (5.9 percentage point) increase in short-run employment, but not in long-run employment. Our findings may differ due to sample, timing, or empirical strategy: Hamersma (2008) takes data on approximately 3,500 TANF recipients between 1997-2002 and uses propensity-score matching to compare the labor market outcomes of individuals who stopped receiving TANF benefits after 6-8 months (ineligible for WOTC) to individuals who received TANF for 9-18 months (eligible).

[5]See Card et al. (2010), Crépon and Van Den Berg (2016) and Card et al. (2018) for meta-analyses and summaries on job search assistance and job training programs.

assistance. This program was eventually phased out after criticism over implementation issues, namely "employer windfalls for hiring employees that they would have hired anyway and too many credit-eligible employees leaving their jobs before receiving much work experience" (Government Accountability Office, 2002). This paved the way for reforms to the design of federal targeted wage subsidies that resulted in the Work Opportunity Tax Credit.

2.1 The Work Opportunity Tax Credit

The Work Opportunity Tax Credit was established by Congress on August 20, 1996 by P.L 104-188. The current WOTC differs from past wage subsidy programs in both design and target populations. As discussed in a 2002 GAO report on WOTC, the most important change was introducing a requirement that employers confirm applicants' WOTC eligibility prior to making hiring decisions to avoid windfall wastage (Government Accountability Office, 2002): on IRS Form 8850, which firms submit when filing for WOTC, both the hire and firm must sign to confirm that "under penalties of perjury, I declare that the applicant provided the information on this form [indicating eligibility for WOTC] on or before the day a job was offered to the applicant." This contrasts with the Targeted Job Tax Credit, under which employers "may claim the tax credit even though they have made no specific effort to recruit, hire, or retain workers targeted by the program" (Government Accountability Office, 1991).

There were also changes to the minimum employment length requirements to encourage longer stints of employment, as well as reforms to eligibility target groups to focus on the neediest job seekers (Government Accountability Office, 2002). Finally, as discussed more below, the number of subsidized workers has expanded substantially. The Targeted Job Tax Credit cost around $300 million in 1994 (U.S. Department of Labor Office of Inspector General, 1994), while we estimate that WOTC currently costs over $2 billion annually. These changes have the potential to make WOTC significantly more effective than its predecessors, but it is an empirical question whether this potential manifests in actual gains.

The main groups of individuals eligible for WOTC are those: (1) aged 18 to 39 and whose family has received SNAP benefits for at least 3 of the 5 months prior to hiring; (2) whose family has received assistance under TANF for at least 9 of the 18 prior months; (3) convicted of a felony and hired within one year of their conviction or release from incarceration; (4) who are long-term TANF recipients, including those who exhausted their TANF benefits in the past two years; (5) who have received SSI over the past three months;[6] or (6) unemployed for at least 27 consecutive weeks and who received unemployment compensation during at least part of the unemployment period.[7] SNAP recipients are by far the largest category, making up around two-thirds of all WOTC certifications in recent years (Figure 1). These populations typically have low rates of labor force

[6]See appendix C.1.3 of Aizawa et al. (2024) for an analysis using survey data from the Health and Retirement Study on how WOTC affects employment among individuals with disabilities. While they find no effect of WOTC on employment outcomes, they note that their estimates are noisy.

[7]A few other categories are also eligible, such as qualified veterans, residents of "designated communities", and employees of summer youth programs, but make up a small fraction of all WOTC subsidized hires

participation: for example, only 52% of non-disabled, working-age SNAP participants are employed in a typical month (Keith-Jennings and Chaudhry, 2018).

All firms are eligible to apply for WOTC and may receive subsidies for an unlimited number of hires, but they can only receive the subsidy once for a particular worker.[8] However, if a worker was previously subsidized by a different employer, a new firm may still claim the full subsidy provided the worker meets the WOTC eligibility criteria at the time of hiring. Employers need only submit two one-page forms for each worker within 28 days of hiring to the relevant state agency to claim the tax credit (plus a one-page form to the Internal Revenue Service at the end of the year aggregating all individual claims).[9] This agency verifies that the worker is eligible and certifies or denies the application.[10] Using data from three states for which we observe the exact dates of filing an application and certification for WOTC, we find that the median time between application and certification is 119 days, with a standard deviation of 115 days.[11]

When applications are approved, the firm receives tax credits for wages over the worker's first 12 months of employment in a job. The firm can claim 25% of wages for workers who worked between 120-400 hours and 40% for employees who worked at least 400 hours, up to a limit of $6,000 of earnings (or $2,400 in tax credits) per worker for most categories of workers (Appendix Figure A1).[12] These tax credits are non-refundable and so require tax liability to be claimed, but they can be carried backward up to one tax year and forward up to 20 tax years. The firm also continues to receive the subsidy even if the worker does not remain in the eligible category after hiring.

WOTC primarily subsidizes low-wage employment. Appendix Figure A2 plots a histogram of the starting hourly wage for WOTC workers, using administrative micro-data on all WOTC applications in Wisconsin between 2005 and 2020. Most jobs are at or just above the minimum wage, which was equal to $7.25 in Wisconsin over this period.[13] Combining this data with administrative quarterly earnings data, we find that for each certification, firms receive an average of $1098 in subsidies. 34% of certified workers work less than the minimum number of hours for eligibility for WOTC (120 hours), 24% work at a 25% wage subsidy rate (120-400 hours), and 42% work enough

[8]Taxable employers can claim WOTC against income taxes, while eligible tax-exempt employers can only claim WOTC against payroll taxes on wages paid to qualified veterans rather than the full set of eligible individuals listed above (Internal Revenue Service, 2024).

[9]The form also requires applicants to supply some evidence of eligibility; for example, for those eligible based on TANF or SNAP receipt, applicants need to provide their case number identifier and/or a signed statement from an Authorized Individual with a description of months of benefits that were received.

[10]While there is an option for workers to get "pre-certified", so that they can present their eligibility to potential employers and avoid this application process, this accounts for a minuscule fraction of certifications in our data (0.65%), almost all of which are eligible due to a felony conviction.

[11]These data are from Arizona, Rhode Island, and Tennessee, and come from FOIA requests (Corwin, 2022). Using coarser (quarterly) data from the Department of Labor that records the number of WOTC applications, certifications, and rejections in a quarter, we can separately estimate the number of quarters in which applications are processed in each state. The processing speed of these three states is close to the national average, so the finer estimates are likely to generalize more broadly.

[12]The limit is $9,600 in tax credits for disabled veterans who meet other criteria, but this is a very small fraction of all WOTC hires.

[13]Data from administrative records in seven other states between 2018 and 2020 (Corwin, 2022) suggest that this is also true outside of Wisconsin.

hours to qualify for the 40% subsidy rate, with 31% of all certifications yielding the maximum subsidy amount of $2400.[14] As these numbers indicate, these jobs are typically short-term, with a median estimated hours worked of 265 hours and only 23% of jobs lasting longer than three quarters.

2.2 History of the Work Opportunity Tax Credit

In its early years, WOTC subsidized the wages of approximately 400,000 individuals annually, where the majority were recipients of TANF. Over time, eligibility criteria have expanded to include additional groups, such as SNAP recipients between the ages of 25 to 39 (in 2007) and the long-term unemployed (in 2015). As a result of these extensions and greater awareness of the program, the number of workers whose wages are subsidized by WOTC has grown sixfold, reaching 2.5 million in 2022 (Department of Labor, 2023b). Panel (a) of Figure 1 shows that most of this growth came between 2008 and 2015, and is due to certifications for WOTC through SNAP.[15] Consistent with this, panel (c) of Figure A3 uses data from the Current Population Survey to estimate the fraction of individuals below the poverty line who would be eligible for WOTC if hired into a new job. This number expands sharply after an expansion in WOTC, and after 2010, ranges from 36 to 47% of all adults between 18 to 40 who are below the poverty line. Patterns in Wisconsin are quite similar to those nationally, suggesting that even though our data is from one state, it will well approximate national patterns.

To further decompose the reasons for this massive growth, we leverage individual-level data on all WOTC applications in the state of Wisconsin between 2005 and 2019, a dataset described in greater detail in Section 3. We match this to employer-employee earnings records, as well as TANF, SNAP, and criminal justice records to measure which new hires are potentially eligible for WOTC subsidies. The expansion could be the result of: (i) an increased number of job applicants who are eligible for WOTC; (ii) firms becoming more likely to apply for WOTC subsidies for a given hire, such as if screening technology improves; or (iii) greater success in the application process, such as a higher fraction of applications being accepted.

Panel (a) of Appendix Figure A3 plots the total number of new hires who are potentially eligible for WOTC over time as a result of the three eligibility criteria that are our observable in our data – SNAP receipt, TANF receipt, and having a recent felony conviction – which account for over three-quarters of WOTC subsidized hires. We then match these employment stints to WOTC micro-data to check what fraction of eligible hires have an associated WOTC application, which we plot in panel (b). Panel (b) also plots the fraction of all applications that result in a certification. Over the main period of expansion from 2008 to 2015, there is a tripling in the number of hires who

[14] To estimate total hours worked for the employer, we divide total earnings for the worker from that employer in this work stint by the starting hourly wage, which is reported in the WOTC application. This could be incorrect if workers receive a raise in their hourly wage, but that is quite unlikely since 400 hours is still only 10 weeks of full-time work and so workers are unlikely to receive a raise so quickly.

[15] Federal law places limits on SNAP eligibility for able-bodied adults without dependents (3 months in a 36 month period). Wisconsin had these requirements waived between 2002 and 2015 due to high unemployment, and we do not see evidence of differences in the effects of WOTC during the waiver/non-waiver periods.

qualify for WOTC. The fraction of eligible hires for whom firms apply for WOTC also increased meaningfully from 11.2% in 2007 to 17.1% in 2015, though this is less important than the increase in eligibility.[16] Finally, application success rates are fairly steady, and so do not explain the change. We thus conclude that the growth of WOTC is mostly due to an increase in the number of hires who are eligible, largely due to the expansion of the SNAP program.

3 Data

The major difficulty with studying WOTC is that the necessary administrative data on eligibility and outcomes are typically siloed within many different state government agencies. We overcome this challenge by using linked administrative data from the state of Wisconsin through the Institute for Research on Poverty (IRP) at the University of Wisconsin-Madison, which contains information on over 13 million individuals. We use linked data from quarterly earnings records, SNAP benefits, TANF benefits, criminal justice records, unemployment insurance benefits, WOTC application and certification data, and a data core that compiles individual demographic information from various state databases. Wisconsin is a good state in which to study WOTC because it is fairly typical in its implementation of the program: for example, Appendix Figure A4 shows that per capita utilization is almost exactly the national average.

Quarterly earnings records: We use quarterly earnings records between 1998 and 2020 that are collected for Wisconsin's Unemployment Insurance (UI) program from the Department of Workforce Development.[17] These records include quarterly earnings for each worker from each of their employers, along with worker and employer identifiers.

SNAP records: We use monthly FoodShare (the name of Wisconsin's SNAP program) benefit records between 1998 and 2020 from the Department of Health Services. These records include benefit amounts for the household and individual identifiers of each eligible member of the household.

TANF records: We use monthly TANF benefit records between 2003 and 2019 from the Department of Children and Families. These records include benefit amounts and individual-level identifiers.

Criminal justice records: These data, which cover the years 2004 to 2020, consist of court records, state Department of Corrections data on entry/exit from prisons, and data on entry and

[16] Note that this is the fraction of *all* hires who would be WOTC eligible, where many of these hires are at firms that do not engage with the WOTC program. Among hires at a firm that has previously filed a WOTC application, applications are filed for around 40% of WOTC-eligible hires, without much change in this rate over the study period. Thus this rise is due to an increase in the number of firms filing for WOTC.

[17] While this data excludes some workers, including those who work in a neighboring state, those who have moved out of state, Federal employees, and self-employed workers and independent contractors, these are a small fraction of total employment.

exit from Milwaukee jails. For the purposes of this study, we combine these to observe whether an individual has been convicted of a misdemeanor or felony in a given quarter.

Work Opportunity Tax Credit application and certification data: We use WOTC certification data between 2005 and 2020 from the Department of Workforce Development. These records include the date of the WOTC application, whether the application was certified or denied, and starting in 2009, the target group under which the certification qualified. It also includes individual and firm identifiers which allows us to link the WOTC certification data to the other data sources.

Demographic data: For individuals who receive a social service such as SNAP, we also observe demographic information such as age, gender, and race.

Table 1 shows summary statistics for (1) individuals for whom a firm files a WOTC application; (2) individuals for whom the firm successfully receives a WOTC certification; and (3) the sample of individuals who are between the ages of 18-39 and received SNAP benefits in three of the past five months (the WOTC qualification criteria under SNAP). Among the WOTC applicants and certified individuals, our data consists of 797,411 applications and 426,498 certifications across over 400,000 individuals.

Panel A provides basic demographic information for these individuals in a particular quarter. The average age for both applicants and certifications is around 29 years, less than half the applicants are male, and over a third are Black. Over three-quarters of successful WOTC certifications are for individuals who are SNAP beneficiaries, while only 10% of them receive TANF benefits. Median quarterly earnings of WOTC-certified individuals is approximately $1,800 per quarter. The SNAP sample of individuals, which consists of almost 900,000 individuals, is comparable demographically to individuals who receive WOTC certifications, although they are mechanically less likely to find employment or be employed in the focal quarter.

Panel B instead provides summary statistics at the job stint level, focusing on employment spells in which the individual: (1) had an associated WOTC application; (2) had an associated WOTC certification; or 3) was between 18-39 and received SNAP benefits for three of the past five months at the beginning of the spell. For WOTC workers, job spells last on average around 3.5 quarters, with median total earnings of around $2,600 and an average starting wage of $9/hour. Mean earnings are significantly higher than median, reflecting that many of these employment spells are of a short duration but there is a long right tail. Retail, admin/support, and food/accommodation are the largest industries, and the average WOTC subsidy is a little over $1,000. As an estimate of the effective subsidy rate that a firm would expect when hiring a worker, we calculate total earnings and total subsidy payments over hires' first $6000 of earnings in the job, i.e., over the period that their wage would be subsidized if they are certified as eligible. Summing across all hires for whom the firm applies for WOTC, we find that this rate is equal to 19.2% and is equal to 35.4% among

those who are certified.[18] Job stints are similar for the SNAP sample in terms of median total earnings and tenure with a firm, though the jobs are much less likely to be in retail.

4 Effects of WOTC eligibility on individual outcomes

In this section, we use the linked administrative data to estimate the effects of WOTC eligibility on labor market outcomes – employment, being hired into a new job, and earnings – as well as spillovers to usage of social assistance and criminal activity. We use three separate identification strategies based on individual-level data: first, we exploit a 2007 expansion in eligibility among the SNAP recipient target group in a difference-in-differences design; second, we exploit sharp age cut-offs in WOTC eligibility in a regression discontinuity design; and third, we leverage a 2017 change in the application process that implicitly decreased the cost of applying for WOTC.

4.1 SNAP expansion

We first examine a large expansion of eligibility among SNAP recipients. SNAP recipients are the largest target group for WOTC, comprising around two-thirds of WOTC certifications in recent years. Prior to 2007, individuals who were between the ages of 18-24 and had received SNAP benefits in three of the previous five months were eligible for WOTC. In 2007, this target group was expanded to include SNAP recipients between the ages of 25 to 39 who met the same benefit-duration requirement. Figure 2, which graphs total WOTC certifications in Wisconsin by application date, shows that total certifications increased from an average of 3,000 per quarter for hires in 2005-2006 to an average of over 5,000 per quarter for hires in 2007-2008 after the SNAP expansion.[19]

To study the impact of this expansion, we construct a sample of individuals who have received SNAP benefits in three of the last five months. We then conduct two analyses (and also stack the analyses): in the first, we compare individuals who are slightly younger than 40 (eligible for WOTC after 2007) before and after the policy change to individuals above age 40 (ineligible for WOTC). In the second, we analogously compare individuals in the sample who are slightly older than age 25 (eligible for WOTC after 2007) before and after the policy change to individuals slightly below age 25 (always eligible for WOTC). To the best of our knowledge, these age cutoffs were not used as a cutoff for other programs experiencing reforms around this time. We focus on the sample period between July 2005 through December 2008 and run event studies and difference-in-differences regressions.

[18] Given that the median time from application to certification is 119 days, the first rate is likely the most relevant for firm decision-making, since firms typically do not know whether an application will be approved at the time of hiring. The first $6,000 in earnings is the most relevant period for calculating the effective subsidy rate, since firms can reassess employment once the subsidy ends and wages revert to the full, unsubsidized rate.

[19] Our data on WOTC certifications only includes the reason for eligibility after 2009. Thus we focus on total certifications rather than only certifications due to SNAP eligibility here. A similar uptick is observed for SNAP-specific certifications using aggregate national data in Figure 1.

The event study specification for the age 40 cutoff is:

$$Y_{i,t} = \sum_{s=2005q3, s\neq 2006q4}^{2008q4} \beta_s 1\left\{age_{i,t} < 40\right\} + \eta_t + \gamma_a + \varepsilon_{i,t} \quad (1)$$

where $Y_{i,t}$ is an outcome for individual i measured in quarter t, η_t are year-quarter fixed effects, and γ_a are age (in months) fixed effects. $age_{i,t}$ measures individual i's age at the start of quarter t, and the indicator is equal to one for individuals whose age is less than 40 (the treatment group) and zero for individuals whose age is 40 or over (the control group). The treatment group consists of individuals with ages between 37.75 years and 39.75 years at the start of a quarter: we select this cutoff as those individuals will be eligible for WOTC for the entirety of quarter t after 2007. Our control group consists of individuals aged between 42 and 44. We exclude individuals aged 40-41 so that the control sample consists fully of those who were not previously eligible for WOTC over the eight quarters after WOTC eligibility expansion in the first quarter of 2007. For example, an individual who turns 40 in the second quarter of 2007 would have been 39 (and thus treated) in the first quarter of 2007.

We also estimate the corresponding difference-in-differences specification that collapses the β_s coefficients into one coefficient post-policy change relative to all time periods prior to the policy change:

$$Y_{i,t} = \beta^{DD} \times 1\left\{age_{i,t} < 40\right\} \times 1\{t \geq 2007q1\} + \eta_t^{DD} + \gamma_a^{DD} + \epsilon_{i,t} \quad (2)$$

For both the event study and difference-in-differences specifications, we cluster standard errors at the individual level.

We also run analogous specifications for the age-25 cutoff, where the treatment group consists of individuals aged between 25 and 27 years at the start of a quarter and the control group consists of individuals aged between 22.75 and 24.75; for similar reasons as the age-40 cutoff, we select the 24.75 cutoff to ensure that all individuals in the control group remain eligible for WOTC for the entirety of quarter t prior to 2007.[20]

We begin by examining three main labor market outcomes. Our first outcome is new hires, defined as an indicator for whether the individual had positive earnings in quarter t in a firm at which they did not have positive earnings in the prior quarter. Our second outcome is employment, defined as an indicator for whether individual i had positive earnings in quarter t. An advantage of using the new hires outcome over employment is that it measures flows into employment, the target of the policy, and excludes workers who are persistently employed and so are least likely to be affected. Our third outcome is earnings in quarter t. This measure captures tenure in the job and wage rate, both of which might be affected by WOTC. For each outcome, we examine effects for the full sample as well as the sample of individuals who were unemployed at the start of period

[20]It is not necessary to exclude individuals aged 25 to 27 because those under age 25 are always eligible for WOTC. As a result, the likelihood of holdover employment in a WOTC-subsidized job for individuals just above age 25 is comparable before and after 2007. This contrasts with the sample around age 40, where, for instance, someone aged 40.25 is more likely to be in a WOTC job after 2007 (when eligibility expanded to ages 25-39) than before.

t, and so for whom WOTC may be particularly relevant.

Table 2 runs the difference-in-differences regressions, with Panel (a) showing the stacked effects and Panels (b) and (c) showing the effects separately for the age-40 and age-25 cutoffs. Panels (a), (b) and (e) of Figure 3 report event study coefficients from Equation (1) for these three labor market outcomes, stacking the two age cutoffs (see Appendix Figures A5 and A6 for the age-40 and age-25 cutoffs, respectively). For all three outcomes, there is no evidence of a pre-trend in outcomes prior to the policy change, and also no detectable effect of the expansion on the outcomes in the eight quarters after the expansion. The confidence intervals on β_{DD} are tight: for example, the upper bound of the 95% confidence interval on being hired would be a 0.25 percentage point increase.[21]

These results suggest that WOTC eligibility does not meaningfully improve labor market outcomes among the SNAP target group. This is not driven, however, by a lack of use of WOTC. Panels (c) and (d) of Figure 3 and Columns (4) and (5) of Table 2 run the same specification, but focus on whether the individual is either employed in a WOTC-certified job or newly hired into a WOTC-certified job in the quarter. Although there is a brief adjustment period, we estimate that the likelihood of being in a WOTC-certified job increases by 2.1 percentage points for the newly eligible group, with point estimates closer to 3 percentage points by the end of the sample period. Thus this expansion does meaningfully increase WOTC utilization.

Finally, lobbyists for WOTC frequently claim that the program results in net savings for the government by allowing people to obtain jobs that pull them off of public assistance and out of criminal activity (Cappelli, 2012). Our precise null estimates on labor market outcomes suggest that this is unlikely to be true, but given the policy importance of this question, we also examine those outcomes. We construct a measure of social assistance as the dollar amount of benefits the individual received from SNAP, TANF, or unemployment insurance in time t. For criminal activity, we construct an indicator equal to one if the individual has a criminal conviction during quarter t. Panels (a) and (b) of Figure A8 and columns (6) and (7) of Table 2 show similar null effects for these two outcomes. It is thus unlikely to be true that these wage subsidies generate any savings for the government.

Even though our estimates suggest that firms on average do not respond to WOTC eligibility in their hiring decisions, it could be that there is a subset of firms that do or there is a response for some types of workers. We check for differential responses among four types of firms that may be more likely to respond to WOTC. First, we focus on employment at the 50 firms with the largest number of WOTC certifications over the sample period; these presumably may have the best WOTC screening procedures. For our second measure of attentiveness to WOTC, we calculate the fraction of WOTC eligible hires for whom each firm actually applies for WOTC. We then focus

[21] In a highly related paper, Cullen et al. (2023) measure how wage subsidies affect employer willingness to hire a worker with a criminal record, experimentally varying the subsidy amount from 0% to 100%. Although they study a different and more heavily stigmatized population (workers with a criminal record), our results are relatively consistent with theirs: they find no response to wage subsidies of up to 25%, which is close to the effective subsidy rate for WOTC calculated in Section 2.

on employment in firms whose application rate is in the top 25% of this metric among WOTC-using firms, as these are the firms that appear to pay the most attention to WOTC. Third, employment services agencies, which provide temporary employees to businesses, are the biggest category of firms utilizing WOTC, and so may be most attentive to the policy. Fourth, firms in industries that are more competitive may be more responsive to policies like WOTC due to their lower margins. We focus on firms in the top 25% most competitive industries (four digit NAICS codes) based on data from the 2022 US Economic Census. Appendix Table A1 finds null employment and hiring results by firm type.[22] Appendix Table A2 also finds no evidence of heterogeneity by race, gender, past conviction status of individuals.

These results are robust to alternative specifications. Appendix Figure A7 and Appendix Table A3 show that our results are similar when we narrow our sample to individuals who enter quarter t unemployed. This sample restriction provides additional precision by focusing on a population that is more likely to be seeking a job. Another concern is that WOTC could have spillovers across workers, whereby subsidized employment for workers in the treated group may displace employment in the untreated group. However, such spillovers would *increase* differences in employment outcomes between the treated and untreated groups rather than bias estimates towards zero. Thus the fact that we find null effects would tend to dispel this concern.[23] The following sections provide further evidence of robustness by using alternative, complementary empirical approaches.

4.2 Age-based discontinuities for SNAP

As a second method of evaluating the effect of WOTC, we exploit the sharp age-based discontinuities in eligibility for WOTC among SNAP recipients. Prior to 2007, SNAP recipients just below age 25 were eligible for WOTC, whereas those just above were not; after 2007, there is a similar discontinuity around age 40. An advantage of this approach relative to our other individual-level analysis is that we will be able to estimate the consequences of WOTC eligibility throughout the sample period rather than at just two points in time (SNAP expansion in 2007; introduction of electronic filing in 2017). It also generates a very large sample, providing excellent statistical power for tests of potential heterogeneity in treatment effects.

We combine two sharp regression discontinuity designs: around age 25 for the period 1998 to 2006 and around age 40 for the period 2007 to 2019. Our estimates are based on the following specification:

$$Y_{i,t} = \gamma_0 + \gamma_1 1\left\{age_{i,t} \geq A_t\right\} + f_1\left(age_{i,t}\right) + f_2\left(age_{i,t}\right) 1\left\{age_{i,t} \geq A_t\right\} + \epsilon_{i,t} \tag{3}$$

[22] While the estimate for employment in highly competitive industries in Panel B is statistically significant at the 5% level, we do not find statistically significant effects for new hires in Panel A or for either outcome in the later RD analysis. We interpret this as most likely reflecting chance variation, due to the large number of regressions.

[23] Furthermore, substitution is unlikely to come purely from the untreated group: for example, in the SNAP expansion research design, it could be that employment of the treatment group (SNAP recipients aged 38-39) displaces someone not from the untreated group (SNAP recipients aged 42-43) but SNAP recipients aged above age 43 or non-SNAP recipients in any age range.

where $Y_{i,t}$ is the labor market outcome for individual i in quarter t, $age_{i,t}$ measures their age at the start of quarter t, and A_t is equal to 25 for years < 2007 and 40 for years ≥ 2007. The coefficient γ_1 captures the (negative) treatment effect, while the functions f_1 and f_2 reflect a continuous but potentially non-parametric relationship between the running variable and the outcome.[24] Using the data-driven approach of Calonico et al. (2014) and *rdrobust* command of Calonico et al. (2017), we apply a triangular weighting kernel in distance from the threshold, calculate a MSE-optimal bandwidth with a linear polynomial estimated within the bandwidth on either side of the cutoff, and calculate heteroskedasticity-robust standard errors clustered at the individual level.[25]

As in the SNAP expansion analysis, we restrict the sample to individuals who have received SNAP for three of the five months preceding the start of a given quarter, i.e., the condition for WOTC eligibility through SNAP. We also drop the quarters in which $age_{i,t}$ crosses the relevant threshold (i.e., individuals whose age at the beginning of a quarter is (24.75,25) or (39.75,40)), as those are difficult to interpret since individuals are partially treated.

This approach has a number of key identifying assumptions. The first is that the running variable, age, is not manipulable around the threshold, such as if individuals lie about their age when applying for SNAP benefits. We test for continuity of the density of the age distribution within our sample around the cut-offs (Cattaneo et al., 2018), as seen visually in Appendix Figure A9: the p-value is 0.27, indicating a lack of manipulation. This also rules out the concern that individuals may be more likely to apply for SNAP benefits when below the relevant age threshold in order to make them eligible for WOTC (and possibly increase their desirability to employers), where this would predict greater density to the left of the threshold.[26]

The second concern is continuity across the age threshold of covariates that may be related to the outcomes, i.e., the composition of sample individuals changes discontinuously around this age threshold. This might be true if WOTC increases employment levels, reducing SNAP utilization and thus changing the composition of SNAP recipients above and below the threshold.[27] We will directly test how employment varies across the threshold below. Here, we examine whether any of the covariates we can observe change discontinuously around the threshold, which could have other root causes, such as other policies using this age cut-off. We focus on gender and race, as well as employment and earnings in previous periods; the labor market variables are particularly good tests, as those are strongly correlated with labor market outcomes in time t, and so pre-existing discontinuities in those variables are most likely to generate bias. Pooling the pre- and post-2007 data, Appendix Table A4 and Appendix Figure A10 find no evidence of any of these variables varying discontinuously across the age threshold.

[24] Crossing the age threshold entails a change from treated to untreated, and so γ_1 is equal to the treatment effect multiplied by negative 1.

[25] The MSE-optimal bandwidth and polynomial will vary for each outcome Y, following Calonico et al. (2018).

[26] We also use the full WADC data on Wisconsin residents to test this directly, where Appendix Table A5 finds that likelihood of receiving SNAP benefits does not vary around the age threshold.

[27] It is not clear whether changes in employment would change SNAP utilization since WOTC jobs are typically quite low wage. The SNAP income limit for a family of 3 in 2010 was $36,620 annually, which means that a household with two adults working full-time at the median WOTC wage in our sample ($9 per hour) would still qualify for SNAP.

We first examine how WOTC eligibility affects labor market outcomes in Table 3 and Figure 4. This analysis combines both the age 25 (pre-2007) and age 40 (post-2007) discontinuities by defining the running variable as distance from the relevant age cut-off; Appendix Tables A6 and A7 report the results separately for the pre- and post-2007 periods. Column (1) of Panel (a) of Table 3 shows that hiring does not respond to WOTC eligibility, while column (3) finds no effect on earnings. For the RD analysis, we prefer looking at new hires rather than employment because the new hire outcome isolates flows into jobs. This removes relatively persistent employment that we would not expect to respond to WOTC as well as holdover of jobs across the age threshold. Nonetheless, we also examine employment (column 2) and find no effect there. These null estimates are even more precise than the estimates based on SNAP expansion – with standard errors that are two to three times smaller – reflecting the greater sample size in the RD analysis.

These results broadly support the findings of the previous section that WOTC eligibility does not meaningfully improve labor market outcomes among targeted workers. To put these estimates in context, we estimate the extent to which individuals above and below the threshold differ in their likelihood of being in a WOTC subsidized job. Column (4) of Table 3 and panel (d) of Figure 4 show that individuals below the discontinuity are 1.0 percentage points more likely to be in a WOTC-subsidized job.[28]

One concern with this analysis is that individuals may remain in a job for multiple quarters. An individual who is hired into a WOTC job at age 39 may still be employed in that job at age 40, which would tend to bias our estimates towards zero. In Panel (b) of Table 3 and Appendix Figure A11, we overcome this concern by restricting the sample to individuals who are unemployed at the start of the quarter t, and so would not experience job holdover. We find that all of the estimates are quite similar to those in Panel (a), so this does not appear to be a major concern. That is likely because most WOTC-subsidized jobs are very short-lived, as we will show in Section 5, reducing the extent of bias due to holdover.

As in the previous section, we look at heterogeneity by individual characteristics and firm type, where our analysis here is even better powered to detect effects. Appendix Table A8 find no evidence of heterogeneity with respect to individual characteristics like race or gender. In columns (1) to (4) of Appendix Table A9, we re-estimate the main RD specification, but redefine the outcome variable to be whether the individual is hired in each of four categories of firms (top 50 WOTC-hiring firm, firms with high success rates on WOTC applications, staffing firms, and firms in highly competitive industries). Even among these firms where the treatment effect may plausibly be larger, we still find no response for either employment (panel a) or hiring (panel b).

One concern with the approach in Section 4.1 is that it was based on an expansion in 2007, but the WOTC program has grown considerably since then. It could be that as part of this growth,

[28]Note that some individuals to the right of the threshold may still be hired into WOTC jobs by virtue of other eligibility criteria, such as a felony conviction or receipt of TANF. The gap between the point estimates for being in a WOTC-certified job and being newly hired into one is smaller in the RD design than in the SNAP expansion analysis. This is because individuals may continue in WOTC-subsidized jobs acquired before crossing the age threshold, dampening the discontinuity, which is why we focus on new hires in the RD analysis. The SNAP expansion design does not face this issue of job holdover.

HR departments have implemented screening for WOTC-eligible job applicants such that WOTC now has an effect on hiring. An advantage of our RD approach is that we can re-estimate the discontinuity at different points in time. The remaining columns of Appendix Table A9 subset the data to different periods of time: column (4) restricts to the pre-2007 period (with the age 25 cut-off), column (5) focuses on the period during which there was significant growth in WOTC (2007 to 2013), and column (6) examines a more recent period (2014-2019), in which number of WOTC certifications stabilized. However, we find no evidence of differential effects over time.

Another concern with the RD approach is that other policies may use the same age thresholds; for example, if there were labor market support policies targeted at individuals above age 40, this could bias our estimates downwards, and potentially explain the null effect. As a final robustness check, we conduct a placebo analysis examining how labor market outcomes vary across the age thresholds during years when the threshold were not relevant for WOTC: i.e., look at the age 40 discontinuity in the pre-2007 data and the age 25 discontinuity in the post-2007 data. If there were other policies targeting these age thresholds that also affected labor market outcomes, we should observe these effects in this placebo analysis. Appendix Table A10 finds no differences over the placebo age thresholds, consistent with the RD approach cleanly identifying the effect of WOTC.[29]

4.3 Effects of reducing WOTC application costs

The previous analyses examined the effect of expanding eligibility for wage subsidies under WOTC. This section analyzes a reduction in the cost to firms of filing for WOTC through the introduction of electronic filing (eWOTC), which occurred in June 2017. As shown in Panel (a) of Figure 5, this led to a substantial increase in the number of WOTC certifications: total WOTC certifications increased 50% from an average of 8,000 per quarter from 2015 to June 2017 to an average of 12,000 per quarter from July 2017 to 2019.[30] To check that this increase was not driven by aggregate changes to labor markets, Panel (b) uses state-level data on quarterly WOTC applications from the Department of Labor to compare WOTC uptake in Wisconsin to the neighboring state of Minnesota, which did not adopt e-filing at this time.[31] Although the two are similar prior to June 2017 in both levels and trends, applications increased markedly and persistently in Wisconsin following its adoption of eWOTC. We examine whether this increase in certifications also caused increases in employment and earnings of eligible SNAP recipients relative to ineligible ones.

We adopt the same event study specification as in Equation (1), but around June 2017 rather than January 2007. We again define our treatment and control group as individuals receiving

[29]The coefficient on WOTC certification (columns 4 and 5) are just statistically significant at the 10% level for the post-2007 period. This is entirely due to data from 2007 – i.e., the year that the new age threshold was put into place – where the coefficient is no longer statistically significant when the first two quarters of this year are removed. This is likely because it takes time to learn about the new age eligibility cutoff, where some firms initially continued to follow an age 25 cut-off for submitting WOTC applications before learning of the new threshold.

[30]The blue line in Panel (a) shows that this sharp increase in Wisconsin also appears among SNAP recipients, the focus of our analysis, with a 26% increase in certifications for the SNAP target group.

[31]The state-level data only allows us to look the quarter of submission for applications (not certifications), whereas the WOTC micro-data in Panel (a) allows us to observe this for both applications and certifications.

SNAP in three of the past five months who were slightly younger and slightly older than 40 (i.e., aged 37.75-39.75 and 42-43, respectively). This specification estimates a fundamentally different treatment effect in that it picks up the effect of participation costs (as opposed to the effect of the existence of the program). The policy may induce responses among a different set of firms, and so have a potentially different effect on employment. This is particularly relevant for policy since one of the most commonly cited reasons for low uptake of WOTC is the cost of filing (Hunt et al., 2018); we can measure whether the natural policy response to this problem – lowering those costs – has desirable effects. Our results also serve as a policy evaluation of the consequences of switching to electronic filing, which is relevant to other states considering adoption.

Figure 6 and Table 4 analyzes the effect of electronic filing on the same set of outcomes as previously. As in the other two analyses, we find no evidence that WOTC eligibility affects labor market outcomes (columns (1) to (3)), public assistance usage (column 6, or criminal activity (column 7, despite an effect on WOTC certifications (columns 4 and 4).[32] This provides further evidence against the efficacy of wage subsides for promoting employment among this population, as well as suggesting that one policy idea for improving WOTC – lowering access costs – is unlikely to achieve desired outcomes; instead, it just makes it easier for firms to collect the subsidies.

4.4 Combining the estimates

As with any study reporting null effects, a key concern is whether the analysis has sufficient statistical power to detect even modest impacts. While each of our three empirical approaches yields relatively precise estimates on its own, we further improve precision by combining them into a precision-weighted average; this approach approximates the efficiency gains from combining estimates via seemingly unrelated regression (Wooldridge, 2010). Since the samples generating the estimates are not independent (e.g., the same individual could appear in both the RD and SNAP expansion DID samples), we construct standard errors for the combined estimates via block bootstrapping at the individual level.[33] Our precision-weighted estimates are 0.0011 (i.e., 0.11 percentage points) for employment (se=0.00171), 0.00066 (i.e., 0.07 percentage points) for new hires (se=0.00084), and -$1.21 (se= $8.46) for earnings, i.e., the confidence intervals are tightly centered around zero.[34]

Another informative measure is the extent of inframarginality: among workers whose jobs are subsidized through WOTC, what share would have been hired even in the absence of the subsidy?

[32]The coefficient on earnings is negative and just statistically significant at the 10% level. Given the lack of effect on other labor market related variables and that the sign of the coefficient is in the opposite direction from what one would expect, our interpretation is that this is likely to be statistical noise that will naturally occur when running a large number of regressions.

[33]In practice, we draw a random sample (with replacement) of Wisconsin residents and run each of the three empirical approaches within the bootstrap sample. We then construct precision-weighted averages of these estimates and repeat across 1000 bootstrap samples to generate standard errors.

[34]As a benchmark of what it means for a null effect estimate to be precise, we can compare our estimates to those from two recent papers published in top economics journals whose main finding is a null effect on employment (Cengiz et al., 2019; Garin et al., 2023). Using standard errors as a measure of precision, our estimates are an order of magnitude more precise.

For example, if WOTC-eligible individuals' probability of being hired into a WOTC job rises by 1 percentage point, but their overall likelihood of being hired increases by only 0.25 percentage points, this implies that 25% of WOTC-subsidized hires were actually induced by the subsidy and the other 75% are inframarginal. For each empirical strategy, we take our estimates of: (1) how much the variation we exploit increases the likelihood of being hired into a WOTC-subsidized job; and (2) the estimated effect on hiring. We then divide the second estimate by the first one.[35] Another way to interpret this estimate is as a normalization: each of our three empirical approaches generates a different increase in the likelihood of being hired into a WOTC-subsidized job, and this division yields a comparable measure of inframarginality across strategies.

For each of the three empirical strategies above, we divide the estimated effect on the individually getting hired into any job by the estimated effect on being newly hired into a WOTC job.[36] The precision weighted average of these three estimated ratios is 0.0279, implying that 97.1% of hires are inframarginal, and we cannot reject the null hypothesis that all WOTC hires are inframarginal ($p = 0.789$). This further reinforces that WOTC has little to no effect on employment of WOTC-eligible workers.

5 Firm-level analysis

The previous analyses were conducted at the level of the worker rather than the firm. This section re-analyzes the data at the firm-level to examine dynamic and aggregate effects that cannot be tested in the worker-level analysis. For example, it may take time for firms to adjust hiring practices after they submit their first WOTC application ("adoption"), which could mute the estimated treatment effects when only looking at the worker side. Alternatively, it could be that there are effects on hiring immediately after adoption, when WOTC is most salient to hiring decisionmakers, but these fade away over time. Either dynamic would suggest policy interventions that could improve the efficacy of WOTC: for example, the latter scenario would indicate that increasing salience of WOTC to hiring managers is the key to program improvement.

5.1 Firm-level analysis on employment outcomes

Our main firm-level empirical approach exploits the staggered timing of firms' initial WOTC applications. We implement an event-study framework centered on the date at which each firm submitted its first WOTC application.[37] This design allows us to examine how firms' hiring behav-

[35] While the ratio is likely to be between zero and one, it could in theory even be greater than one. For example, suppose that a firm applies for and receives WOTC for some of its hires but does not screen on WOTC when making hiring decisions. It may respond to an increase in the pool of WOTC-eligible workers (e.g., following the 2007 SNAP expansion) by beginning to favor WOTC-eligible job applicants at the time of hiring, which could increase the hiring of WOTC eligible workers by more than the marginal increase in certifications the the firm receives due to expansion.

[36] We focus on the outcome of hiring rather than employment. Constructing this estimate using the estimated effects on employment will implicitly weight each hiring episode by length of employment (i.e., an individual employed for three quarters will have thrice the weight as an individual employed for only one), which is less transparent.

[37] The WOTC microdata begin in 2005, so we cannot observe whether a firm applied prior to that year. To address this, we define adopters as firms whose first observed application occurs in 2007 or later – i.e., firms with no WOTC

ior changes as they begin to receive WOTC subsidies for eligible workers, and specifically, whether they increase hiring of eligible relative to ineligible workers.

We focus on whether adopting firms increase hiring of eligible workers (SNAP recipients just below the age-40 cutoff) relative to ineligible ones (SNAP recipients just above age 40), compared to firms that had not yet adopted WOTC. This yields a triple-differences specification, leveraging variation across firms, time, and worker eligibility. By comparing the *relative* hiring of two highly similar groups of workers, we isolate changes attributable to WOTC adoption rather than other contemporaneous shifts in firm behavior (e.g., firms may tend to adopt WOTC during a period of expansion of the firm workforce). Our identifying assumption is that WOTC-adopting firms do not simultaneously experience shocks to their demand for SNAP recipients just below age 40 relative to those just above. In Section 6, we present evidence that firms view these two groups as highly substitutable, supporting the plausibility of this assumption.[38]

To analyze the dynamic effects of staggered WOTC adoption on outcomes $y_{f,t}$, we implement an event-study specification following Callaway and Sant'Anna (2021). Specifically, we estimate the average treatment effect on the treated (ATT) for firms at each year relative to adoption.[39] The estimating equation is given by:

$$y_{f,t} = \alpha_f + \lambda_t + \sum_{\ell \neq -1} \delta_\ell D^\ell_{f,t} + \varepsilon_{f,t} \tag{4}$$

Here, α_f and λ_t denote firm and year fixed effects, respectively. The variable $D^\ell_{f,t}$ is an indicator that equals one if firm f adopted the policy exactly ℓ periods ago by year t, and zero otherwise. The coefficients δ_ℓ represent the dynamic average treatment effects at each period relative to adoption, capturing the temporal evolution of the policy's impact. Standard errors are clustered at the firm level. We then estimate an overall effect that aggregates across the five years before and after adoption.

In Panel (a) of Figure 7, we define the outcome variable $y_{f,t}$ as the number of hires by firm f in year t who are receiving SNAP and are aged 38 or 39 at the time of hiring (i.e., eligible for WOTC) minus the number of hires who receive SNAP and are aged 40 or 41 (i.e., just ineligible for WOTC). In Panel (c), we instead use SNAP recipients aged 35 to 39 as the eligible group and those aged 40 to 44 as the ineligible group to test robustness to a wider age band and improve statistical power. In both cases, we find no increase in the relative demand for WOTC eligible workers despite the economic incentive to shift hiring towards subsidized workers. Table 5 provides estimates of the aggregated ATT: the point estimates are small and precisely estimated relative to the average number of hires in a period. These results reinforce findings from the analyses in Section 4 that

activity between 2005 and 2006 – since the absence of earlier applications suggests that 2007 was likely their true adoption date.

[38]The main threat would be if firms adopted WOTC due to an unrelated increase in demand for SNAP recipients under age 40. This would bias our estimates upward, toward finding a hiring effect. However, since we estimate precise null effects, this concern appears minimal.

[39]This analysis aggregates the data to the year-level so that the method of Callaway and Sant'Anna (2021) can be implemented, as quarterly data creates too many comparison groups.

firms have limited responsiveness to targeted hiring subsidies.

A natural question about this approach is whether WOTC adoption meaningfully lowers the relative cost of hiring eligible versus ineligible workers. For example, some adopting firms may file infrequently or stop filing shortly after adoption, resulting in little to no financial incentive to prefer eligible hires. To assess this, we redefine the dependent variable $y_{f,t}$ as the difference in the number of WOTC certifications that the firm receives for just-eligible hires versus just-ineligible hires. If this coefficient is small, it would suggest the effective subsidization of eligible hires is low. Using the same narrow and wide age bands, Panels (b) and (d) of Figure 7 show that firms experience a sharp and sustained increase in WOTC certifications after adoption. This confirms that adoption leads to a real reduction in the effective labor cost of hiring eligible workers relative to ineligible ones, and so this does not explain the lack of hiring response.

Another question is whether WOTC may induce aggregate effects at the level of the firm that an individual-level analysis would miss. For example, firms may face pay equity or other internal wage setting constraints that prevent them from raising the wages of individual workers, and so they respond by raising the wages of all entry-level hires (Saez et al., 2019). They may also expand the total number of workers in the firm.

To test for such effects, we exploit variation in the extent to which firms were exposed to the 2007 WOTC expansion. For each industry (at the 4-digit NAICS code level), we calculate the fraction of the industry's hires in the pre-2007 period who received SNAP and were between the ages of 25-39, i.e., who would become eligible for WOTC after the expansion. We then use a difference-in-differences design to test whether firms who have adopted WOTC and are in an industry in the top tercile of exposure (i.e., had a large expected positive shock from the expansion) increase their payroll (potentially due to offering higher wages) or workforce as compared to firms who have adopted WOTC but are in the bottom tercile of exposure.[40] Column (1) of Appendix Table A13 and Panel A of Appendix Figure A14 indeed find that more heavily exposed firms have a greater influx of WOTC hires, averaging over 3 additional WOTC hires per quarter. This is similar using a measure of WOTC hires per total hires (column 2 and Panel B). However, the remaining columns of the table and panels of the figure find little evidence that this translates into additional total hiring (column 3), total payroll (column 4) or starting hourly wages for workers (column 5).[41] Note that even though WOTC-adopting firms file applications for a large fraction of their hires, the subsidy amount is still a relatively small fraction of its wage bill because WOTC workers earn such low wages. Given this, it is sensible that any firm-level effects would be muted.

[40] We reweight the payroll-by-hires distribution in the bottom tercile group to match that of the top tercile group for better comparability.

[41] For this last column, we take the average starting hourly wage among workers hired at the firm in the WOTC data. This is imperfect since it is only a subset of the workforce, but the only option given the lack of other data on hourly wage rates. Furthermore, this is the group most likely to experience wage rate changes relative to others in the firm, and so looking at their wages should be if anything conservative.

5.2 Do firms churn through WOTC-eligible workers?

The short-term nature of WOTC-subsidized employment raises concerns that WOTC may give firms an incentive to "churn" workers, i.e., fire subsidized employees after the subsidy is exhausted to hire a new batch of subsidized workers (Corwin, 2022). As a result, the existence of WOTC could hinder workers from finding stable jobs, including workers who are ineligible for the subsidies. This could be true even if firms do not account for WOTC in hiring decisions, as the results of the previous sections would indicate, where WOTC status may be more salient after hiring and certification are complete.

We test for churning behavior using hours- and earnings-based discontinuities built into the program. The WOTC subsidy is exhausted at $2400 per worker, which typically corresponds to $6000 in worker earnings.[42] Churning firms would be expected to terminate workers after reaching that threshold, generating bunching in earnings just above $6000 for WOTC-subsidized employment stints. They might also not bunch, but exhibit a change in the separation rate at around this threshold: for example, if terminations are often the result of worker infractions (e.g., tardiness), the threshold for termination may drop once the subsidy is exhausted.

To test for these behaviors, we measure earnings and hours worked in WOTC subsidized job stints. Panel (a) of Figure 8 plots the distribution of total earnings prior to separation for workers whose employment was subsidized by WOTC (and were eligible for WOTC through SNAP). There is no obvious discontinuity in either total separations or separation rate at $6000. However, it could be that churning behavior is concentrated among certain types of firms that are most attentive to WOTC. Appendix Figure A12 examines the distribution of worker earnings prior to separation for WOTC-subsidized workers who were employed at the top 50 WOTC-using firms (panel a), firms with high success rates in applying for WOTC (panel b), employment services firms (panel c), and highly competitive industries (panel d), but but again finds no evidence of firms responding to subsidy exhaustion. The (lack of) relationship is also present when we split the sample by year of employment (panels e and f), where there is no evidence of churning within more recent years when firms may be more attentive to WOTC or have better payroll processing technology that makes churning easier. While there is no obvious change around $6000 visually, formal tests also find no evidence of either bunching above the threshold or changes in the rate of separation around this threshold.[43]

The design of the program also provides two additional places to test for churning. As seen in Appendix Figure A1, the subsidy amount increases discontinuously after workers have been in the job for 120 hours (subsidy increases from 0% to 25%) or 400 hours (subsidy increases from

[42] At the 40% subsidy rate, the subsidy would be exhausted at $6000 in earnings. If a worker earned an hourly rate of above $24 per hour, then they would exhaust the subsidy at the 25% rate and a higher total earnings amount, but only 0.2% of WOTC subsidized workers have hourly rates that high in our data.

[43] For the first test, we test for a change in the density of earnings at $6000 with a simple local polynomial density estimator from (Cattaneo et al., 2020) ($p = 0.86$). To test for a change in rate of separation, Appendix Table A11 estimates a hazard model comparing the hazard rate of separation for WOTC hires as compared to hires at WOTC-using firms for whom a WOTC application was not filed. We find no differential change in the hazard rate of separation around $6000 in earnings for WOTC hires relative to non-WOTC hires.

25% to 40%): for a worker earning the median wage of $9 per hour, firms would get $540 more in subsidies for keeping them for 400 hours as compared to 399. Churning firms may therefore exhibit bunching to the right of those thresholds, where they keep workers for slightly longer in order to gain the subsidy. Panel (b) of Figure 8 plots the distribution of total hours worked in a WOTC subsidized job, with dashed lines marking 120 and 400 hours. The distribution is smooth over those thresholds, with no obvious bunching.[44] Appendix Figure A13 also finds this to be the case when focusing on particular firms that may be more attuned to WOTC or over more recent years.

Based on these analyses, we conclude that firms do not exhibit churning behavior in response to WOTC. It could be that managers are not aware of the benefit schedule for the firm, and so it would be difficult for them to target these discontinuities. Another possibility is that recruitment or training costs are sufficiently high that firms prefer to keep trained workers rather than churn through them for increased WOTC wage subsidies. That seems particularly plausible given that firms do not appear to target hiring towards WOTC-eligible workers, meaning that the odds of getting WOTC subsidies for a replacement worker may not even be that high.

5.3 Firm characteristics

Our analysis indicates that WOTC subsidies accrue to employers rather than workers. This naturally raises questions about what types of firms benefit, and whether it is desirable for policymakers to subsidize their operations.[45] We begin by examining the distribution of benefits among firms. We rank all firms in the data in order of the number of WOTC certifications they receive between 2005 and 2019 in Wisconsin, with rank 1 being the firm with the most certifications, and so on. In Figure 9, the blue line plots the cumulative fraction of WOTC certifications accruing to firms of rank between 1 and N for the top 300 firms. Benefits accrue to a small number of firms, where over half of all certifications went to just 48 firms. However, it could be that this is not a disproportionate fraction of rents, but that these firms also employ a large fraction of all workers. The red line instead plots the cumulative fraction of hires for these firms, finding that they receive 4 to 5 times the amount of tax credit expected given their share of employment: for example, the top 48 firms accounted for just 9% of all hires over the period.

Given this high concentration of WOTC certifications, we focus on understanding the 50 firms with the most WOTC certifications over this period. These firms are large, where we observe an average annual payroll of over $80 million in the years in which they receive WOTC certifications. For additional details, we use data from FOIA requests made to the Wisconsin Department of Workforce Development, which provide the total number of WOTC applications and certifications

[44] This figure is similar to Figure 4 in Hamersma (2011), which plots estimated hours worked in WOTC-subsidized jobs between 1998 and 2003 to visually examine if there is bunching around 120 and 400 hours (although not for changes around subsidy exhaustion). We augment her analysis by including data from after 2003, conducting formal statistical tests as is permitted by our much larger sample size (over 430,000 certified work stints as compared to 8,908), and examining heterogeneity across types of firms.

[45] Benefits could also accrue to consumers if the subsidy is passed through to prices. We are unable to measure this with our data, but it is unclear whether this would be expected given price rigidities and the typically short-run nature of WOTC employment.

by firm between 2018 and 2020 (Corwin, 2022).[46] Just over half of the top 50 firms (52%) are temporary staffing services agencies.[47] Around a quarter (24%) are large publicly traded firms, where these firms have a median market capitalization at over $30 billion, with only one having a market capitalization below $1 billion. Most of the remaining privately held firms are large franchisee operators of national fast food chains (16%) or large private companies with annual revenues in excess of $5 billion annually (4%). The high number of temporary staffing firms is notable given experimental work showing that employment in temporary-help positions may actually decrease future employment and earnings (Autor and Houseman, 2010). As a result, subsidizing those types of firms is unlikely to achieve long-run employment gains for disadvantaged workers.

6 Mechanisms

These findings present a puzzle: why do profit maximizing firms fail to respond to subsidies like WOTC? The question is especially striking given that these firms *do* apply for the subsidies after hiring eligible workers, so lack of awareness of the program cannot account for their lack of response. Understanding the mechanisms behind this disconnect is critical for assessing when wage subsidies can benefit targeted workers across a broader range of contexts. This section evaluates three possible mechanisms.

Standard model of labor supply and demand. We first consider whether these results can be reconciled within a standard model of labor supply and demand. In this model, the wage subsidy shifts up the firm's labor demand curve for subsidized workers, as firms now have a lower effective cost of their services. The observed lack of change in either employment or wages could only be rationalized if labor demand for these workers is perfectly inelastic: firm labor demand is fixed, and the full value of the subsidy accrues to firms as the more inelastic side of the market.[48] Perfect inelasticity in demand for these workers implies a lack of substitutability between eligible and ineligible workers. That would be surprising given these workers are often quite similar: for example, our empirical approaches typically compare labor outcomes of SNAP recipients who are just above and below a particular age cutoff (such as age 40). For this model to be correct, firms must not be able or willing to substitute workers just above age 40 (ineligible) with those just below (eligible), which seems unlikely.

[46] The Wisconsin Administrative Data Core data is anonymized and so researchers using it do not have access to the identity of particular firms. We are grateful to Emily Corwin for sharing this data with us (see Corwin (2022) for details).

[47] Because workers at temporary staffing agencies are directly employed by the staffing agency (and not the firm to which they are sent), it is the staffing agency that receives WOTC subsidies. However, there could be some pass-through to the contract with the receiving firm.

[48] If instead labor supply were perfectly inelastic and labor demand was downwards sloping in wages, then the subsidy would fully pass through to the worker as an increase in wages. If labor supply were perfectly elastic and labor demand were downwards sloping, the subsidy would induce an increase in employment. If labor demand were perfectly elastic or in intermediate cases, the wage subsidy should lead to an increase in both wages and employment.

To empirically test this substitutability, we examine hiring following exits of WOTC-eligible and WOTC-ineligible workers. If WOTC-eligible workers are not substitutable with other types of workers (producing perfect inelasticity in demand for their services), then their exit should trigger replacement by another of this type of worker, as opposed to hiring other types of workers. For each firm, we measure the number of workers who exit the firm in a given quarter t who received SNAP and were between the ages of 37-39 at the time of hiring (eligible exits), as well as those who received SNAP and were between the ages of 42-44 (ineligible exits). Columns (1) and (2) of Appendix Table A12 report how the number of new hires of eligible workers (SNAP recipients aged 37-39) in quarter t responds to these exit variables, while columns (3) and (4) does the same with new hires of ineligible workers (SNAP recipients aged 42-44). We include fixed effects for quarter, firm, and total number of exits for the firm in a quarter to account for any firm-specific patterns in separation from and hiring of workers. If the two groups of workers are highly substitutable, we would expect similar coefficients in both specifications, i.e., that the exit of a 37-39 SNAP recipient can be compensated by hiring either a 37-39 or 42-44 year old SNAP recipient (or other types of workers). Unsurprisingly, the coefficients on "Eligible Exits" are quite similar across specifications, consistent with a high degree of substitutability between these types of workers such that perfectly inelastic demand does not explain our results.

Negative signal value of subsidies. Another possible model is that firms infer eligibility for wage subsidies as a negative signal of productivity, as seen in the seminal study of Burtless (1985). If this negative signal exactly offsets the value of the subsidy to the firm (in expectation), then this could generate a lack of firm response to WOTC eligibility.

Our results point against this hypothesis. In particular, suppose that the negative signal exactly offset the net value of the subsidy prior to the 2017 introduction of e-filing. The reduction in (implicit) application costs starting in 2017 should have increased the hiring of WOTC-eligible workers among firms for which the expected benefit of the subsidy and the negative signal value of WOTC eligibility were previously equal. However, our analysis in Section 4.3 does not find any employment response, and so the negative signaling mechanism thus does not appear to explain our results.

Information about eligibility. Another potential reason why firms may not respond to WOTC would be if hiring decision makers do not observe WOTC eligibility at the time of hiring decisions, such as if there are high screening costs or other constraints on information acquisition. To both investigate this explanation and better understand how WOTC integrates into hiring processes, we compile three pieces of evidence: (1) original data on job applications for openings at a sample of WOTC-using firms; (2) an audit study experiment on how WOTC-using firms respond to signals of WOTC eligibility among job applicants; and (3) an online survey of individuals with hiring experience at WOTC-using firms.

We first collect data from a random sample of Wisconsin firms that use WOTC. Taking data from FOIA requests to the Wisconsin Department of Workforce Development, we observe each

WOTC application and certification between 2018 and 2020, including the name of the associated firm. We drew a random sample of 170 of these firms using probability proportionate to size sampling, and searched for current job postings by the firm (available for 78% of firms). We then submitted job applications for positions at those firms, which jointly account for 51.2% of all WOTC certifications in this period.[49] We recorded data on characteristics of the job application process, including whether the application asked WOTC-related eligibility questions and the framing of these questions.

Table 6 reports summary statistics from these applications. The most striking finding is that even among this subset of firms that file for WOTC, only a small fraction of their job applications (18%) contain questions about WOTC eligibility. Because firms do not typically have access to government data that could indicate whether a potential hire is eligible for WOTC, they must rely on applicant self-reported data related to eligibility (e.g., receipt of SNAP benefits) to identify WOTC-eligible hires.[50]

Furthermore, in 46% of the applications where the WOTC eligibility information is collected, the firm does not itself gather the data. Instead, the applicant is taken to the separate website of a hired consultant or payroll processor, which collects this information.[51] Our discussions with firms indicate that this information is not typically shared with the person making hiring decisions. In fact, as seen in the job application form in panel (a) of Appendix Figure A15, these forms often explicitly state that the eligibility information will not be shared with the employer. Instead, if the worker is hired, the outside party uses this information to file for WOTC tax credits on behalf of the firm. In many cases, eligibility is assessed only after the hiring decision – often during onboarding – suggesting that WOTC status does not influence hiring decisions. Overall, our job application data imply that hiring managers are aware of an applicant's WOTC eligibility in no more than 10% of firms that file for the program, and potentially even fewer.

The absence of explicit screening on WOTC eligibility does not necessarily imply that WOTC has no effect on employment of eligible workers. For example, those responsible for hiring could still respond to observable characteristics correlated with WOTC eligibility even if they do not know exactly who is eligible.[52] As a test of this possibility, Appendix Table A14 repurposes the audit study data from Kline et al. (2024), which submitted more than 83,000 job applications to entry-level jobs, where WOTC is common. Kline et al. (2024) randomize applicant characteristics such as age, and their replication data provides the name of the firm to which each application

[49] In cases where it was possible to apply for multiple positions, we selected the position that seemed most likely to hire individuals eligible for WOTC based on the posted wage, desired skills, or other attributes of the job.

[50] An exception to this is felony status, which can be determined through a criminal background check. However, individuals with a felony conviction are a relatively small share of all WOTC-eligible individuals (less than 4%). For the most common reason for eligibility – receipt of SNAP benefits – there is not a straightforward way for firms to determine this independently.

[51] Two examples of how firms collect this information can be found in Appendix Figure A15.

[52] Another possible channel of response is that firms using WOTC may advertise more heavily to pools of potential job applicants that are WOTC-eligible. However, the null effects on employment in Section 4 suggest that either such targeted advertising does not occur, it fails to increase applications, or any increase is offset by screening during the hiring process.

was submitted. As with the job application analysis above, we determine which of those firms use WOTC using FOIA data on WOTC applications between 2018 and 2020 that provides the name of the associated firm (Corwin, 2022). Using the same regression discontinuity approach as in Section 4.2, column (1) finds that firms that use WOTC are no more likely to call back applicants whose age could make them eligible for WOTC. Column (2) runs the same analysis among non-WOTC using firms to rule out confounds from other possible policies using this age threshold, while column (3) confirms a lack of effect when differencing the estimates in columns (1) and (2) with a differences-in-discontinuities approach. Columns (4) and (5) also find no evidence of effects when running the same specification but restricting to two types of job applicants whose observable characteristics may make firms more likely to think they receive SNAP (applicants without a college degree and Black applicants). Thus firms do not appear to be screening on WOTC in either an explicit or implicit fashion.

These exercises clarify the mechanism underlying the lack of response to WOTC: firms do not set up hiring processes to screen on WOTC, so the person making hiring decisions typically lacks information to respond to WOTC. But this raises a further puzzle of why firms do not collect this information and encourage hiring managers to incorporate it in their decisions. To understand this, we conducted surveys with individuals involved in making hiring decisions at firms employing low-wage workers. Respondents were sampled through the Prolific platform and compensated at a rate of $20-30 per hour for taking our survey.[53] Our survey asked questions about hiring practices at their company, and, if relevant, questions about WOTC practices (e.g., their screening and application procedure).

We focus on respondents who worked at firms that receive WOTC subsidies but state that their firms do not ask about WOTC prior to the hiring decision. We asked these respondents for the reasons why they do not ask about WOTC, and then to rank these reasons in order of importance. The most common reasons were "fear of discrimination lawsuits" (68% of respondents), "Don't want to scare people off of applying for the position" (38%), and "Hard to explain to applicants why we are asking these questions" (32%).[54]

The first option refers to the concern that unsuccessful job applicants may sue the company alleging discriminationary employment practices: for example, the eligibility criteria for WOTC incentivizes firms to favor younger applicants (under age 40), which could run afoul of age discrimination legislation. The expected benefit to a firm of taking on such a risk may be low, especially since explicit screening may only marginally increase the number of WOTC eligible hires relative to simply hiring from the pool of low-wage workers, many of whom are anyway be WOTC eligible.

The relevance of this concern is demonstrated by the many requests made to the Equal Employment Opportunity Commission (EEOC) by employers for guidance on the legality of screening based on WOTC status. EEOC issued at least 12 informal discussion letters between 2000 and

[53] Only Prolific members who reported working at a private firm and having experience hiring workers that earn less than $20 per hour were selected for the survey.

[54] After these, the next most common reasons were "Don't want to make job applications too long" (21%) and "Too time-consuming for the company to keep track of" (21%).

2019 indicating that screening on WOTC status would be acceptable, but these documents "explicitly cannot be relied upon [in court]" (U.S. Equal Employment Opportunity Commission, 2020b). After two decades of uncertainty, this was resolved in a Formal Opinion Letter from EEOC in April 2020 (U.S. Equal Employment Opportunity Commission, 2020a) that "can be used as a defense by employers if they are in litigation on these issue" and "create a binding defense in court" (U.S. Equal Employment Opportunity Commission, 2020b).

However, even five years later, the absence of WOTC screening in our job application data suggests that many firms still harbor this concern. This is reflected in the language of their applications. A firm aiming to attract WOTC-eligible candidates would be expected to signal this explicitly. Yet only two job applications had language suggesting that WOTC eligibility could improve an applicant's likelihood of being hired, and even in these cases, the statement appears to have been weakened to survive possible legal scrutiny ("The information you supply ... may assist members of targeted groups in securing employment").[55] A further issue is that ground-level hiring managers may not have the training to understand these legal nuances. The prevalence of this response in our survey suggests that this misperception is widespread, and these individuals may err on the side of caution by avoiding any behavior that could be perceived as discriminatory.

The second and third most common reasons refer to the possibility that explicit screening for WOTC could make it more difficult to attract applicants. Especially if they are unfamiliar with the WOTC program, workers may fear that disclosing characteristics that determine WOTC eligibility, such as receipt of SNAP or TANF, may hurt their prospects of employment. This fear is clear from the job applications that we observe: among the subset of firms whose job applications collected information on WOTC eligibility, 83.3% state either that the information will not be shared with the employer or that it will not negatively impact hiring decisions (Appendix Table A15). In the high-turnover jobs where WOTC certifications are common, firms rely on maintaining a steady flow of applicants. As a result, employers may prefer to avoid pre-screening altogether and instead collect WOTC information after hiring decisions are made. It may also be preferable to wait since applicants who fear being stigmatized for WOTC eligibility will have less of an incentive to lie about eligibility after the hiring decision has been made. There is only limited work in economics on how job applicants learn about potential employers (e.g., Benson et al., 2020; Sockin and Sojourner, 2023), but our findings suggest that firms may change screening procedures and avoid collecting valuable information to avoid negative signaling to applicants.

7 Conclusion

Targeted hiring subsidies are widely seen as a promising tool to promote economic mobility for disadvantaged workers, yet rigorous evidence on their effectiveness in the U.S. remains limited. Using administrative data on the Work Opportunity Tax Credit (WOTC) and multiple complementary empirical strategies, we find that these subsidies do not increase hiring or earnings among eligible

[55] See Appendix Table A15 for the full language from each job application that we observe that screens for WOTC.

groups. Instead, the financial benefits are concentrated among a small number of large firms.

As Congress prepares to reauthorize WOTC in December 2025, our findings suggest a need to reassess the program's design and ensure that the over $2 billion spent annually on WOTC actually delivers gains for disadvantaged workers. For example, a reauthorization bill could include explicit language to provide a strong, statutory defense to shield firms from legal liability related to WOTC hiring. It could also establish mechanisms to help interested firms more easily identify WOTC-eligible candidates, such as a streamlined pre-certification process, or better enforce the requirement that WOTC eligibility be determined prior to hiring. Without reform, the program will continue as a costly transfer to firms with little benefit to the populations it is meant to support.

More broadly, our results provide evidence on what conditions must be present for wage subsidy programs to be effective. In countries with active employment discrimination protections, legal liability concerns may deter firms from incorporating subsidy eligibility into hiring decisions. Even in the US context, where the EEOC has issued a formal opinion letter clarifying that WOTC-based screening is permissible under federal law, our data suggests that many firms either remain unaware of this guidance or have failed to successfully communicate this to ground-level hiring managers. Future work should examine whether informing firms of this legal defense may alter their behavior or whether other channels may also serve as barriers to efficacy. For example, job applicants may be wary of disclosing eligibility-related information, or it may prove difficult to design incentives that lead hiring managers to appropriately consider subsidy eligibility without allowing it to dominate their hiring decisions. Ultimately, the effectiveness of targeted hiring subsidies hinges not just on financial incentives, but on other institutional factors.

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Tables

Table 1: Summary statistics, individual level

	WOTC applicants	WOTC certified	SNAP sample, 18-39
Characteristics			
Age	29.1	28.2	28.7
Male	0.41	0.36	0.35
White	0.59	0.55	0.63
Black	0.37	0.43	0.32
Hispanic	0.10	0.10	0.11
Born in WI	0.62	0.64	0.64
SNAP beneficiary in quarter	0.63	0.77	0.88
Quarterly SNAP benefits, cond. ($)	945.5	1042.6	1012.1
TANF beneficiary in quarter	0.064	0.100	0.064
UI beneficiary in quarter	0.083	0.083	0.065
Felony conviction in quarter	0.012	0.012	0.014
Employed in quarter	0.92	0.93	0.53
Quarterly earnings (mean), cond. ($)	2533.9	2363.4	4030.9
Quarterly earnings (median), cond. ($)	1847.7	1756.5	3563.1
Newly hired in quarter	0.86	0.87	0.15
New job stints			
Total earnings at job (mean)	13563.9	12530.4	14470.1
Total earnings at job (median)	2771.0	2578.9	2476.6
Num. quarters with firm	3.50	3.42	3.54
Industry: retail	0.31	0.31	0.14
Industry: admin/support	0.33	0.33	0.27
Industry: food/accom	0.17	0.17	0.18
Applied for WOTC	1	1	0.21
Certified for WOTC	0.55	1	0.17
Pre-certified	0.012	0.015	
Starting wage (WOTC)	9.15	9.02	
Total hours at job (WOTC)	1483.4	1312.3	
Total hours: 0-120 (WOTC)	0.63	0.34	
Total hours: 120-400 (WOTC)	0.13	0.23	
Total hours: 400+	0.24	0.42	
WOTC subsidy ($)	608.5	1097.9	
Unique individual-quarters	640818	354829	10985951
Unique individuals	415828	234557	867916

Note: Table reports summary statistics for individuals in quarters during which: a firm applied for WOTC on their behalf (column 1), a firm received a WOTC certification on their behalf (column 2), or they had received SNAP in 3 of the past 5 months and were ages of 18-39. Data from 2005-2019. SNAP beneficiary rates is not necessarily 100% for the third column because being in the SNAP sample is based on the past five months prior to the start of the quarter. The rates of employment and being newly hired are also not necessarily 100% for WOTC applicants and certified individuals. This can occur when workers are hired right at the end of a quarter (e.g. the worker begins at the job and the WOTC application is filed on Monday December 29th, but the worker is first paid on Friday January 2nd), workers never show up to the job and earn positive earnings.

Table 2: Effect of WOTC on individual outcomes, DiD analysis from SNAP expansion

Panel A: Stacked sample							
	New hire	Employed	Earnings	Certified	Certified (new hire)	Public benefit (amt)	Convicted (=1)
Treat X Post	-0.0010	0.0050	6.2783	0.0209***	0.0115***	11.9742	0.0000
	(0.0022)	(0.0043)	(25.5111)	(0.0015)	(0.0007)	(8.1083)	(0.0007)
Dep var mean	0.1553	0.5228	1954.2627	0.0416	0.0184	877.2957	0.0153
Observations	527241	527241	527241	527241	527241	527241	527241
Panel B: Age 25 cutoff sample							
	New hire	Employed	Earnings	Certified	Certified (new hire)	Public benefit (amt)	Convicted (=1)
Treat X Post	0.0000	0.0071	61.6382*	0.0247***	0.0142***	5.3779	-0.0001
	(0.0031)	(0.0055)	(32.0817)	(0.0023)	(0.0011)	(10.3116)	(0.0010)
Dep var mean	0.1887	0.6076	2171.8661	0.0650	0.0288	946.2940	0.0162
Observations	324605	324605	324605	324605	324605	324605	324605
Panel C: Age 40 cutoff sample							
	New hire	Employed	Earnings	Certified	Certified (new hire)	Public benefit (amt)	Convicted (=1)
Treat X Post	-0.0027	0.0018	-82.2326*	0.0147***	0.0073***	22.5206*	0.0001
	(0.0032)	(0.0070)	(42.0108)	(0.0012)	(0.0006)	(13.1278)	(0.0012)
Dep var mean	0.1021	0.3878	1607.7469	0.0043	0.0019	767.4215	0.0138
Observations	202636	202636	202636	202636	202636	202636	202636

Note: Table reports difference-in-differences estimates of the effect of WOTC from the 2007 expansion to SNAP recipients aged 25-39 in Equation (2) on new hires, employment, earnings, new hire into a WOTC-certified job, social assistance utilization, and criminal activity. Controls include monthly age fixed effects and quarter-year by age sample fixed effects in Panel A. Controls include monthly age fixed effects and quarter-year fixed effects in Panels B and C. Standard errors are clustered at the individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Effect of WOTC on individual outcomes, RD analysis

Panel A: Full sample							
	New hire	Employed	Earnings	Certified	Certified (new hire)	Public benefit (amt)	Convicted (=1)
RD_Estimate	-0.0007	-0.0002	-3.1037	-0.0100***	-0.0097***	0.8321	0.0000
	(0.0010)	(0.0020)	(12.0372)	(0.0009)	(0.0004)	(4.2601)	(0.0003)
Dep var mean	0.124	0.469	2032.539	0.018	0.003	1025.865	0.011
Bandwidth	2.858	3.082	4.272	1.354	1.585	3.539	4.627
Effective Obs	2782835	2947210	4174431	1052058	1255960	3438705	3999889
Panel B: Unemployed sample							
	New hire	Employed	Earnings	Certified	Certified (new hire)	Public benefit (amt)	Convicted (=1)
RD_Estimate	0.0004	0.0008	4.4435	-0.0094***	-0.0108***	-1.4682	-0.0001
	(0.0013)	(0.0015)	(4.9398)	(0.0004)	(0.0005)	(5.8701)	(0.0004)
Dep var mean	0.126	0.151	333.487	0.003	0.003	1135.288	0.014
Bandwidth	2.672	2.592	2.444	2.159	2.147	3.510	4.471
Effective Obs	1602980	1552567	1450598	1022585	1022585	2109348	2362483

Note: Table reports regression discontinuity estimates for employment, earnings, program utilization, and criminal activity. The running variable is distance between the individual's age and the age cutoff for WOTC eligibility (age 25 before 2007 and age 40 in 2007 and afterwards). Each specification uses a linear polynomial, triangular kernel, and MSE-optimal bandwidth estimated following Calonico et al. (2017). Standard errors are clustered at the individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Effect of eWOTC on individual outcomes

	(1) New hire	(2) Employed	(3) Earnings	(4) Certified	(5) Public benefit (amt)	(6) Convicted (=1)
Treat x post	0.0032	-0.0009	-61.0683*	0.0038***	-3.2468	0.0002
	(0.0023)	(0.0052)	(34.6924)	(0.0007)	(8.0994)	(0.0006)
Dep var mean	0.1045	0.4312	2073.8991	0.0039	764.3424	0.0092
Observations	458986	458986	458986	458986	458986	458986

Note: Table reports difference-in-differences estimates from the 2017 shift to electronic filing of WOTC applications among our SNAP sample for new hires, employment, earnings, new hires into WOTC-certified jobs, social assistance utilization, and criminal activity. Controls include monthly age fixed effects and quarter-year fixed effects. Standard errors clustered at the individual level.

Table 5: Effect of WOTC on firm-level outcomes

	Panel A (40-41 vs 38-39)		Panel B (40-44 vs 35-39)	
	Diff. in hires	Diff. in WOTC certs.	Diff. in hires	Diff. in WOTC certs.
ATT	0.024	0.100***	0.026	0.310***
	(0.020)	(0.008)	(0.041)	(0.023)
Observations	51884	51884	51884	51884

Note: Table reports difference-in-difference estimates of the staggered firm-level adoption of WOTC on hiring and utilization of WOTC, following Callaway and Sant'Anna (2021). Panel A defines the outcome as the difference in the number of hires (WOTC certifications) who are SNAP beneficiaries aged 38 or 39 (i.e., eligible for WOTC) and SNAP beneficiaries aged 40 or 41 (i.e., just eligible for WOTC). Panel B defines the outcomes using SNAP recipients aged 35 to 39 as the eligible group and those aged 40 to 44 as the ineligible group. All regressions include firm and year fixed effects. Standard errors clustered at the firm level.

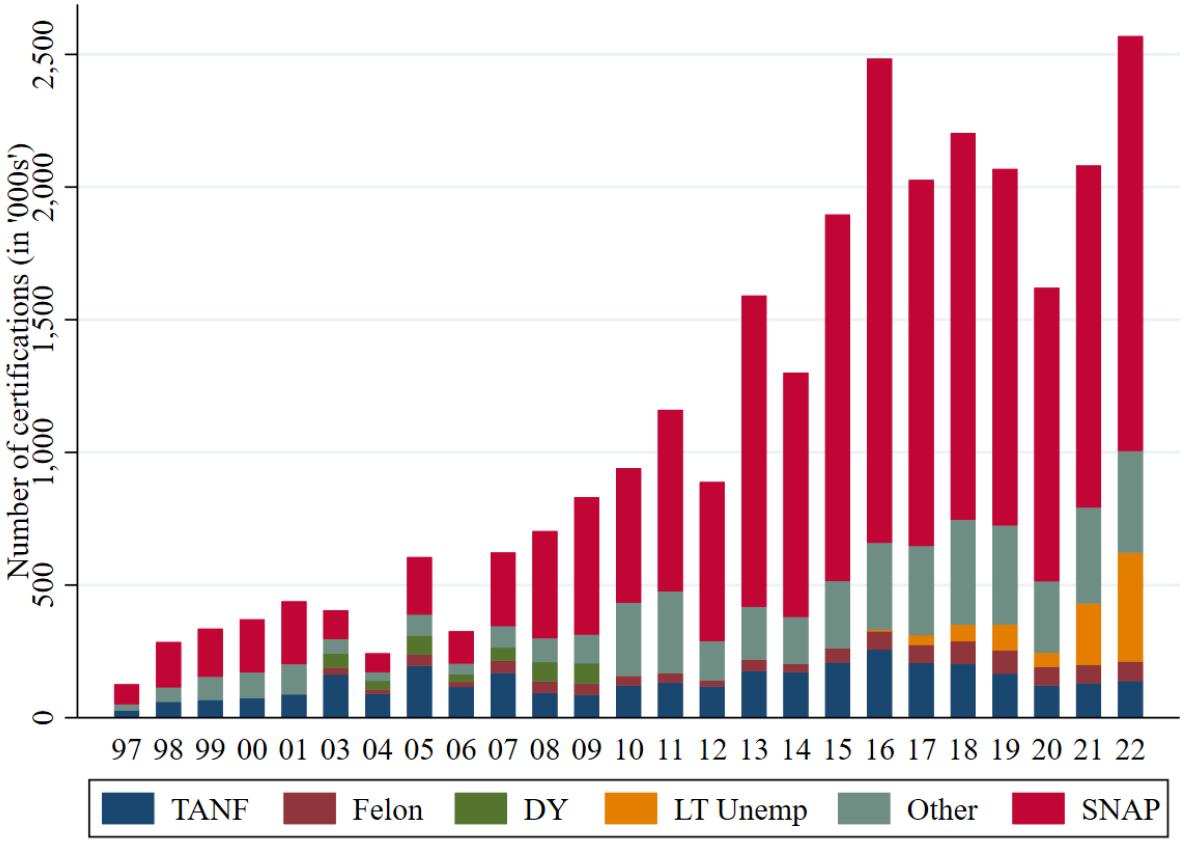
Table 6: Initial Job Applications for a Sample of WOTC-using Firms

Panel A: All Applications (N=132)	
Characteristic	(% of applications)
WOTC Screening Questions	18.2
EEOC Questions	48.8
Submit Resume	63.3
Education History	56.4
Employment History	68.7
References	11.6
Panel B: Applications with WOTC Screening Questions (N=24)	
Characteristic	(% of applications)
WOTC questions direct to third-party site	45.8
WOTC questions state that no impact/negative impact on hiring	83.3
WOTC questions ask about individual target group eligibility	66.67

Note: Table reports means of job application characteristics collected from a representative sample of online job applications for WOTC-using firms.

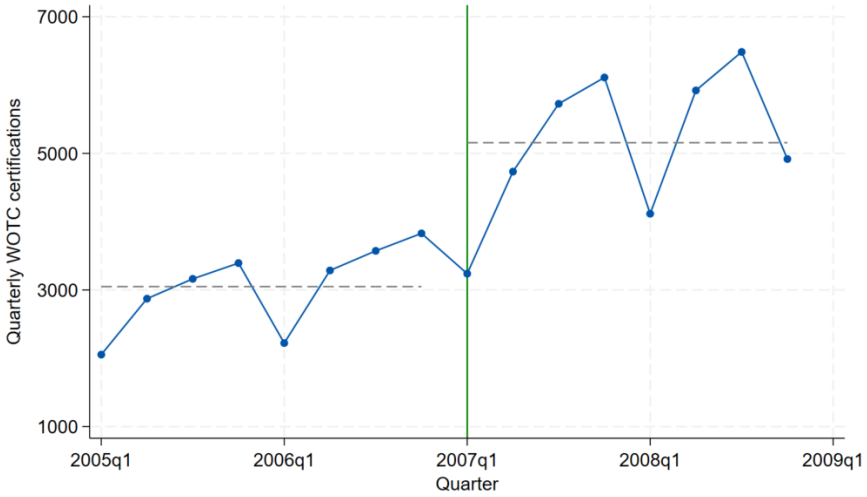
Figures

Figure 1: National Trends in WOTC certifications



Note: Panel (a) presents the total annual WOTC certifications nationally from 1997-2022 using data from Department of Labor (DoL) annual reports. It splits the certifications by the reason for eligibility, where the Other category combines smaller categories such veterans, youth summer jobs, and long-term TANF. The DoL reports provide number of certifications by year of *certification* rather than *hiring*. There were temporary WOTC lapses in 2004, 2012, and 2014 during which firms could still receive WOTC subsidies for hires made during those periods, but the certifications were not issued until after the lapsation. This inflates the numbers in 2005, 2013, and 2015 due to displacement from the previous years: e.g., the lapsation between January 1, 2004 and October 4, 2004 displaced certifications from 2004 into 2005. The remaining analysis uses individual-level Wisconsin data with date of hiring and so does not have this issue. For 1998, 2000, and 2001, we only observe the national totals, so we use the category percentages from the most recent preceding year with data to estimate the breakdowns. For 1997 to 2002, we do not observe the felon or disconnected youth categories separately, so this is included among "Other".

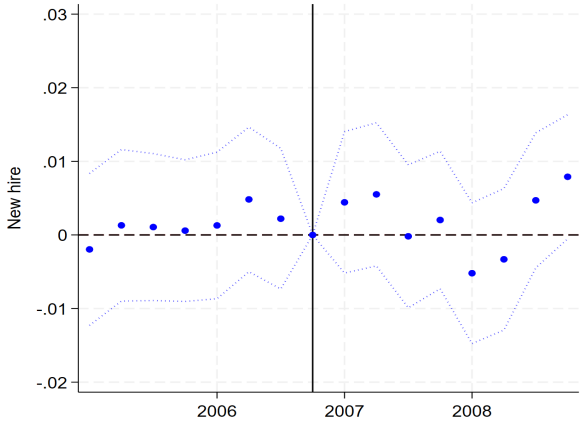
Figure 2: Number of WOTC certifications in Wisconsin (2005-2008)



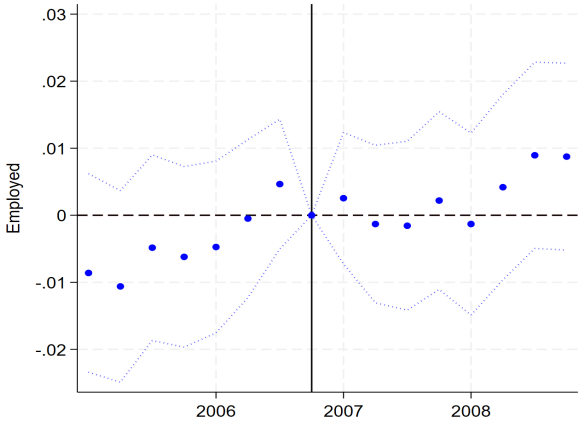
Note: This figure reports total WOTC certifications in Wisconsin by quarter of application from 2005-2009. Gray dashed horizontal lines signify average quarterly certificates over the two-year period.

Figure 3: Effect of WOTC on individual outcomes, event study analysis of SNAP expansion

(a) New hire

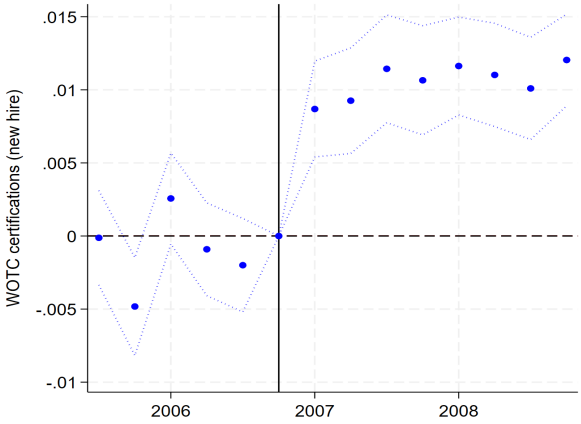


(b) Employed

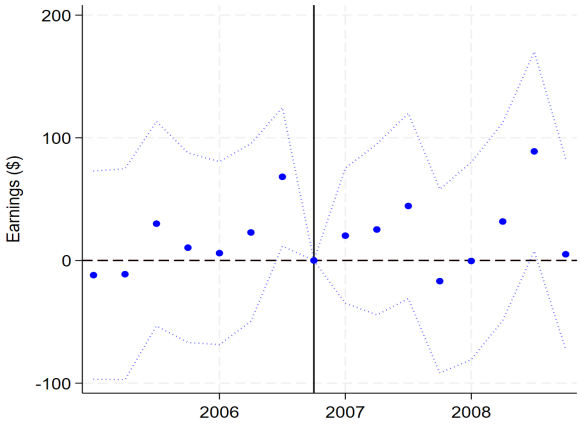


(c) New hire into WOTC certified job

(d) New hire into WOTC certified job



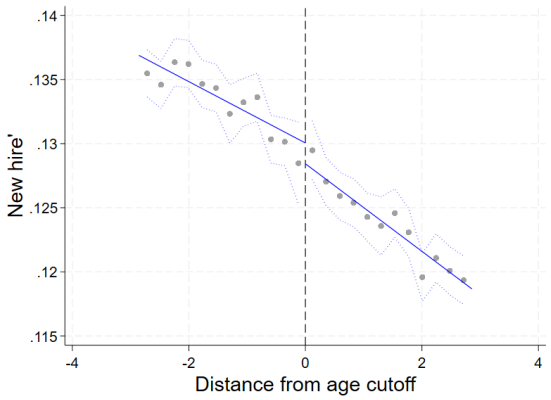
(e) Earnings



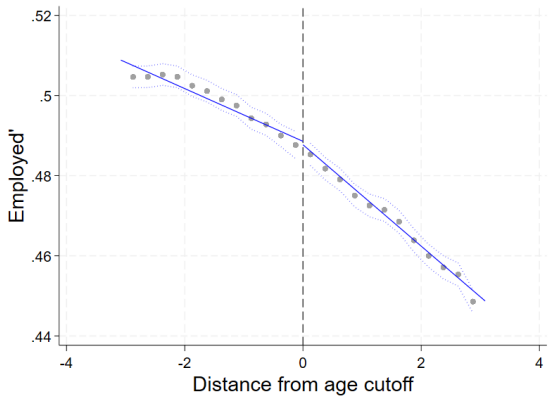
Note: Figure reports stacked event study estimates from the 2007 expansion to SNAP recipients aged 25-39 in Equation (1) for employment, new hires, employment in a WOTC-certified job, new hire into a WOTC-certified job and earnings. Controls include monthly age fixed effects and quarter-year by age sample fixed effects. Standard errors clustered at the individual level.

Figure 4: Effect of WOTC on individual outcomes, RD analysis

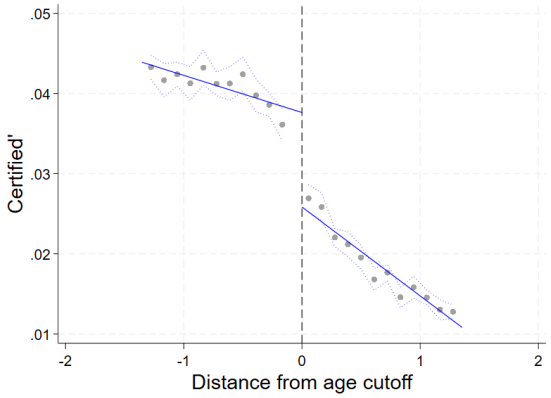
(a) New hire



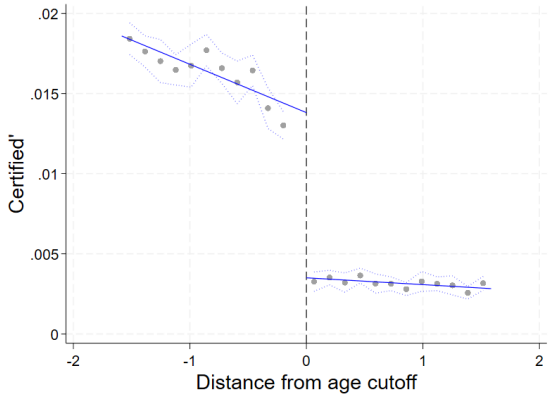
(b) Employed



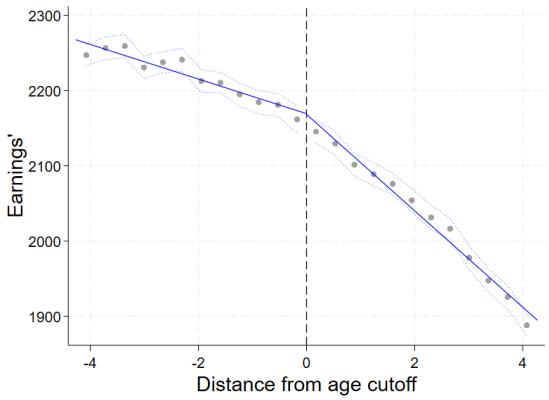
(c) WOTC certified job



(d) New hire into WOTC certified job



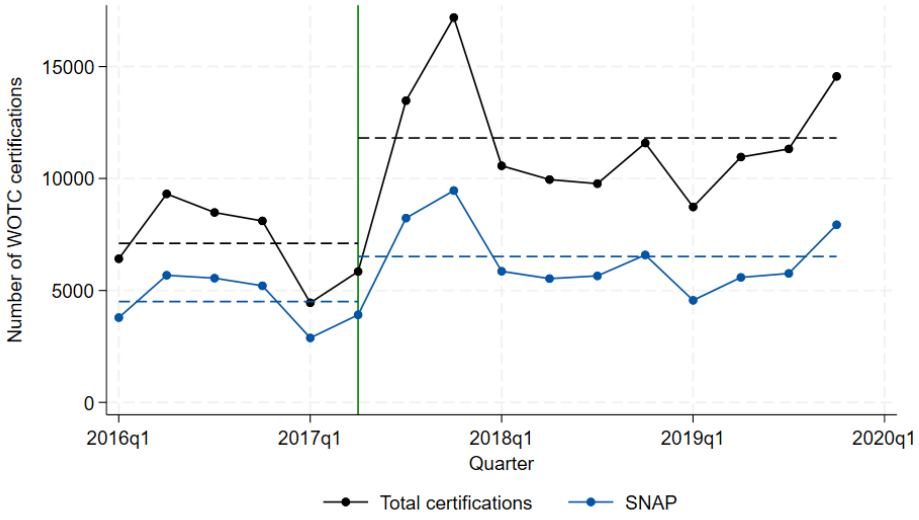
(e) Earnings



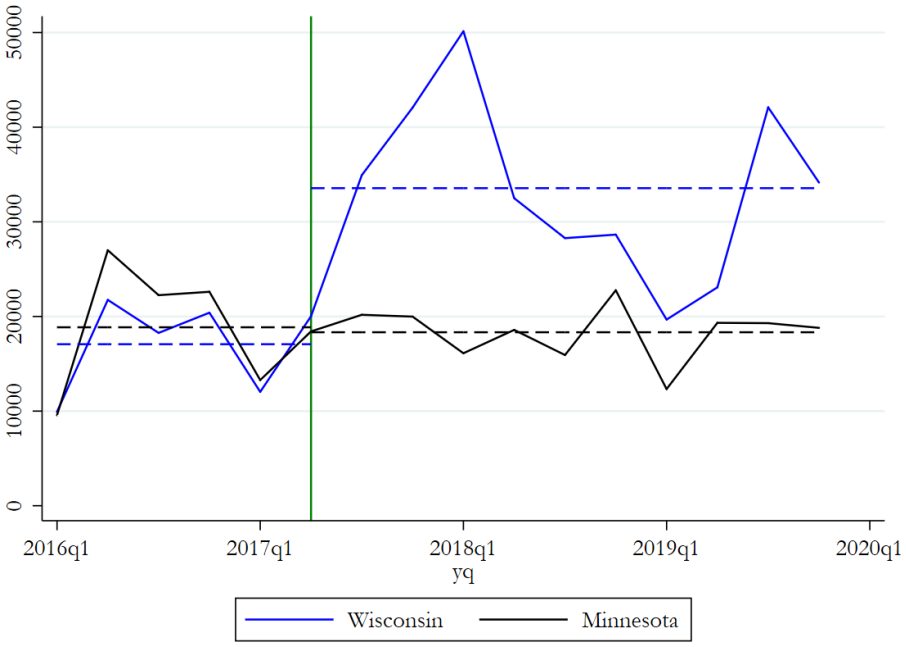
Note: These figures plot the relationship between individual-level outcomes and the difference between the individual's age and the relevant WOTC age eligibility threshold. Individuals whose age is to the left of the threshold are eligible for WOTC, while those to the right of the threshold are not. The bandwidth is based on the optimal bandwidth selection from Cattaneo et al. (2020). Panel (a) examines whether the individual is hired into a new job in that quarter, panel (b) focuses on whether the individual is employed, and panel (c) measures individual earnings in the quarter. Panel (d) plots the first stage relationship between the individual's age and whether they are newly hired in a job with an associated WOTC certification.

Figure 5: WOTC utilization around adoption of electronic filing in Wisconsin

(a) Quarterly WOTC certifications in Wisconsin, 2016-2019



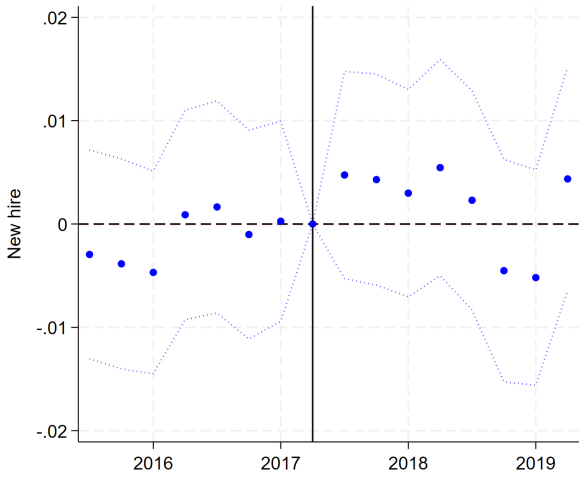
(b) Quarterly WOTC applications in Wisconsin and Minnesota, 2016-2019



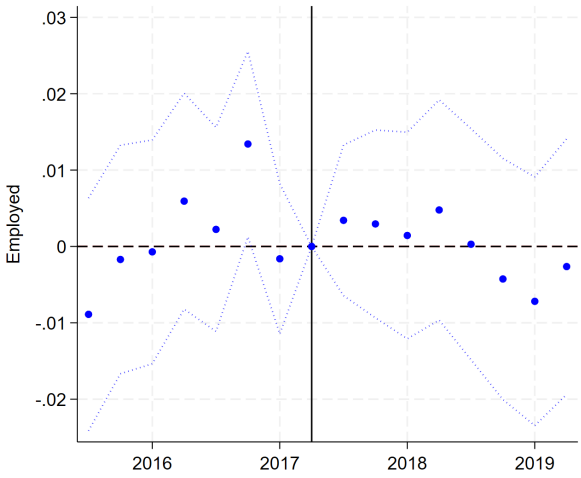
Note: Panel (a) reports total WOTC certifications in Wisconsin by quarter of application from 2015-2019. The vertical green line indicates the date of e-filing adoption. Data is taken from the WOTC micro-data provided to the researchers by the Department of Workforce Development. Panel (b) reports total WOTC applications in Wisconsin and Minnesota by quarter of application from 2016-2019. The vertical green line indicates the date of e-filing adoption in Wisconsin. Data is from the Department of Labor national WOTC data, which is based on quarterly data submitted by state workforce agencies through the the web-based Tax Credit Reporting System. The figures differ due to the different outcome variables (certifications versus applications): for using the national data, it is necessary to use applications as the dependent variable due to the reporting system.

Figure 6: Effect of eWOTC on individual outcomes

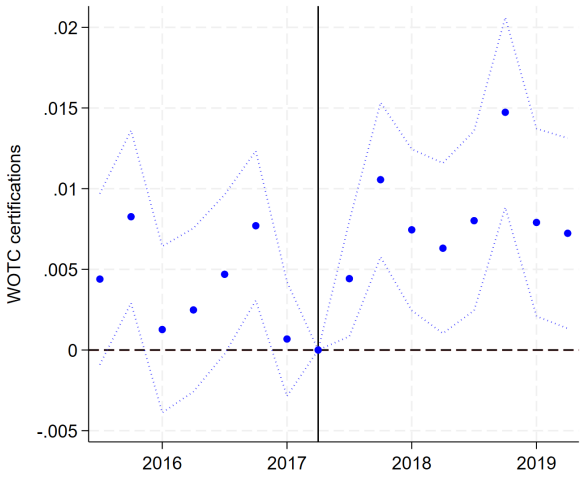
(a) New hire



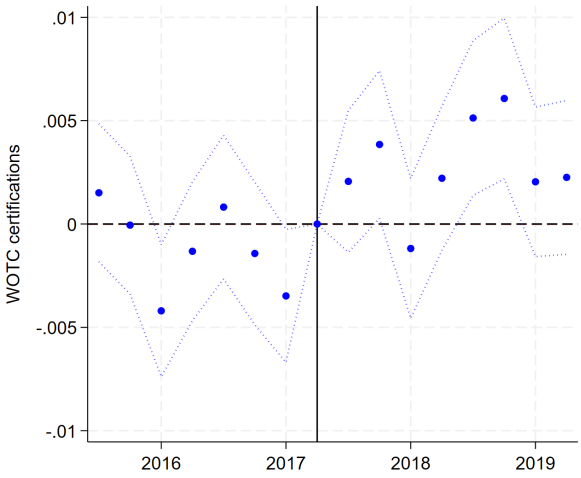
(b) Employed



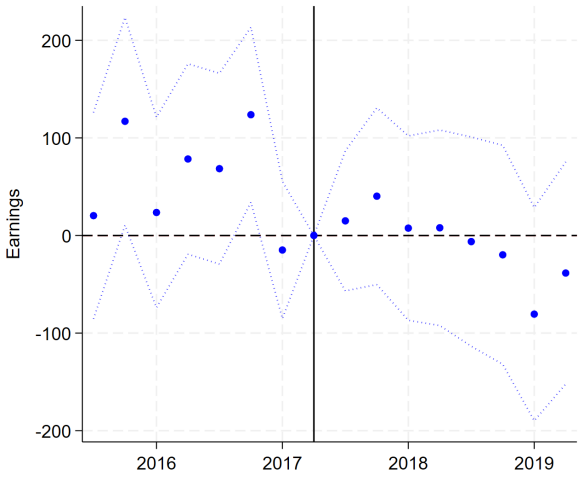
(c) New hire into WOTC certified job



(d) New hire into WOTC certified job



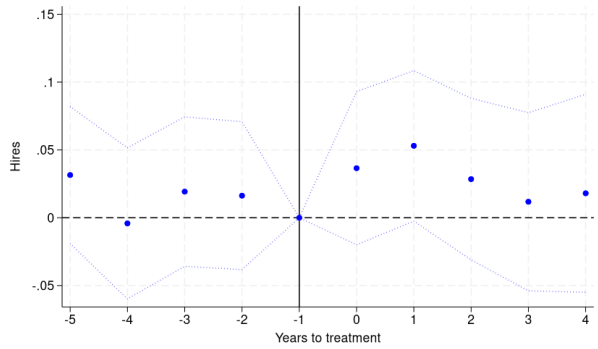
(e) Earnings



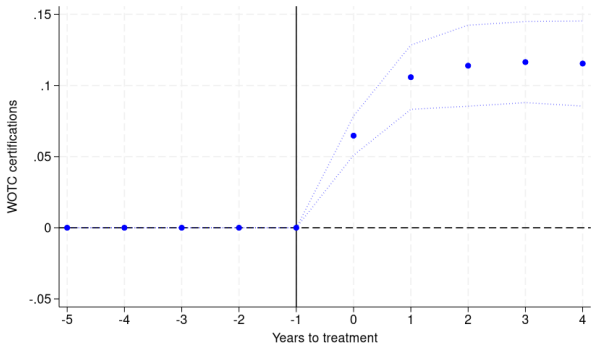
Note: Figure reports event study estimates from the 2017 shift to electronic filing of WOTC applications among our SNAP sample for employment, new hires, earnings, new hire into a WOTC-certified job, social assistance utilization, and criminal activity. Controls include monthly age fixed effects and quarter-year fixed effects. Standard errors clustered at the individual level.

Figure 7: Effect of WOTC on firm-level outcomes

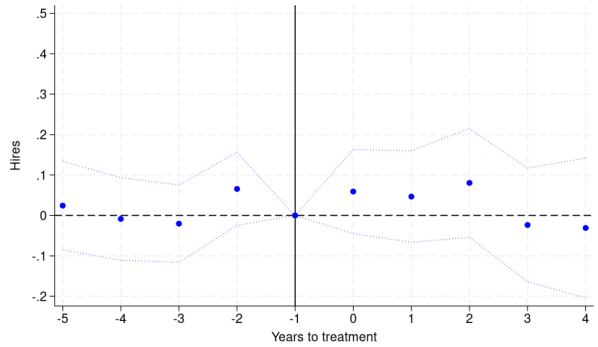
(a) Difference in hires, age 40-41 vs 38-39



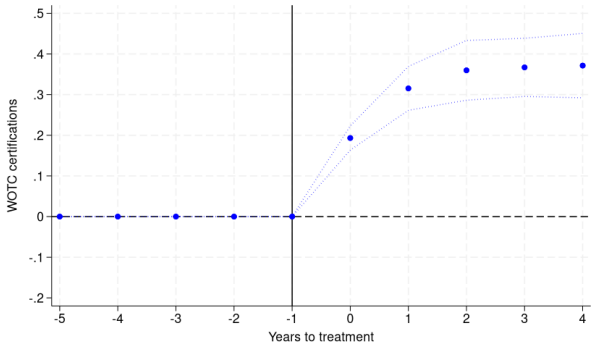
(b) Difference in WOTC certs, age 40-41 vs 38-39



(c) Difference in hires, age 40-44 vs 35-39



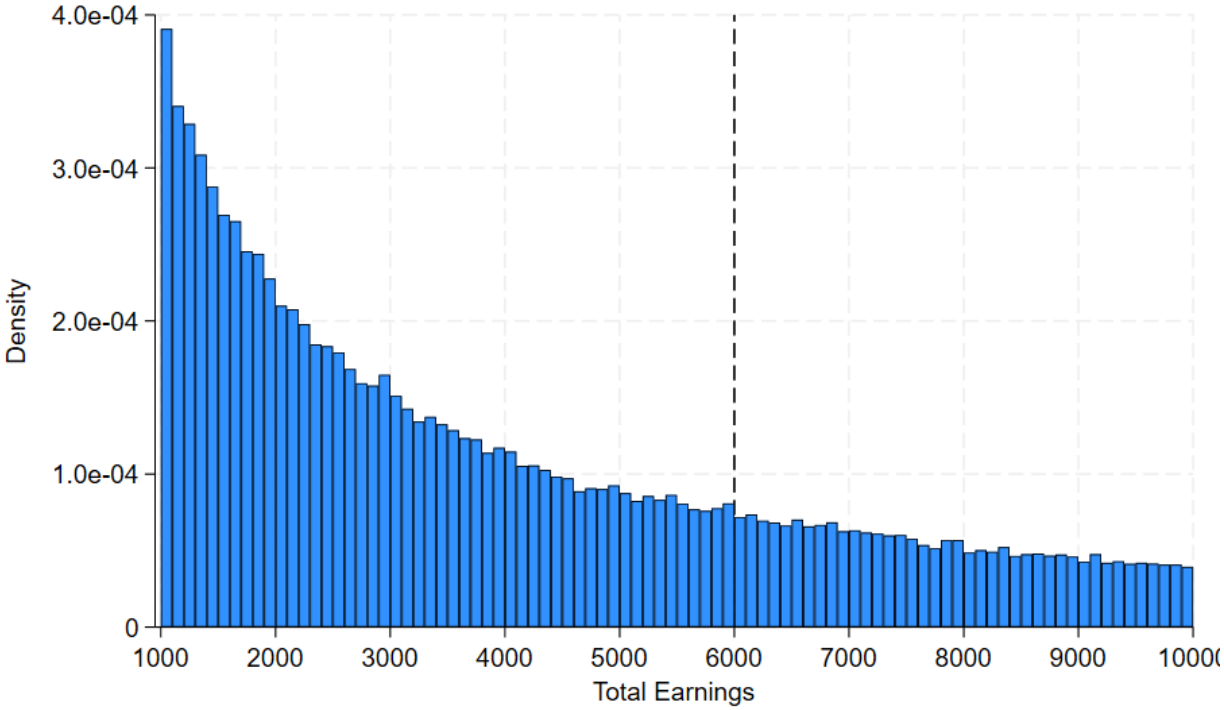
(d) Difference in WOTC certs, age 40-44 vs 35-39



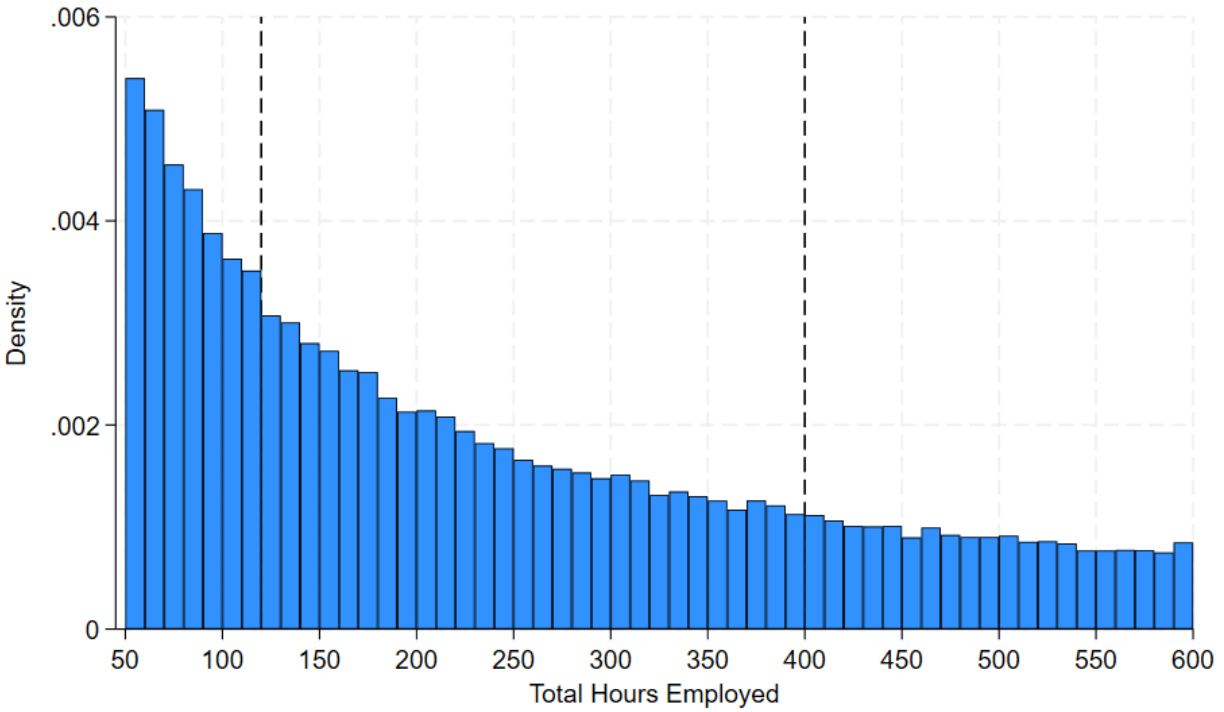
Note: This figure reports the estimated effects of firm-level adoption of WOTC on hiring and utilization of WOTC. The outcomes in the first two panels are the difference in number of hires (WOTC certifications) by the firm of people who are receiving SNAP and are aged 38 or 39 at the time of hiring (i.e., eligible for WOTC) and those who receive SNAP and are aged 40 or 41 (i.e., just ineligible for WOTC). In the third and fourth panels, we instead use SNAP recipients aged 35 to 39 as the eligible group and those aged 40 to 44 as the ineligible group to test robustness to a wider age band. To analyze the dynamic effects of staggered WOTC adoption, we implement an event-study specification following Callaway and Sant'Anna (2021). All regression include firm and year fixed effects. The coefficients estimate the dynamic average treatment effects at each period relative to adoption. Standard errors are clustered at the firm level to account for serial correlation.

Figure 8: Histograms of total earnings and hours worked for WOTC-certified workers

(a) Distribution of Earnings

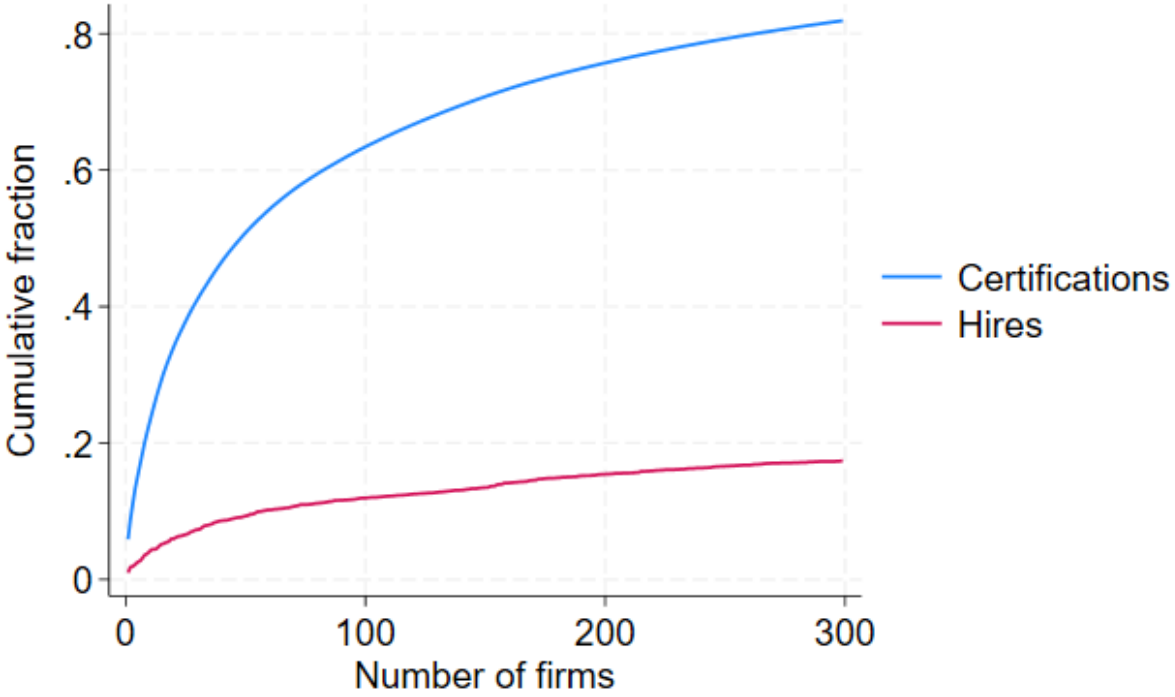


(b) Distribution of Hours Worked



Note: Figures plot the distribution of total earnings and hours worked prior to separation for workers whose hiring was subsidized by WOTC and who were eligible for WOTC through SNAP receipt.

Figure 9: Cumulative density function of WOTC certifications by firm



Note: This figure measures the concentration of WOTC certifications among firms. Ranking the firms in terms of WOTC certifications between 2005 and 2019 in Wisconsin, the blue line plots the cumulative fraction of WOTC certifications accruing to firms of rank between 1 and N for the top 300 firms. The red line plots the cumulative fraction of all hires made by those firms over 2005-2019.

Appendix Tables

Table A1: Effect of WOTC on employment and hiring by firm type

		Panel A: New hire		
	Top 50 firm	High succ firm	Staffing firm	High comp industry
Treat x post	0.0003	-0.0002	0.0004	-0.0011
	(0.0008)	(0.0007)	(0.0010)	(0.0014)
Dep var mean	0.0236	0.0179	0.0338	0.0653
Observations	594524	594524	594524	594524
		Panel B: Employed		
	Top 50 firm	High succ firm	Staffing firm	High comp industry
Treat x post	-0.0018	0.0004	0.0006	0.0076**
	(0.0022)	(0.0018)	(0.0020)	(0.0037)
Dep var mean	0.0836	0.0551	0.0773	0.2476
Observations	594524	594524	594524	594524

Table reports difference-in-differences estimates testing the effect of WOTC from the 2007 expansion to SNAP recipients aged 25-39 in Equation (2) on labor market outcomes by firm type. Panel A examines whether the individual is newly hired at one of the 50 firms that are the heaviest users of WOTC (column 1), have a WOTC application success rate above the 75^{th} percentile (column 2), are an employment services firm, i.e. NAICS 5613 (column 3), or are a highly competitive firm (HHI below the 25^{th} percentile). Panel B focuses on the same set of outcomes, but examines whether that the individual is employed rather than newly hired. Controls include monthly age fixed effects and quarter-year by age sample fixed effects. Standard errors are clustered at the individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A2: Effect of WOTC on employment and hiring by individual characteristics

	Black		Female		Past conviction	
	(1) Employed	(2) New hire	(3) Employed	(4) New hire	(5) Employed	(6) New hire
Treat x post	0.0037	-0.0005	0.0027	-0.0020	0.0048	-0.0024
	(0.005)	(0.003)	(0.008)	(0.004)	(0.005)	(0.002)
Treat x post X inter.	0.0096	-0.0023	0.0054	0.0004	0.0122	0.0045
	(0.009)	(0.005)	(0.009)	(0.005)	(0.011)	(0.006)
Dep var mean	0.5208	0.1547	0.5206	0.1546	0.5206	0.1546
Observations	593850	593850	594524	594524	594524	594524

Note: Table reports estimates of heterogeneous treatment effects for the difference-in-differences estimates testing the effect of WOTC from the 2007 expansion to SNAP recipients aged 25-39 in Equation (2). Columns (1) and (2) examine heterogeneity related to race, columns (3) and (4) examine heterogeneity related to gender, and columns (5) and (6) report heterogeneity related to past criminal convictions. Each specification include fixed effects for the full set of interactions between age (in months), treatment status, and the relevant interaction variable as well as between age (in months), quarter-year, and the interaction variable. Standard errors are clustered at the individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Effect of WOTC on individual outcomes among unemployed sample, DiD analysis from SNAP expansion

Panel A: Stacked sample							
	New hire	Employed	Earnings	Certified	Certified (new hire)	Public benefit (amt)	Convicted (=1)
Treat X Post	-0.0018	0.0002	0.3784	0.0119***	0.0121***	21.3934*	-0.0006
	(0.0031)	(0.0033)	(9.7383)	(0.0009)	(0.0009)	(11.4008)	(0.0011)
Dep var mean	0.1639	0.1941	364.4326	0.0187	0.0196	985.6675	0.0189
Observations	304498	304498	304498	304498	304498	304498	304498
Panel B: Age 40 cutoff sample							
	New hire	Employed	Earnings	Certified	Certified (new hire)	Public benefit (amt)	Convicted (=1)
Treat X Post	-0.0044	0.0010	-14.4070	0.0065***	0.0066***	36.5802**	-0.0003
	(0.0038)	(0.0042)	(13.8553)	(0.0007)	(0.0007)	(17.2350)	(0.0016)
Dep var mean	0.0953	0.1169	249.4371	0.0017	0.0019	796.6606	0.0159
Observations	133189	133189	133189	133189	133189	133189	133189
Panel C: Age 40 cutoff sample							
	New hire	Employed	Earnings	Certified	Certified (new hire)	Public benefit (amt)	Convicted (=1)
Treat X Post	0.0003	-0.0005	11.8802	0.0162***	0.0163***	9.5793	-0.0008
	(0.0045)	(0.0049)	(13.5547)	(0.0015)	(0.0016)	(15.2052)	(0.0015)
Dep var mean	0.2205	0.2577	459.1230	0.0327	0.0342	1141.3009	0.0213
Observations	171309	171309	171309	171309	171309	171309	171309

Note: Table reports difference-in-differences estimates of the effect of WOTC from the 2007 expansion to SNAP recipients aged 25-39 in Equation (2) on employment, new hires, earnings, employment in a WOTC-certified job, social assistance utilization, and criminal activity. Controls include monthly age fixed effects and quarter-year fixed effects. Standard errors clustered at the individual level.

Table A4: Balance on pre-determined characteristics, RD analysis

	Demographics		Employed		Earnings	
	(1) Female (=1)	(2) Black (=1)	(3) (t-1)	(4) (t-2)	(5) (t-1)	(6) (t-2)
RD_Estimate	0.0012	-0.0004	-0.0006	0.0002	3.8123	7.8239
	(0.0021)	(0.0021)	(0.0020)	(0.0020)	(11.7246)	(11.3883)
Dep var mean	0.6540	0.3054	0.4833	0.4779	1972.7684	1857.3763
Bandwidth	2.5335	4.1067	3.2818	3.0561	4.3648	4.2236
Effective Obs	2453543	4000381	3045416	2794327	4057170	3878363

Note: Table reports regression discontinuity estimates testing whether pre-determined covariates vary discontinuously across the age threshold. The sample includes both the pre-2007 and post-2007 periods. Each specification uses a linear polynomial, triangular kernel, and MSE-optimal bandwidth estimated following Calonico et al. (2017). Standard errors in parentheses are clustered at the individual level; p-values in square brackets.

Table A5: SNAP usage as a function of WOTC eligibility, RD analysis

	(1) Pre-2007	(2) Post-2007
RD_Estimate	-0.0000	0.0009
	(0.0008)	(0.0010)
Dep var mean	1.0000	1.0000
Bandwidth	2.7560	4.1658
Effective Obs	8154275	13003920

* p<0.10, ** p<0.05, *** p<0.01

Note: Table reports regression discontinuity estimates testing whether SNAP receipt changes as a function of potential WOTC eligibility, i.e., whether an individual is more likely to apply for and receive SNAP benefits if they are of an age where this could convey WOTC eligibility. The running variable is the distance between the individual's age and the age cutoff for WOTC eligibility. The sample includes all individuals in the Wisconsin Administrative Data Core from 1998 to 2019. Each specification uses a linear polynomial, triangular kernel, and MSE-optimal bandwidth estimated following Calonico et al. (2017). Standard errors in parentheses are clustered at the individual level; p-values in square brackets.

Table A6: Effect of WOTC on individual outcomes for the age 25 discontinuity (pre-2007)

Panel A: Full sample							
	New hire	Employed	Earnings	Certified	Certified (new hire)	Public benefit (amt)	Convicted (=1)
RD_Estimate	-0.0008	0.0012	4.4106	-0.0079***	-0.0060***	2.3184	-0.0006
	(0.0024)	(0.0039)	(21.3345)	(0.0028)	(0.0019)	(7.6854)	(0.0010)
Dep var mean	0.193	0.570	2164.937	0.015	0.007	1006.151	0.015
Bandwidth	2.609	2.198	2.469	1.275	1.193	2.682	2.308
Effective Obs	670323	564441	628505	102337	95351	690768	331729
Panel B: Unemployed sample							
	New hire	Employed	Earnings	Certified	Certified (new hire)	Public benefit (amt)	Convicted (=1)
RD_Estimate	-0.0002	-0.0009	-2.0195	-0.0089***	-0.0086***	3.3656	-0.0010
	(0.0031)	(0.0033)	(9.5933)	(0.0019)	(0.0024)	(10.7880)	(0.0016)
Dep var mean	0.222	0.254	508.083	0.006	0.008	1197.885	0.020
Bandwidth	3.138	2.909	2.947	1.787	1.548	3.101	2.281
Effective Obs	461858	426329	438208	76567	65655	461858	182393

Note: Table reports regression discontinuity estimates for employment, earnings, program utilization, and criminal activity in the pre-2007 periods. The running variable is distance between the individual's age and the age cutoff for WOTC eligibility (age 25 before 2007 and age 40 in 2007 and afterwards). Each specification uses a linear polynomial, triangular kernel, and MSE-optimal bandwidth estimated following Calonico et al. (2017). Standard errors are clustered at the individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A7: Effect of WOTC on individual outcomes for the age 40 discontinuity (post-2007)

Panel A: Full sample							
	New hire	Employed	Earnings	Certified	Certified	Public benefit (amt)	Convicted (=1)
RD_Estimate	-0.0007	-0.0001	-6.7245	-0.0108***	-0.0102***	-2.4194	-0.0000
	(0.0010)	(0.0022)	(14.8457)	(0.0010)	(0.0004)	(5.0939)	(0.0003)
Dep var mean	0.097	0.422	1986.687	0.018	0.003	1031.352	0.010
Bandwidth	3.119	4.205	4.051	1.568	1.904	3.629	5.910
Effective Obs	2237715	3051764	2926116	1065411	1310450	2612025	4333731
Panel B: Unemployed sample							
	New hire	Employed	Earnings	Certified	Certified	Public benefit (amt)	Convicted (=1)
RD_Estimate	0.0003	0.0012	5.1002	-0.0094***	-0.0108***	-4.2548	-0.0001
	(0.0013)	(0.0015)	(4.9809)	(0.0004)	(0.0004)	(6.8718)	(0.0004)
Dep var mean	0.092	0.116	269.716	0.002	0.003	1111.432	0.013
Bandwidth	2.962	2.809	3.038	2.453	2.585	3.704	5.094
Effective Obs	1316675	1239692	1355817	1085064	1162364	1666465	2338938

Note: Table reports regression discontinuity estimates for employment, earnings, program utilization, and criminal activity in the pre-2007 periods. The running variable is distance between the individual's age and the age cutoff for WOTC eligibility (age 25 before 2007 and age 40 in 2007 and afterwards). Each specification uses a linear polynomial, triangular kernel, and MSE-optimal bandwidth estimated following Calonico et al. (2017). Standard errors are clustered at the individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A8: Effect of WOTC on employment and hiring by individual characteristics

Panel A: Employed						
	Race		Gender		Past conviction	
	Black	Non-black	Female	Male	Yes	No
RD_Estimate	0.0001	-0.0011	0.0013	-0.0020	0.0012	0.0001
	(0.0035)	(0.0023)	(0.0025)	(0.0030)	(0.0042)	(0.0022)
Dep var mean	0.465	0.465	0.500	0.394	0.356	0.492
Bandwidth	3.653	3.728	3.035	5.359	4.284	2.843
Effective Obs	1,077,393	2,490,163	1,953,968	1,793,276	756,916	2,284,982
Panel B: New hire						
	Race		Gender		Past conviction	
	Black	Non-black	Female	Male	Yes	No
RD_Estimate	-0.0019	-0.0001	-0.0001	-0.0017	-0.0022	-0.0005
	(0.0019)	(0.0012)	(0.0013)	(0.0017)	(0.0020)	(0.0011)
Dep var mean	0.145	0.114	0.131	0.110	0.115	0.125
Bandwidth	3.068	2.726	2.777	2.858	4.113	2.826
Effective Obs	902,147	1,810,147	1,791,604	937,173	725,794	2,217,935

Table reports regression discontinuity estimates for labor market outcomes by individual characteristics. Panel A examines whether the individual is newly hired, dividing the sample by the individual's race (columns 1 and 2), gender (columns 3 and 4), and having a past criminal conviction (columns 5 and 6). Panel B focusses on the same set of outcomes, but examines whether that the individual is employed rather than newly hired. The running variable is distance between the individual's age and the age cutoff for WOTC eligibility (age 25 before 2007 and age 40 in 2007 and afterwards). Each specification uses a linear polynomial, triangular kernel, and MSE-optimal bandwidth estimated following Calonico et al. (2017). Standard errors are clustered at the individual level. Standard errors are clustered at the individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A9: Effect of WOTC on employment and hiring by firm type and year

	Firm-level				Years		
	Top 50 firm	High succ firm	Staffing firm	High comp industry	1998-2006	2007-2013	2014-2019
Panel A: Employed							
RD_Estimate	0.0000	0.0004	0.0003	-0.0013	-0.0010	0.0022	-0.0017
	(0.0009)	(0.0007)	(0.0009)	(0.0016)	(0.0040)	(0.0031)	(0.0032)
Dep var mean	0.064	0.035	0.070	0.217	0.577	0.401	0.442
Bandwidth	3.686	3.576	3.832	4.002	2.310	4.399	4.550
Effective Obs	3601745	3438705	3684042	3929298	535047	1613972	1628347
Panel B: New hire							
	Firm-level				Years		
	Top 50 firm	High succ firm	Staffing firm	High comp industry	1998-2006	2007-2013	2014-2019
RD_Estimate	0.0002	0.0001	0.0002	0.0001	-0.0013	0.0013	-0.0028*
	(0.0004)	(0.0003)	(0.0005)	(0.0006)	(0.0024)	(0.0012)	(0.0015)
Dep var mean	0.018	0.010	0.028	0.051	0.182	0.086	0.107
Bandwidth	2.296	2.609	3.168	3.646	2.695	4.145	3.637
Effective Obs	2204601	2535660	3110432	3520309	630557	1519191	1281592

Table reports regression discontinuity estimates for employment (panel A) and being hired (panel B) at firms that might plausibly be more responsive to WOTC and over different time intervals. The running variable is distance between the individual's age and the age cutoff for WOTC eligibility (age 25 before 2007 and age 40 in 2007 and afterwards). The first four columns examines the outcomes of employment at the 50 firms that have the most WOTC subsidized jobs, firms with a high success rate in applying for WOTC for their WOTC-eligible hires, staffing services agencies (NACIS 5613), and firms in more competitive industries (as measured by having a Herfindahl index in the bottom 25% of industries, using data from the Economic Census). Columns 5 to 7 measure the outcomes within distinct time intervals (1997 to 2006, 2007 to 2013, and 2014 to 2019). Each specification uses a linear polynomial, triangular kernel, and MSE-optimal bandwidth estimated following Calonico et al. (2017). Standard errors are clustered at the individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A10: Placebo RD analysis

	(1) New hire	(2) Employed	(3) Earnings	(4) Certified	(5) Certified (new hire)	(6) Public benefit (amt)	(7) Convicted (=1)
RD_Estimate	-0.0002	-0.0021	-11.5450	-0.0020**	-0.0007*	-2.0942	0.0002
	(0.0010)	(0.0017)	(10.0275)	(0.0010)	(0.0004)	(3.6145)	(0.0003)
Dep var mean	0.1560	0.5452	2194.8615	0.0657	0.0258	1027.5926	0.0148
Bandwidth	2.5791	2.5680	2.6078	2.6704	3.1502	2.5395	3.7762
Effective Obs	3030117	3030117	3126338	2853547	3272132	3030117	4101431

Note: Table reports the relationship between individual-level outcomes and the difference between the individual's age and a placebo WOTC age eligibility threshold. For the pre-2007 period, the placebo age eligibility threshold is age 40, while for the post-2007 period, the placebo age eligibility threshold is age 25. This checks whether there is a relationship between the age threshold and the individual level outcomes during the years when this age threshold is not relevant for WOTC eligibility. Panel A examines outcomes for the pre-2007 period, while Panel B focuses on the post-2007 period. Each specification uses a linear polynomial, triangular kernel, and MSE-optimal bandwidth estimated following Calonico et al. (2017). Standard errors are clustered at the individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A11: Effect of WOTC expiration on the hazard rate of exit from employment

	(1) Hazard model	(2) Hazard model	(3) Hazard model
Time	-0.0028***	-0.0014***	-0.0010***
	(0.0000)	(0.0000)	(0.0000)
Post	14.9490***	5.6687***	3.1156***
	(0.1283)	(0.0447)	(0.0245)
WOTC	-0.1431	-0.0230	0.0041
	(0.1999)	(0.0608)	(0.0276)
Post X WOTC	0.1215	-0.0408	0.0024
	(0.2563)	(0.0893)	(0.0491)
Post X Time	-0.0023***	-0.0007***	-0.0003***
	(0.0000)	(0.0000)	(0.0000)
Post X WOTC X Time	-0.0000	0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)
WOTC X Time	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)
Lower bound	5000	4000	3000
Upper bound	7000	8000	9000
Observations	696590	779176	885725

Note: Table estimates a hazard model of employment, testing whether the hazard rate of separation increase for WOTC workers relative to non-WOTC workers around $6000 in earnings, when the WOTC subsidy expires. We restrict to employment stints in 2007 and after (when the WOTC application micro-data is higher quality) at firms who submitted at least one WOTC application in the quarter of hire. We also restrict to workers aged 18 to 39 at time of hiring to maintain comparability of age with WOTC hires. The full model regresses the hazard rate of separation on a dummy variable for if the stint is associated with a WOTC application (WOTC), dollar of earnings (*earnings*), a dummy variable for if the earnings level is above $6000, and the full set of interactions of these variables ($postXearnings, WOTCXearnings, postXWOTC$, and $postXWOTCXearnings$). We are interested in whether the hazard rate changes discontinuously around $6000, i.e., the coefficient on $postXWOTC$. For robustness, we estimate this within three different bandwidths around $6000.

Table A12: Substitutability of WOTC-eligible and ineligible SNAP beneficiaries

	(1) Eligible hires	(2) Eligible hires	(3) Ineligible hires	(4) Ineligible hires
Eligible exits	0.124***	0.084***	0.107***	0.086***
	(0.025)	(0.013)	(0.020)	(0.011)
Ineligible exits	0.151***	0.114***	0.119***	0.087***
	(0.026)	(0.014)	(0.027)	(0.013)
Firm FEs	Yes	Yes	Yes	Yes
Year-Quarter FEs	Yes	Yes	Yes	Yes
Total Exits FEs	No	Yes	No	Yes
Observations	615668	615264	615668	615264

Note: Table reports estimates of how many hires a firm made in a quarter as a function of separations from the firm in that quarter. Column 1 examines the number of hires of individuals who are between ages 37-39 and received SNAP benefits for 3 of the past 5 months (eligible for WOTC), while column 2 examines hires of those between ages of 42-44 and received SNAP benefits for 3 of the past 5 months (ineligible for WOTC). In both cases, the dependent variable is regressed on the number of exits from the firm in that quarter of individuals with those characteristics. All specifications include fixed effects for firm and year-quarter, as well as the total number of exits from the firm in that quarter. Standard errors are clustered at the firm level.

Table A13: Aggregate firm-level effects of WOTC

	(1) WOTC certs	(2) WOTC certs/hire	(3) Hires (logs)	(4) Payroll (logs)	(5) Starting wage (WOTC)
Top tercile	5.60***	0.0100*	0.49***	-0.013	1.04***
	(1.73)	(0.0056)	(0.16)	(0.11)	(0.22)
Top tercile x post	3.78**	0.019***	0.016	0.052	-0.093
	(1.53)	(0.0059)	(0.068)	(0.045)	(0.16)
Mean, bottom tercile	3.275	0.0300	3.639	14.92	9.874
Observations	4592	4512	4512	4592	2752

Note: Table reports estimates from a firm-level regression of the outcome denoted by the column header on whether the firm was in the top tercile of exposure relative to the bottom tercile, year-quarter fixed effects, and the interaction between top tercile and whether the year-quarter was after the policy change. Bottom tercile firms are rewighted to align their pre-2007 payroll-by-hires distribution with the top tercile firms' distribution. Exposure is defined as the fraction of the industry's hires in the pre-2007 period who received SNAP and were between the ages of 25-39. Sample is firms that had adopted WOTC prior to 2007 and whose exposure fell in the bottom or top tercile of the exposure distribution. Standard errors clustered at the firm level.

Table A14: Audit study analysis

	Type of firm		Diff-in-RD	Applicant type (WOTC firms)	
	(1) WOTC firm	(2) Non-WOTC firm	(3) .	(4) Black	(5) Non-college
RD_Estimate	-0.038	0.011	-0.049	-0.054	-0.026
	(0.029)	(0.038)	(0.048)	(0.034)	(0.032)
Dep var mean	0.241	0.242		0.241	0.242
Bandwidth	7.627	8.070		6.657	7.547
Effective Obs	19946	12755		8627	10227

Note: This table reanalyzes audit study data from Kline et al. (2024), who randomized applicant characteristics, including age, and include firm identifiers in their replication data. We apply the same regression discontinuity design as in Section 4.2 to test whether call-back rates vary by applicant age around the WOTC eligibility threshold (age 40). In columns (1) and (2), we classify firms as WOTC users or non-users using FOIA data on WOTC applications from 2018-2020 (Corwin, 2022), and estimate the specification separately for each group. Column (3) presents the difference between the two, following a differences-in-discontinuities approach. Columns (4) and (5) restrict the sample to WOTC-using firms and focus on applicants who may be more likely perceived as SNAP recipients: those without a college degree and Black applicants.

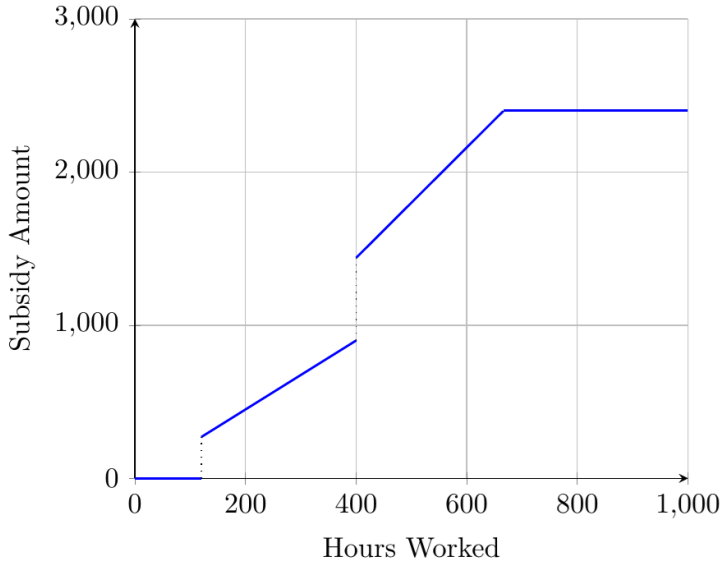
Company	Job Application Text
Company 1	"The information you provide is collected by a third party unrelated to the company and will not be shared with anyone at the company until after you have accepted an offer of employment."
Companies 2–5	"The information you provide will be used solely by [Payroll Processor] to determine your eligibility under the tax credit program and this employer's eligibility to obtain tax credits. [Payroll Processor]'s determinations as to tax credit eligibility will not affect the consideration of your application for employment by this employer. All information you provide will be kept confidential by [Payroll Processor]. Your answers to the survey questions will not be shared with this employer."
Companies 6–9	"The information you supply will be used by this company to complete its federal and state tax returns and in no way will negatively impact any hiring decision. Your responses to the questions are voluntary and will be confidential to the employer's management and federal, state, and local agencies."
Company 10	"The information that you give will be used to determine the company's eligibility for these programs and will in no way negatively impact any hiring, retention, or promotion decisions."
Companies 11–12	"We ask that you answer the following questions to help determine our company's eligibility for this tax credit should we choose to hire you. Your answer will be kept confidential and will not be used as a condition for employment."
Company 13	"We guarantee that your answers to these questions will not affect your eligibility for employment nor any benefits you or your family may currently be receiving."
Company 14	"Your responses are voluntary and may assist members of targeted groups in securing employment. Your answers will be kept strictly confidential and will not adversely affect your employment opportunity."
Company 15–18	"All answers will be kept strictly confidential and will not adversely affect your employment opportunity."
Companies 19–20	"The screening is administered by an independent tax consulting firm on behalf of the organization. To assist, please respond as requested below. Your answers will not negatively impact consideration of your application for employment, and your participation is highly encouraged. The information provided is used solely to determine your eligibility for the tax credit program(s)."
Company 21	"The information you supply will be used by or on behalf of this company to complete its federal and/or state tax returns and may assist members of targeted groups in securing employment. Your responses to the question are voluntary and will be confidential to this company's management and third-party service providers, federal, state, and local agencies, and other third parties as necessary to determine eligibility."
Company 22	"As a step in your application process, we ask that you provide a preliminary response to us relating to potential qualifications for the Work Opportunity Tax Credit. [Company 22] participates in this program which helps us obtain federal incentives for hiring and retaining individuals from certain targeted groups into our workforce. We welcome you to participate in this screening by checking the box below if you believe any of the statements below relate to you."

Table A15: Language about use of Work Opportunity Tax Credit on Job Applications

Note: This table reports language related to WOTC on job applications for the random sample of employers in section 6. All names of companies and third party processors have been removed. In cases where multiple companies have exactly the same language, which typically occurs when WOTC is processed by a third party, we group the companies.

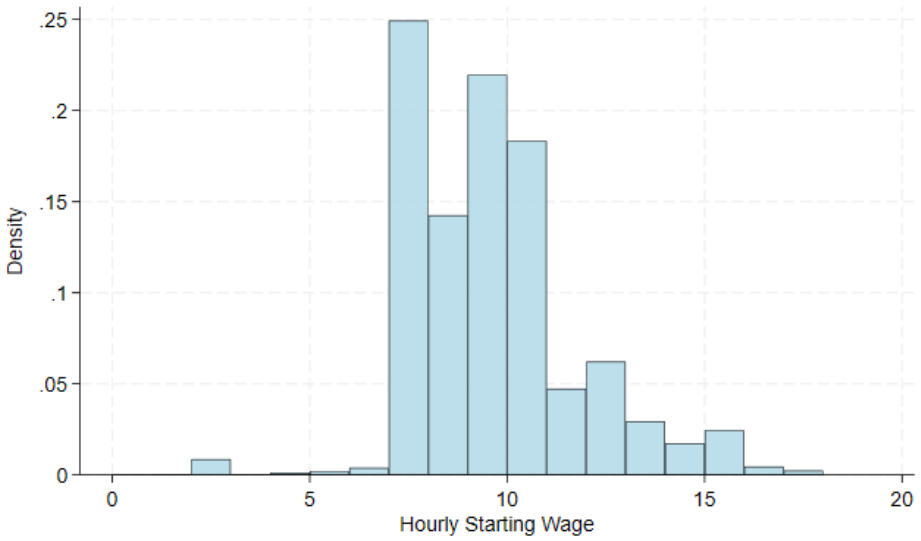
Appendix Figures

Figure A1: Example WOTC subsidy schedule



Note: Figure reports the subsidy amount by hours worked for the median worker earning $9 per hour. For the first 120 hours, the subsidy does not pay anything. The subsidy then pays 25% of wages for hours 120 to 400 and 40% of wages for more than 400 hours, up to a cap of $2400.

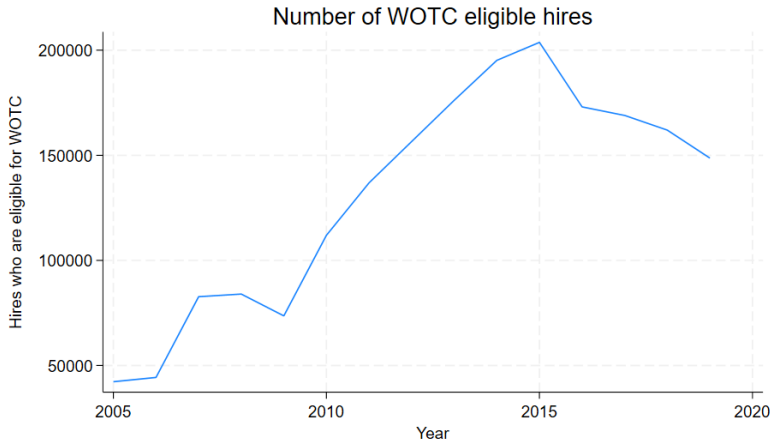
Figure A2: Hourly Starting Wage



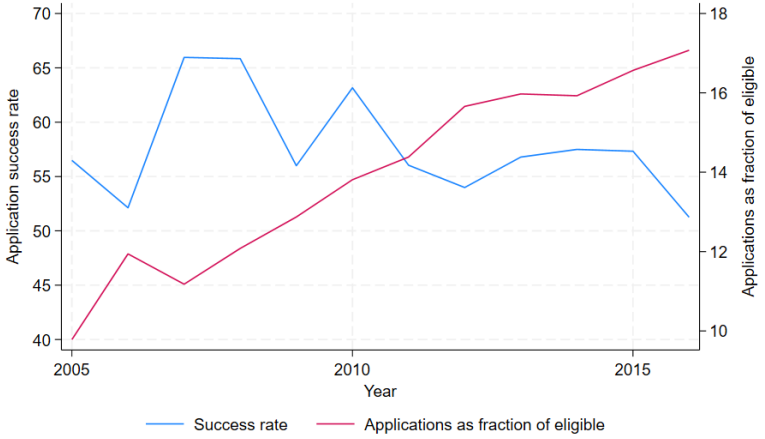
Note: Figure reports the distribution of starting hourly wage for workers in WOTC-certified jobs in Wisconsin between 2009-2020.

Figure A3: Changes in WOTC over time

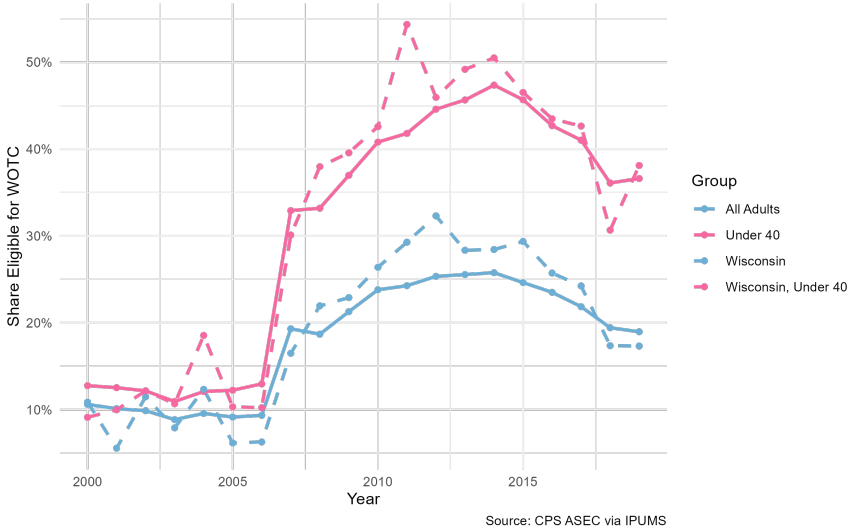
(a) Hires eligible for WOTC in Wisconsin



(b) Firm application behavior in Wisconsin

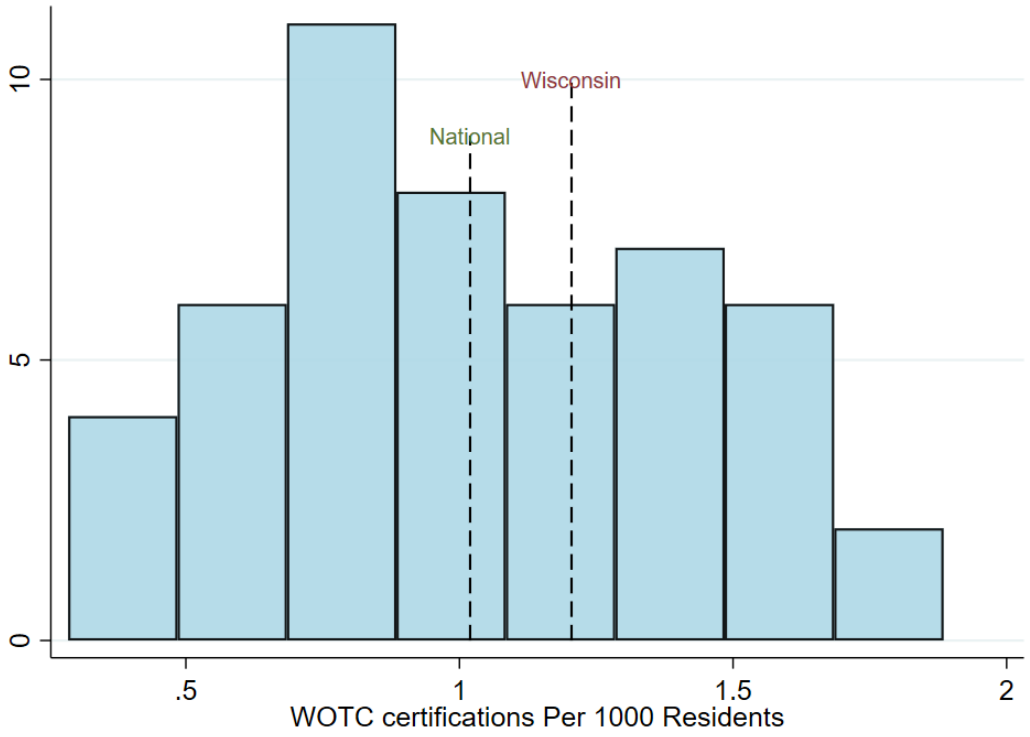


(c) Share of below poverty line individuals eligible for WOTC



Note: Panel (a) reports the total number of new hires in Wisconsin in a given year for whom our administrative data indicates they are eligible for WOTC due to participation in SNAP or TANF, or conviction for a felony. Panel (b) reports the fraction of WOTC applications that are successful as well as the fraction of eligible individuals for whom firms apply for WOTC. Panel (c) uses data from the Current Population Survey to estimate the fraction of individuals below the poverty line who would be eligible for WOTC if hired into a new job. It estimates this separately for all adults, adults under age 40, and Wisconsin. Estimates are based on CPS data on unemployment, veteran status, and receipt of SNAP, TANF, and SSI. This leaves out those who may be eligible for other reasons (e.g. felony conviction in the previous year). Combined, these omitted categories typically account for around 10% of certifications, meaning the estimates in the figure are likely lower bounds on the true eligibility fraction.

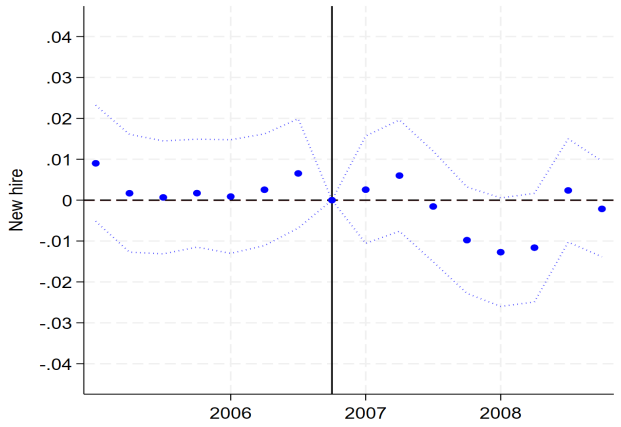
Figure A4: Average Quarterly WOTC applications by State (Per 1000 residents)



Note: Figure reports average quarterly WOTC applications per 1000 residents by state. The vertical dashed lines indicates the average applications in Wisconsin as well as averaged across all 50 states. Data is taken from the Department of Labor national Work Opportunity Tax Credit data, which is based on quarterly data submitted by state workforce agencies through the the web-based Tax Credit Reporting System.

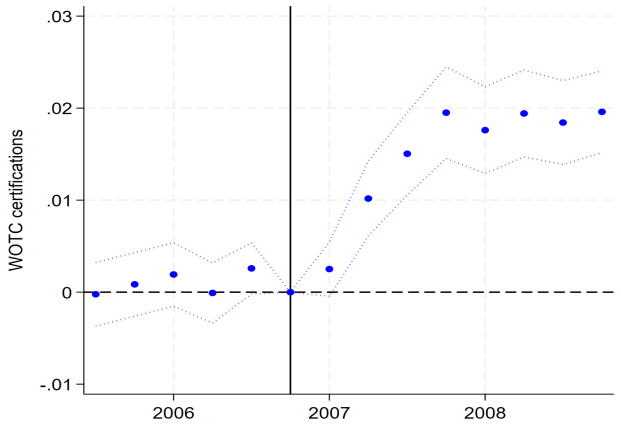
Figure A5: Effect of WOTC on individual outcomes, event study analysis of SNAP expansion (age 40 sample)

(a) New hire

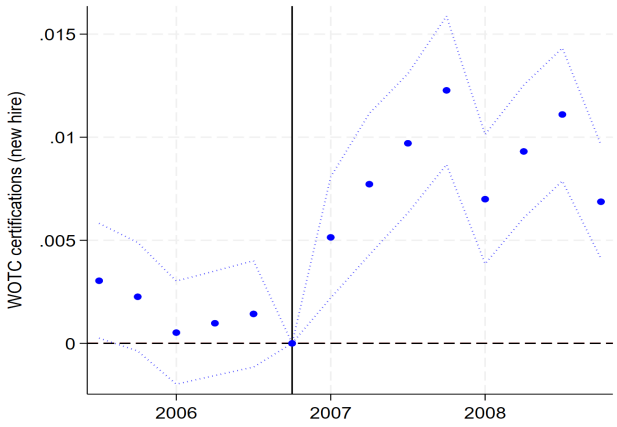


(b) Employed

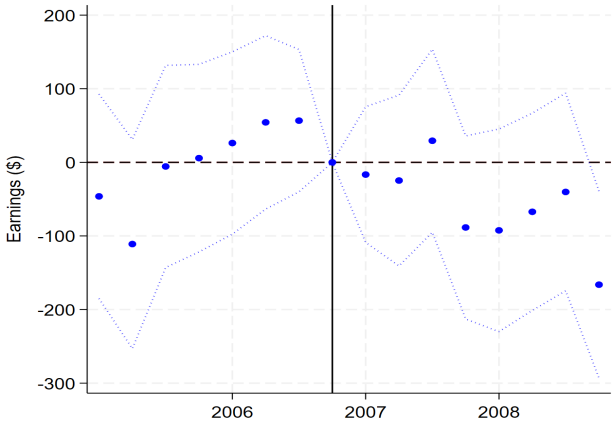
(c) WOTC certified job



(d) New hire into WOTC certified job



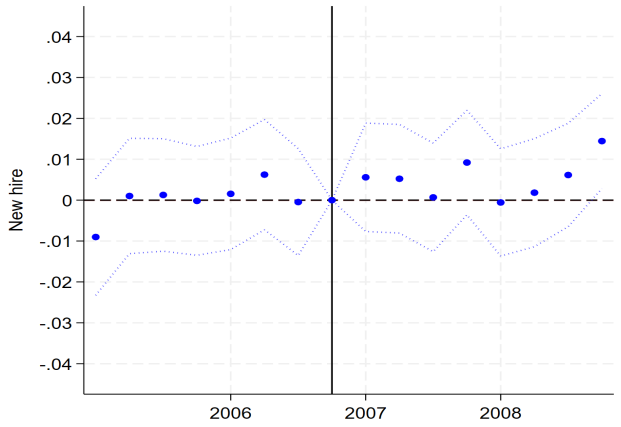
(e) Earnings



Note: Figure reports event study estimates from the 2007 expansion to SNAP recipients aged 40-39 in Equation (1) for new hires, employment, earnings, new hire into a WOTC-certified job, social assistance utilization, and criminal activity. Sample is individuals who are around the age 40 cutoff. Controls include monthly age fixed effects and quarter-year fixed effects. Standard errors clustered at the individual level.

Figure A6: Effect of WOTC on individual outcomes, event study analysis of SNAP expansion (age 25 sample)

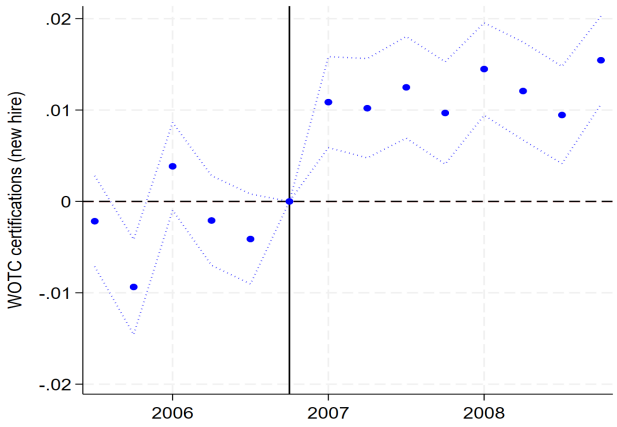
(a) New hire



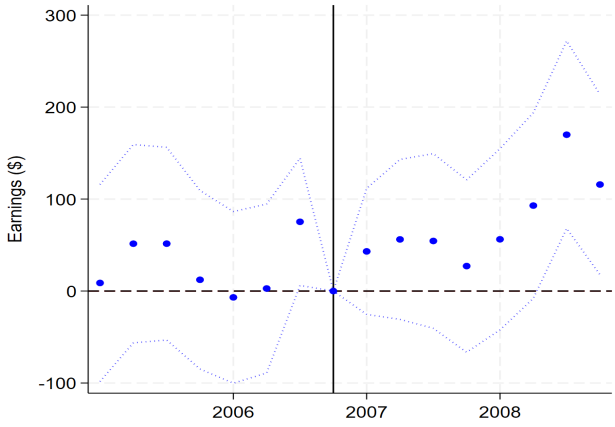
(b) Employed

(c) WOTC certified job

(d) New hire into WOTC certified job



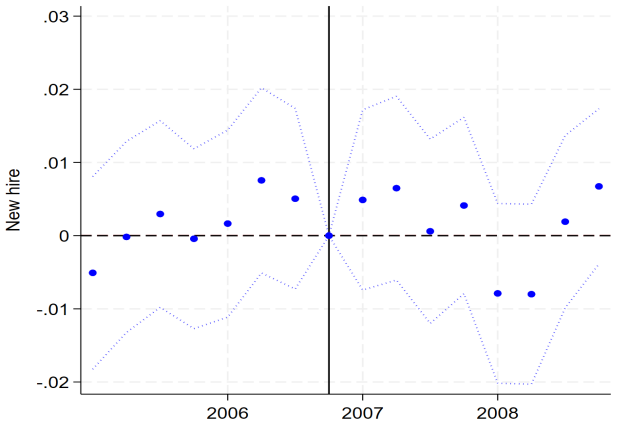
(e) Earnings



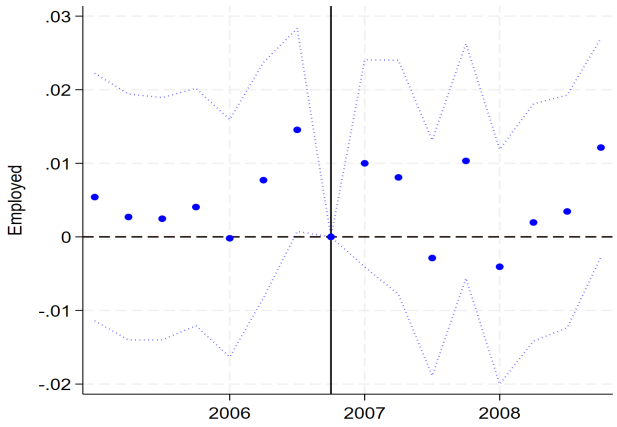
Note: Figure reports event study estimates from the 2007 expansion to SNAP recipients aged 25-39 in Equation (1) for new hires, employment, earnings, new hire into a WOTC-certified job, social assistance utilization, and criminal activity. Sample is individuals who are around the age 25 cutoff. Controls include monthly age fixed effects and quarter-year fixed effects. Standard errors clustered at the individual level.

Figure A7: Effect of WOTC on individual outcomes, event study analysis of SNAP expansion (unemployed sample)

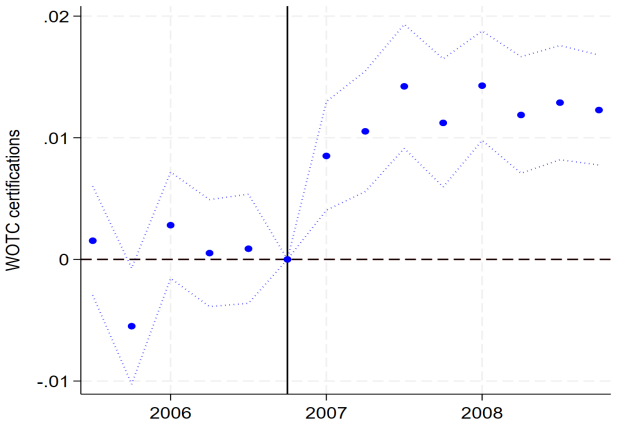
(a) New hire



(b) Employed

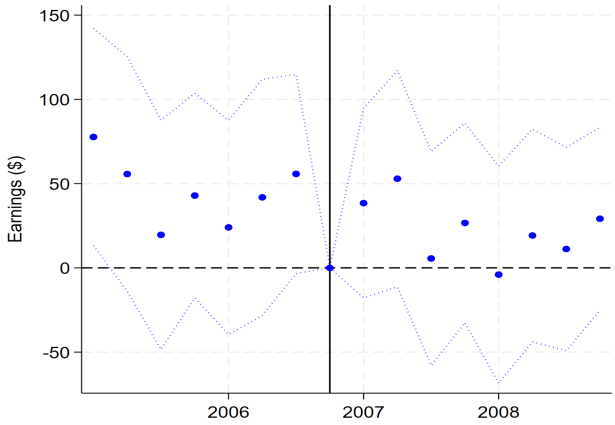


(c) WOTC certified job



(d) New hire into WOTC certified job

(e) Earnings

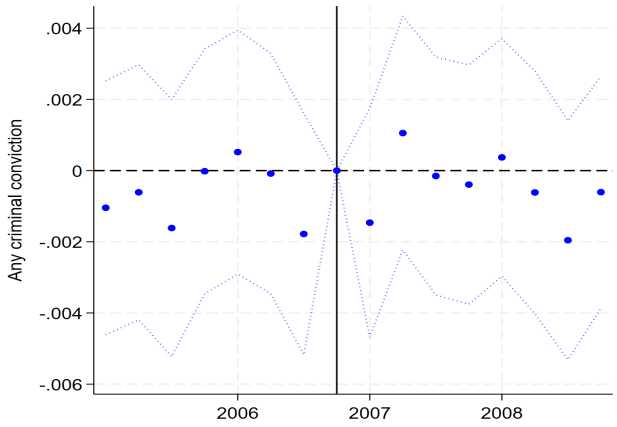


Note: Figure reports stacked event study estimates from the 2007 expansion to SNAP recipients aged 25-39 in Equation (1) for new hires, employment, earnings, new hire into a WOTC-certified job, social assistance utilization, and criminal activity. Sample is individuals who entered quarter t unemployed. Controls include monthly age fixed effects and quarter-year by age sample fixed effects. Standard errors clustered at the individual level.

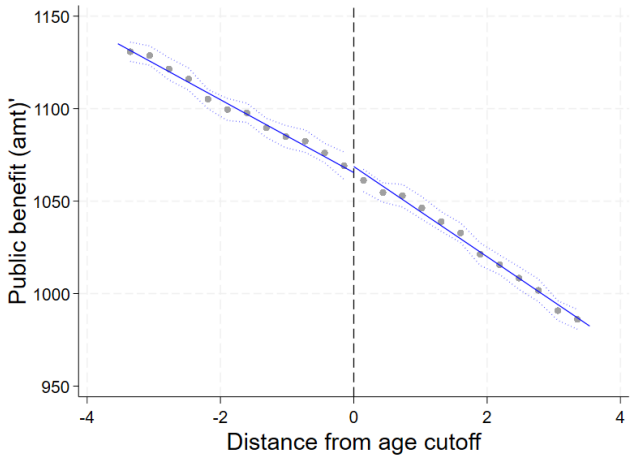
Figure A8: Effect of WOTC on public benefits usage and criminal convictions

(a) Public benefits (event study)

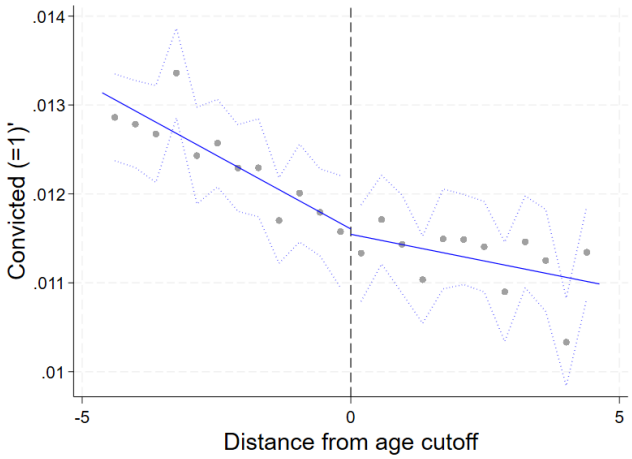
(b) Criminal conviction (event study)



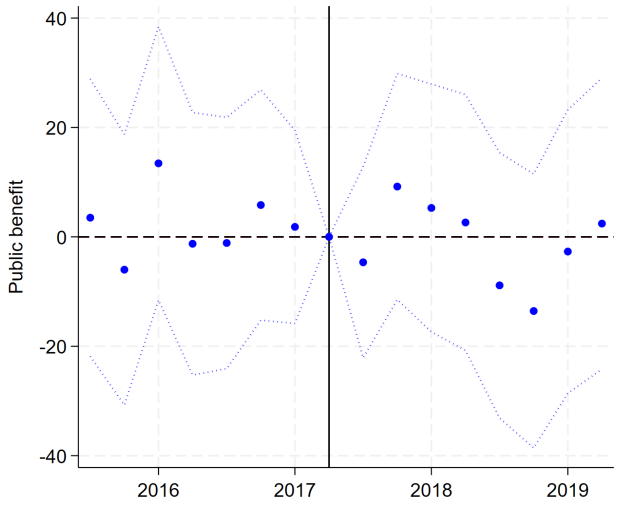
(c) Public benefits (RDD)



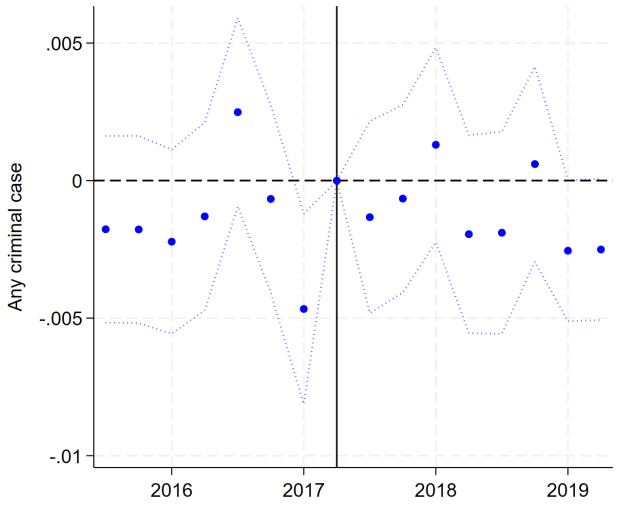
(d) Criminal conviction (RDD)



(e) Public benefits (eWOTC)

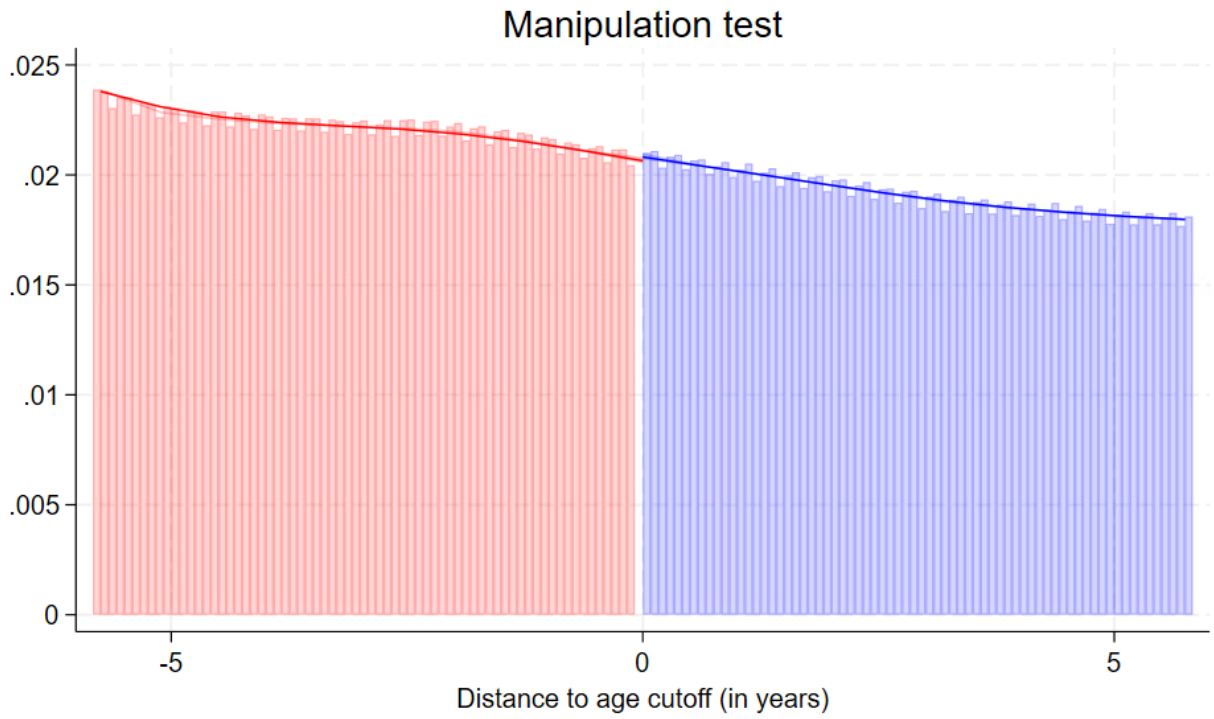


(f) Criminal conviction (eWOTC)



Note: Figure reports the consequences of WOTC eligibility for public benefits receipt (dollar value of three forms of public benefits in a quarter: TANF, Unemployment Insurance, and SNAP) and being convicted of a criminal offense in the relevant quarter. Panels (a) and (b) report stacked event study estimates from the 2007 expansion to SNAP recipients aged 25-39 in Equation (1). Controls include monthly age fixed effects and quarter-year by age sample fixed effects. Panels (c) and (d) plot the relationship between these outcomes and the difference between the individual's age and the relevant WOTC age eligibility threshold. Individuals whose age is to the left of the threshold are eligible for WOTC, while those to the right of the threshold are not. The bandwidth is based on the optimal bandwidth selection from Cattaneo et al. (2020). Panels (e) and (f) repeat this for the eWOTC expansion analysis. Standard errors clustered at the individual level for all figures.

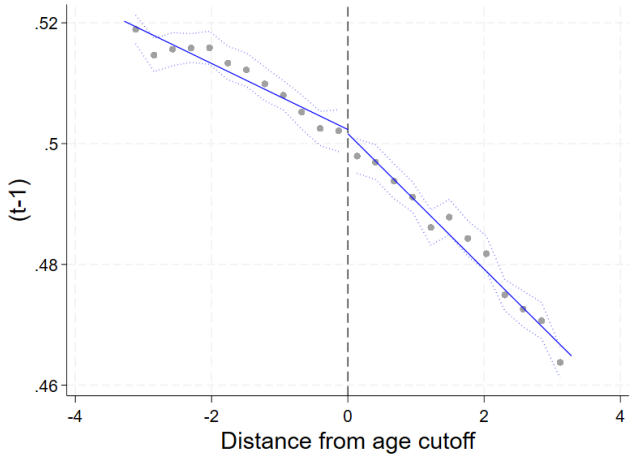
Figure A9: Distribution of the running variable, RD analysis



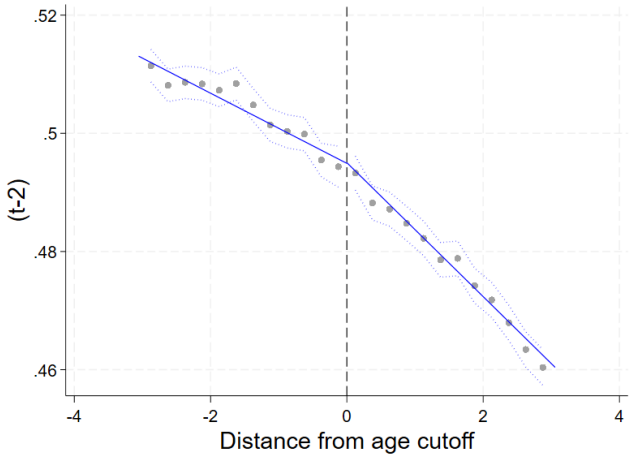
Note: This figure plots the distribution of age around the relevant thresholds and a non-parametric regression for each half of the distribution in order to test for a discontinuity in population density around the threshold (Cattaneo et al., 2020).

Figure A10: Balance on pre-determined characteristics, RD analysis

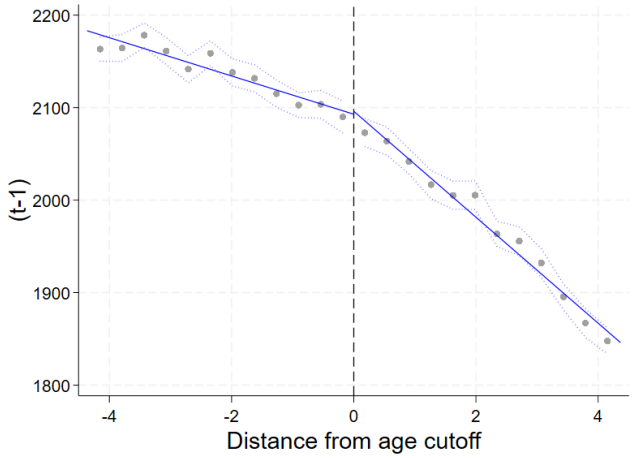
(a) Employed (t-1)



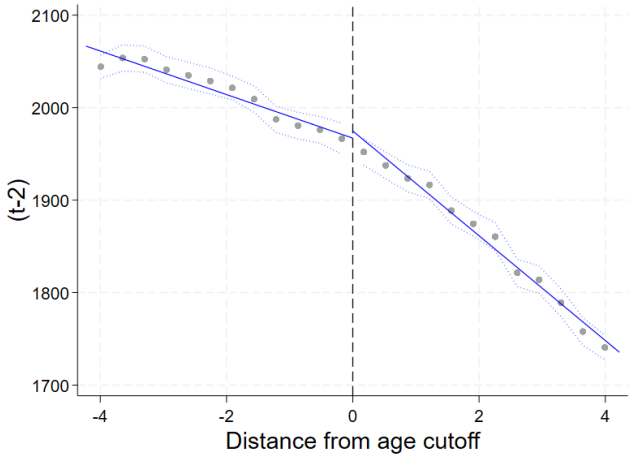
(b) Employed (t-2)



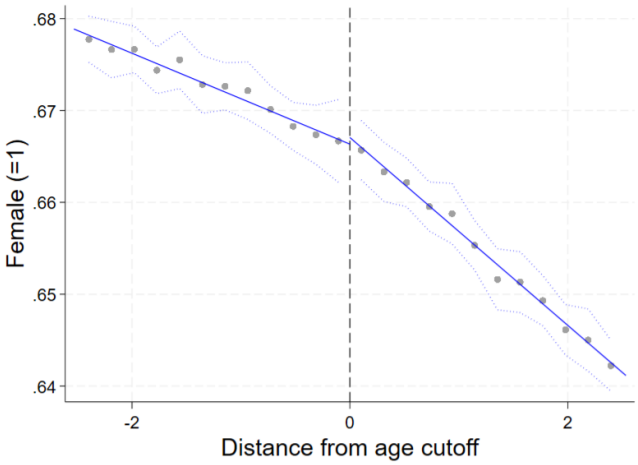
(c) Earnings (t-1)



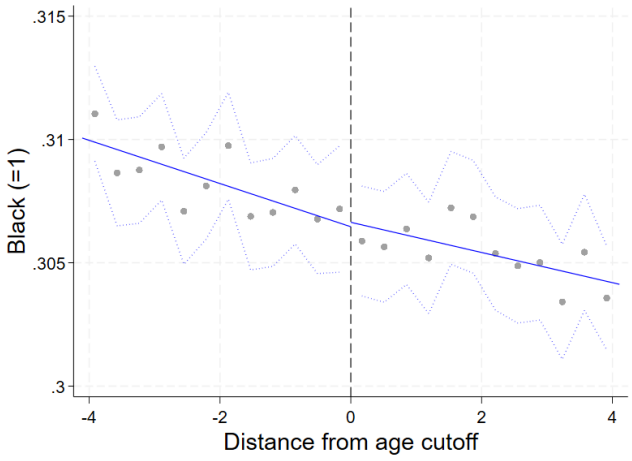
(d) Earnings (t-2)



(e) Female



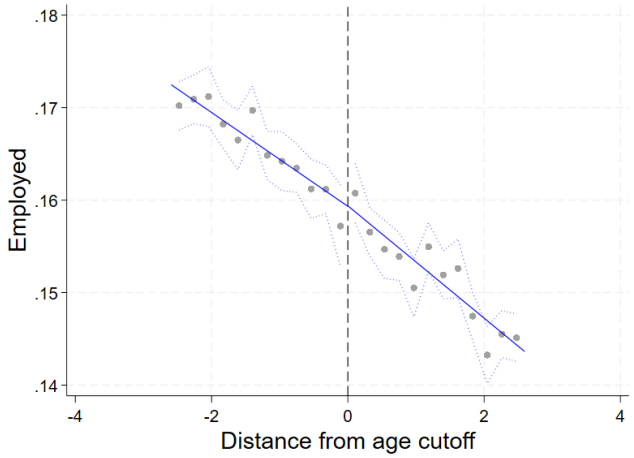
(f) Black



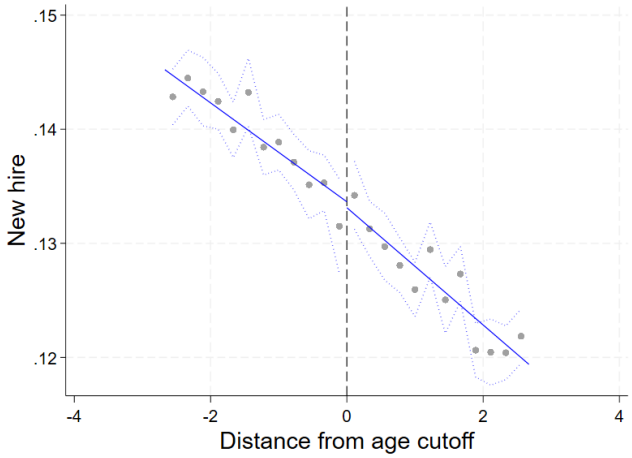
Note: These figures plot the relationship between various characteristics of the individual in the period prior to t and the running variable in order to test for pre-existing imbalances.

Figure A11: Effect of WOTC on individual outcomes, RD analysis (unemployed sample)

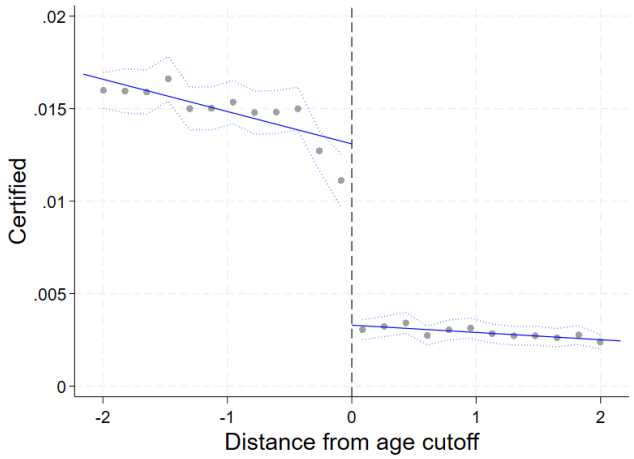
(a) Employed



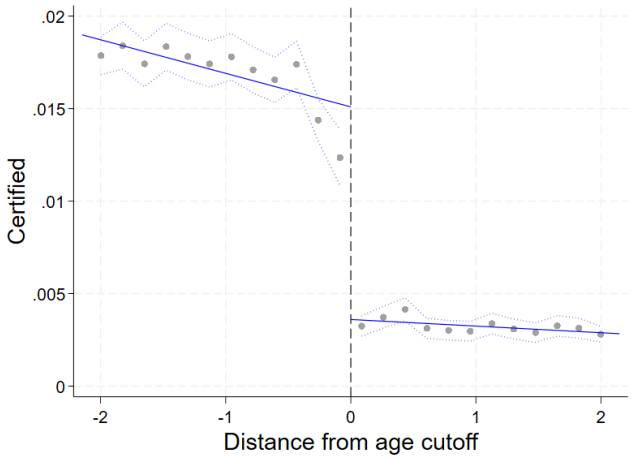
(b) New hire



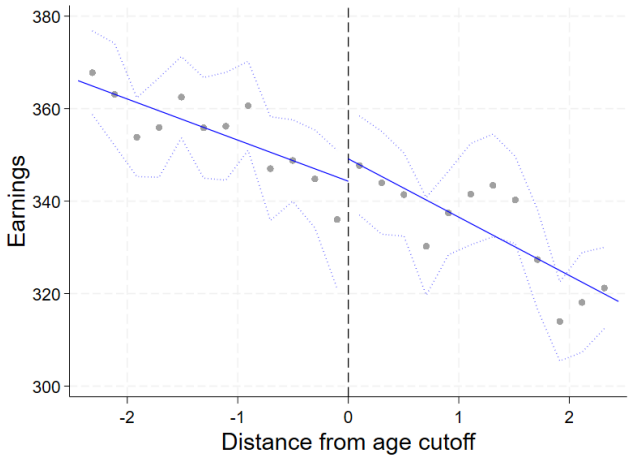
(c) WOTC certified job



(d) New hire into WOTC certified job



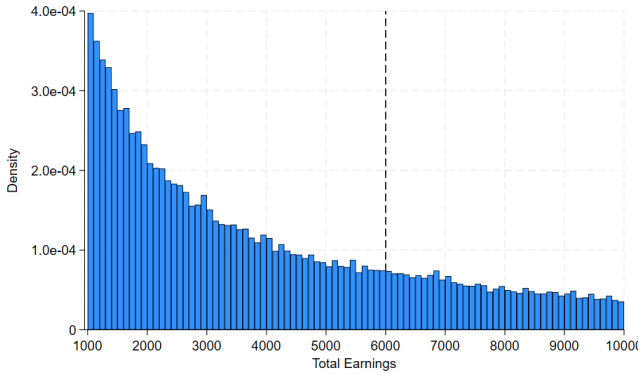
(e) Earnings



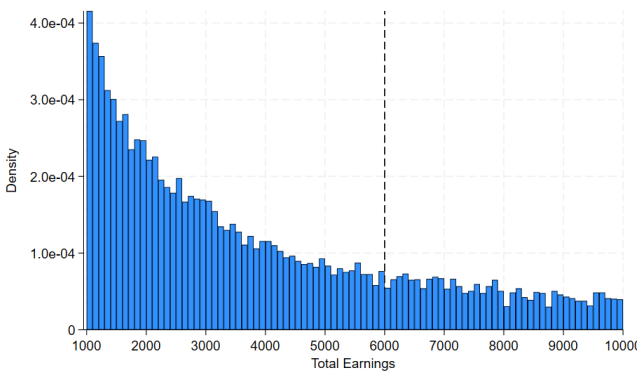
Note: These figures plot the relationship between individual-level outcomes and the difference between the individual's age and the relevant WOTC age eligibility threshold. The data is collected at the quarterly level, and the sample is restricted to individuals who are not employed at the start of the quarter. Individuals whose age is to the left of the threshold are eligible for WOTC, while those to the right of the threshold are not. The bandwidth is based on the optimal bandwidth selection from Cattaneo et al. (2020). Panel (a) examines whether the individual is employed, panel (b) focuses on whether the individual is hired into a new job in that quarter. Panels (c) and (d) plot the first stage relationship between the individual's age and whether they are working in a job with an associated WOTC certification (Panel c) or are hired into a job with an associated WOTC certification (Panel d). Panel (e) measures individual earnings in the quarter.

Figure A12: Histograms of total earnings for WOTC-certified workers

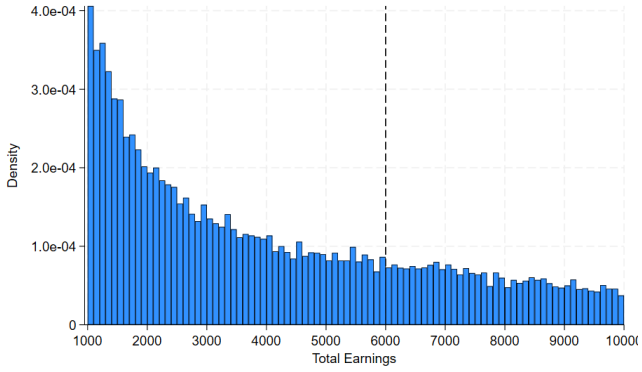
(a) Top 50 WOTC firm



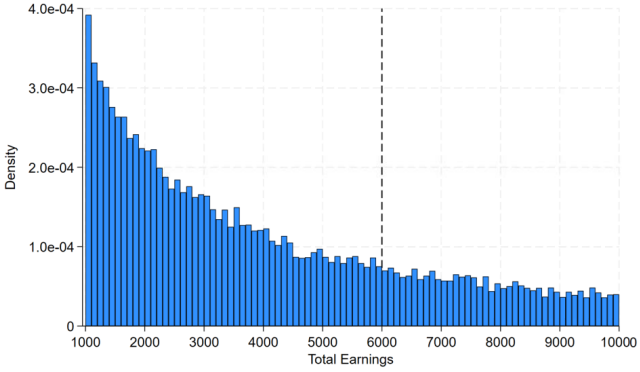
(b) WOTC high success firm



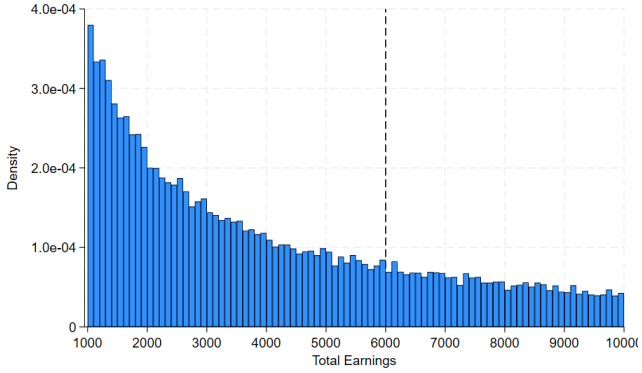
(c) Staffing firm



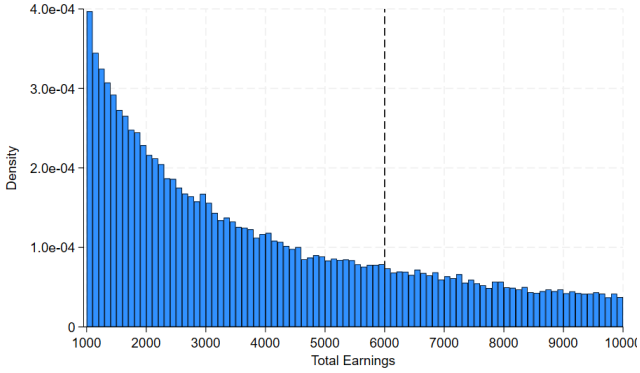
(d) Highly competitive industries



(e) 2007 to 2013



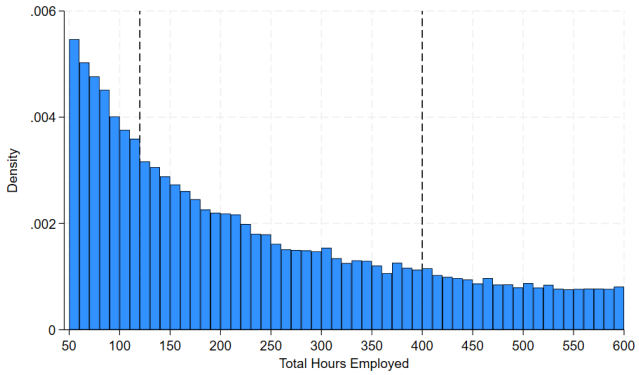
(f) 2014 to 2019



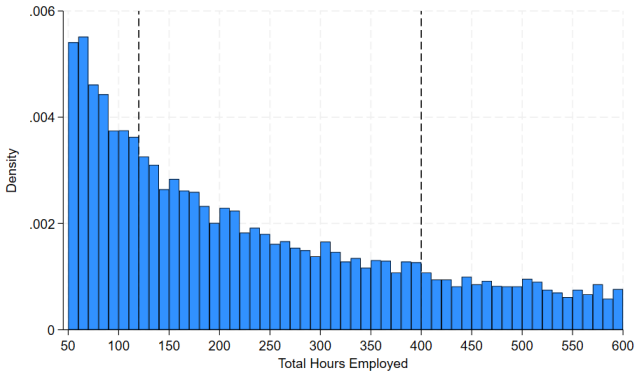
Note: These figures plot the distribution of total earnings prior to separation for workers whose hiring was subsidized by WOTC and who were eligible for WOTC through SNAP receipt. Panel (a) plots this for workers at the 50 firms that most heavily use WOTC. Panel (b) plots this for the WOTC-utilizing firms who are in the top quartile in terms of applying to WOTC for WOTC eligible hires. Panel (c) plots this for workers at employment services firm (i.e. NAICS 5613). Panels (d) and (e) plot this for the years 2007 to 2013 and after 2014 across all firms.

Figure A13: Histograms of total hours worked for WOTC-certified workers

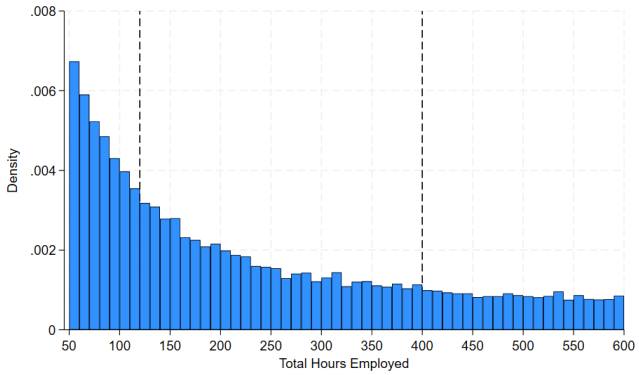
(a) Top 50 WOTC firm



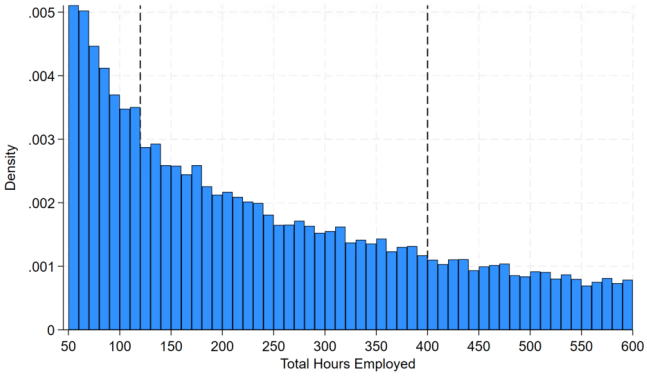
(b) WOTC high success firm



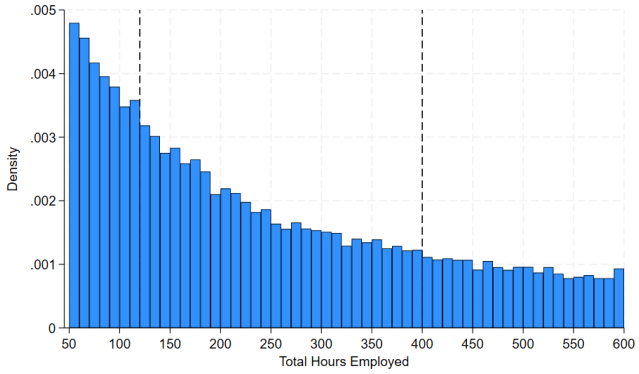
(c) Staffing firm



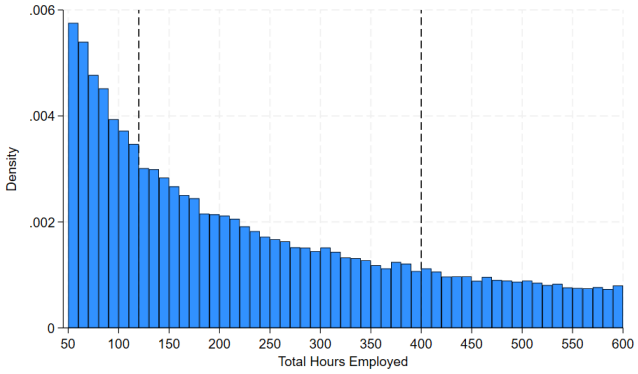
(d) Highly competitive industries



(e) 2007 to 2013



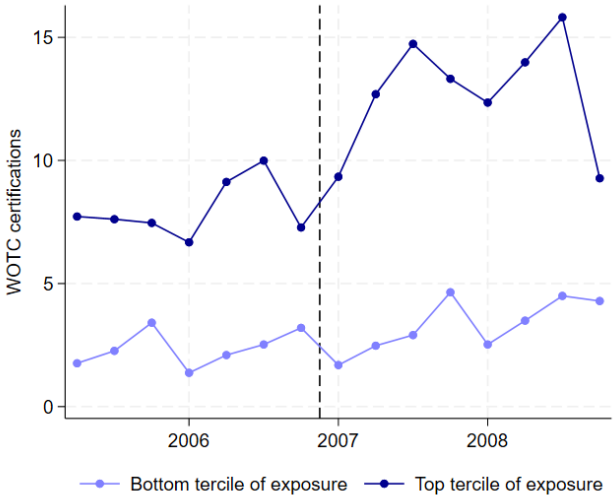
(f) 2014 to 2019



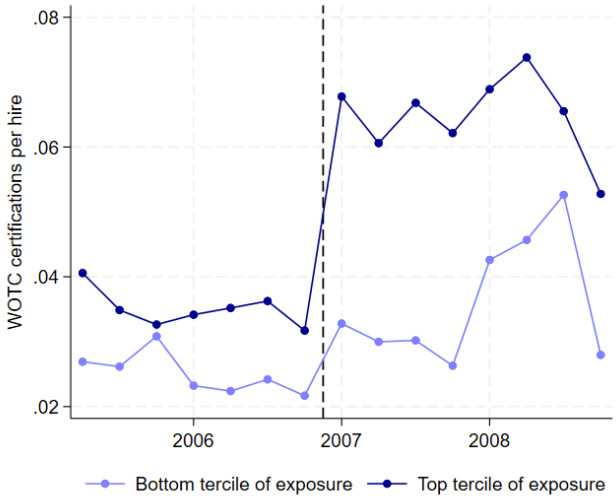
Note: These figures plot the distribution of total hours worked prior to separation for workers whose hiring was subsidized by WOTC and who were eligible for WOTC through SNAP receipt. Panel (a) plots this for workers at the 50 firms that most heavily use WOTC. Panel (b) plots this for the WOTC-utilizing firms who are in the top quartile in terms of applying to WOTC for WOTC eligible hires. Panel (c) plots this for workers at employment services firm (i.e. NAICS 5613). Panels (d) and (e) plot this for the years 2007 to 2013 and after 2014 across all firms.

Figure A14: Aggregate effects

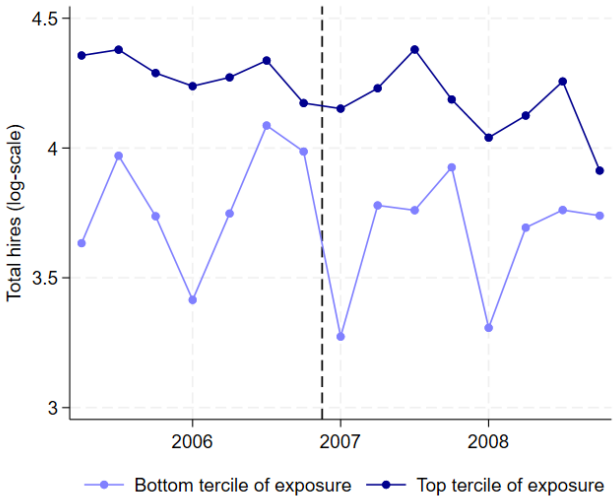
(a) WOTC certifications



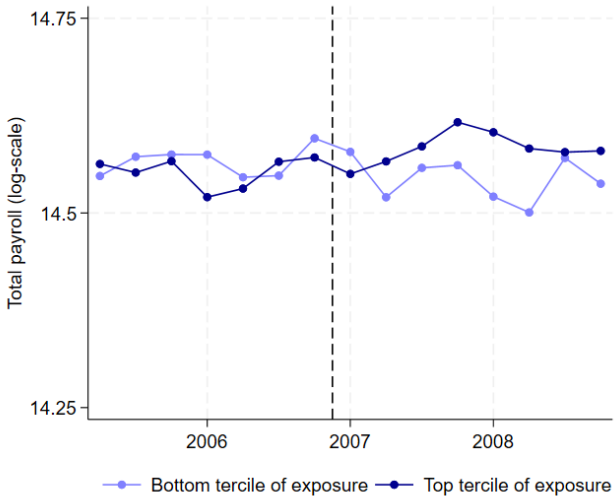
(b) WOTC certifications per hire



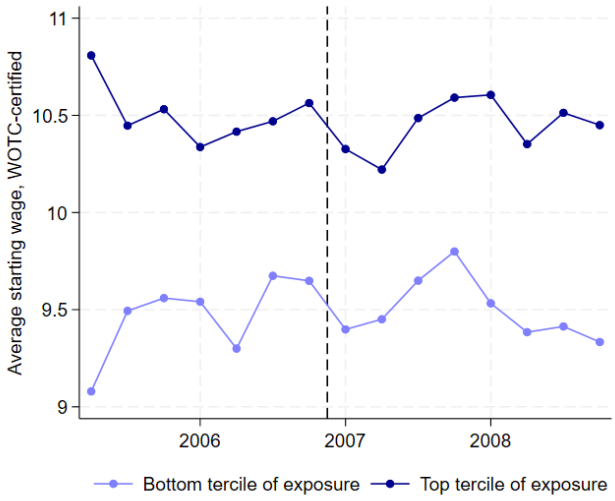
(c) Total hires



(d) Total payroll ($1,000s)



(e) Average starting wage (WOTC)



Note: Figures plot outcomes by whether the firm was in the top tercile of exposure relative to the bottom tercile. Bottom tercile firms are reweighted to align their pre-2007 payroll-by-hires distribution with the top tercile firms' distribution. Exposure is defined as the fraction of the industry's hires in the pre-2007 period that received SNAP and were between the ages of 25-39. Sample is firms that had adopted WOTC prior to 2007 and whose exposure fell in the bottom or top tercile of the exposure distribution.

Figure A15: Examples of WOTC information collection on job applications

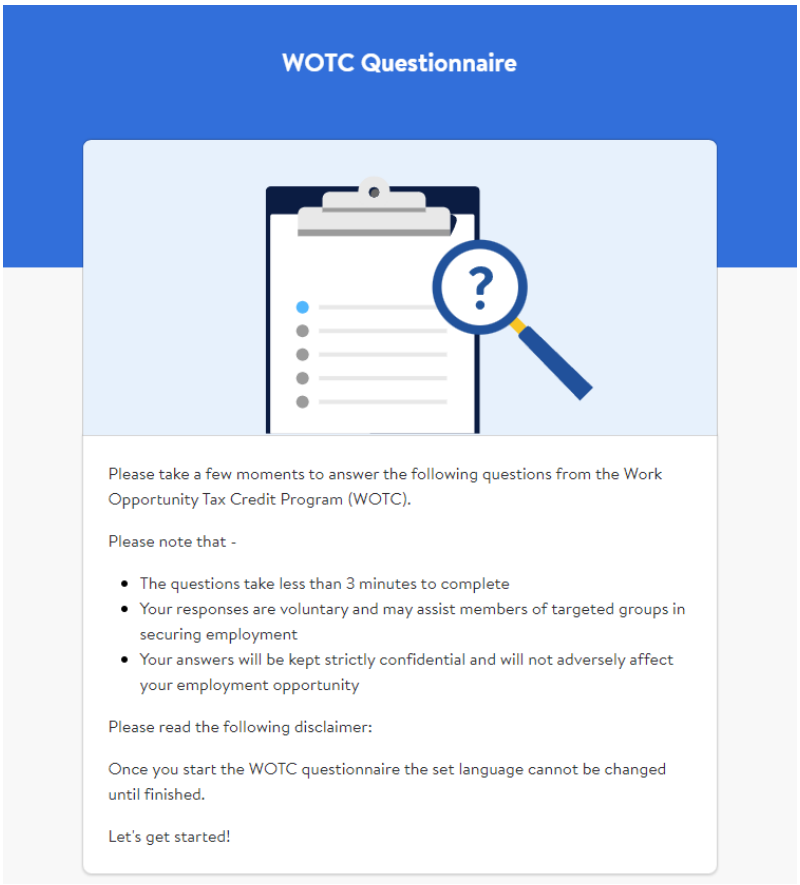
(a) Example of third-party WOTC screening

[redacted] is an independent tax consulting firm that has been hired by this employer to administer WOTC and other federal tax credit programs. As part of its administration of the tax credit program, [redacted] requests that you complete the following on-line survey. Your participation in the survey is voluntary, but encouraged, and your decision to participate will not have any negative effect on the consideration of your application for employment by this employer. The information you provide will be used solely by [redacted] to determine your eligibility under the tax credit program and this employer's eligibility to obtain tax credits. [redacted] determinations as to tax credit eligibility will not affect the consideration of your application for employment by this employer. All information you provide will be kept confidential by [redacted] Your answers to the survey questions will not be shared with this employer. *Click for more information.*

The security and protection of your personal information is very important to us. Any personal information you share with us is stored under layers of protection including encryption, firewalls and physical access restrictions. This site also uses 128 bit SSL encryption to protect your data during transmission to this site.

Your responses to the [redacted] WOTC Survey will be handled in accordance with the [redacted] WOTC Survey Privacy Notice.

(b) Example of direct screening by the company



Note: This figure contains images from job applications that include WOTC screening questions.