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

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PRELIMINARY DRAFT. PLEASE DO NOT CITE OR CIRCULATE.

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 wage subsidy 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 three complementary empirical approaches to assess WOTC's impact on labor market outcomes, including age-based eligibility discontinuities and eligibility expansions. We find precise null effects on hiring, employment, and earnings across all specifications, where we can rule out effects on employment 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 evidence that this is due to concerns about legal liability and agency issues within the firm.

Keywords: wage subsidies, economic mobility, Work Opportunity Tax Credit
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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). Labor markets, however, typically involve not only workers choosing whether to accept jobs, but also firms offering jobs. An alternative demand-side approach is wage subsidies, in which the government subsidizes the wages paid to workers.

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.[1] 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 for 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 relatively inexperienced 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

[1] Other categories include Temporary Aid to Needy Families (TANF), and Supplemental Security Income (SSI) recipients, ex-felons, and the long-term unemployed, among others

(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, TANF, unemployment insurance, and criminal justice records. We additionally link this to individual-level application and certification data from the WOTC program, which allows us to characterize which types of firms and workers receive WOTC benefits.

Our empirical focus is SNAP recipients, which comprise approximately two-thirds of all workers whose wages are subsidized by WOTC (Internal Revenue Service, 2024). We use three 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).

Second, we exploit these sharp age-based eligibility criteria for WOTC among SNAP recipients: prior to 2007, SNAP recipients below age 25 were eligible, and after 2007, there is a similar cutoff at age 40. Using a regression discontinuity design around those thresholds, we test whether labor market outcomes differ for those who are just eligible for the subsidies as compared to those who are just ineligible. This approach has numerous advantages, such as a large sample for exploring heterogeneous treatment effects and allowing us to estimate the consequences of WOTC eligibility throughout the sample period rather than at just the time of expansion.

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 age-based treatment and control groups among SNAP recipients as in the first empirical approach, 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 strategies, we find no evidence that WOTC eligibility increases likelihood of employment. These estimates are extremely precise, where we can rule out increases in employment as small as 0.2 percentage points at a 95% confidence level. This implies that WOTC eligibility does not influence firm hiring decisions, and so firms receive 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 in a WOTC-subsidized job; this measures the effective difference between the treated and comparison group in program uptake. We divide the bounds on our employment estimates by these uptake estimates to establish bounds on the fraction of WOTC-subsidized hires whose hiring could be attributable to WOTC. Taking the 95% confidence intervals around our most precise estimates, between 87 and 100% of WOTC-subsidized hires appear to be windfall wastage.

Even if hiring decisions are unchanged by wage subsidies, they could still benefit targeted workers if passed through in the form of 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 looking at earnings, we find no evidence of this.[2] Our estimates are again quite precise, where the upper bound of the estimated confidence interval implies that we can rule out positive effects on quarterly earnings as little as $19 per quarter.

Proponents of wage subsidies suggest that wage subsidies could reduce usage of public benefit programs and discourage engagement in criminal activity, with Congressional filings by program lobbyists arguing that this channel leads to the program creating a net savings for the government (Casselli, 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 likelihood of a criminal conviction.

One 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". If this were the case, hiring subsidies may not only not help workers, but actively reduce the availability of stable jobs. We investigate this possibility using discontinuities in the WOTC subsidy schedule, checking for bunching or kinks in termination likelihood after 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.

Put together, our results imply that hiring subsidies through WOTC are a pure transfer to firms. Moreover, we find 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). Independently acquired data from Freedom of Information Action requests provides more details on these firms (Corwin, 2022). Of the top 50 firms in WOTC certifications, 52% are temporary staffing services agencies. Most of the rest are very large firms: among those that are publicly listed (24%), the median market capitalization is over $30 billion, and most of the remaining privately held firms are large franchisees of

[2]Due to the lack of impact on employment, we can directly interpret effects on worker tenure or wages as the impact of WOTC without concerns about changes in the composition of employed workers due to the subsidies.

national fast food chains (16%). Thus, in stark contrast to the stated objectives of aiding disadvantaged workers, the wage subsidies instead benefit a small set of employers.

The final section of the paper examines the puzzle of why firm hiring practices do not respond to this relatively sizable subsidy. We first test and rule out conventional explanations related to standard models of labor supply and demand or the negative signal value of WOTC eligibility. We then collect information from job applications for openings at a representative sample of WOTC-using firms. This data suggest that firm personnel decisions are not responsive to WOTC eligibility because the individuals making hiring decisions lack information to do so: only 13% of initial job applications collect information on WOTC eligibility, and even among those that do, the information is often not shared with the individual making hiring decisions. We further investigate firm motivations for this hiring strategy with a survey of individuals with hiring experience at WOTC-using firms. We find that firms are often concerned that preferring WOTC-eligible applicants could risk lawsuits over hiring discrimination, that there are agency issues within the firm, and that explicit screening may discourage applications due to imperfect information on the applicant side.

This paper contributes to three main literatures. First, our results bring new estimates to the literature on hiring and wage subsidy policies in the United States. An older literature studied early US 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 there "exists much uncertainty [about the efficacy of wage subsidies]." More recent papers have studied smaller state tax credits (e.g., Bartik, 2001; Bartik and Erickcek, 2014; Neumark and Grijalva, 2017) and typically find that these programs create jobs at a very high cost.[3] We provide estimates for a much larger federal program, and for wage subsidies that are targeted at individuals with disadvantages in the labor market.

Second, our paper contributes to the literature on how frictions often absent in classic models of labor markets turn out to be quite important in understanding their functioning. A recent literature has shown, for example, that equity pay constraints can explain the lack of within-firm pass-through of payroll taxes (Saez et al., 2019) and worker-side information frictions and misperceptions in job negotiations can impact wage gaps (Cullen and Pakzad-Hurson, 2023; Roussille, 2024; Jäger et al., 2024). Our results show that firm-side information frictions are also important in determining labor market outcomes, and even that these frictions can be self-imposed in response to legal institutions or within-firm agency issues.

Third, we contribute to a smaller literature that has studied WOTC specifically. These

[3]Outside of the US, 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 papers in other European countries have found modest or no effects (e.g., Huttunen et al., 2013; Schünemann et al., 2015).

papers either focus on an earlier time period at which point 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). 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 such as "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] While our empirical results focus on SNAP recipients (the largest target group) and thus we cannot definitively speak to the effects of WOTC on other target groups, the informational constraints that we identify will also apply to those groups. The Work Opportunity Tax Credit will be up for renewal by Congress in December 2025, at which point there may even be attempts to expand the scope of the program (Congress, 2023). Overall, our results imply that either reforms are needed to make WOTC actually benefit targeted groups or that the billions spent annually on WOTC could be more impactful if allocated to other programs.

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 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

[4]The only other paper that attempts to causally identify the labor market consequences of WOTC, Hamersma (2008), estimates that WOTC generates a meaningful (5.9 percentage point) increase in short-run employment. Our findings may differ due to sample, timing, or empirical strategy: Hamersma (2008) uses data from approximately 3,500 TANF recipients between 1997-2002 and compares labor market outcomes of individuals who stopped receiving TANF benefits after 6-8 months (just 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.

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 requirements so that employers confirm WOTC eligibility prior to making hiring decisions to avoid windfall wastage (Government Accountability Office, 2002).[6] 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 whether this potential manifests in actual gains is an empirical question.

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) receiving Supplemental Security Income (SSI) over the past three months; 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 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 there is no limit on the number of hires for whom they can receive subsidies, but they can only receive the subsidy for a particular

[6] 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."

[7] A few other categories are also eligible, such as qualified veterans, residents of "designated communities", and employees of summer youth programs.

worker once.[8] 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.[9] This agency verifies that the worker is eligible and certifies or denies the application.[10]

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 (Figure A1).[11] 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. Even if another firm has received WOTC for a particular worker in the past, the worker's current employer can still claim the full subsidy amount as long as the worker satisfies the eligibility criteria at the time of 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 2009 and 2020. Most jobs are at or just above the minimum wage, which was equal to $7.25 in Wisconsin over this period.[12] Combining this data with administrative quarterly earnings data, we find that for each certification, firms receive an average of $1057 in subsidies.[13] 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 hours to qualify for the 40% subsidy rate, with 31% of all certifications qualifying firms for the maximum subsidy amount of $2400. 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 for more than three quarters.

[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%).

[11] The limit is $4,800 of tax credits for disabled veterans who meet other criteria, but this is a very small fraction of all WOTC hires.

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

[13] To calculate total hours worked for the employer, we take the starting hourly wage reported in the WOTC application and divide total earnings for the worker from that employer in this work stint. 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.

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). Figure 1 shows that most of this growth came between 2008 and 2015, and is due to certifications for WOTC through SNAP.[14]

To understand the reasons for this massive growth, which has not been discussed in the previous academic literature, 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 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: TANF receipt, SNAP receipt.[15] 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 qualify for WOTC.[16] The fraction of eligible hires for whom firms apply for WOTC also increases modestly from 11.2% in 2007 to 17.1% in 2015, but application success rates are fairly steady. We thus conclude that the growth of WOTC is primarily due to an increase in the number of hires who would be eligible, largely due to the expansion of the SNAP program.

[14] 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 evidences of differences in the effects of WOTC during the waiver/non-waiver periods.

[15] These eligibility criteria account for approximately three-quarters of WOTC subsidized hires.

[16] Our Wisconsin data does not extend after 2020, but from figure 1, it appears that much of the growth between 2020 and 2022 is due to firms applying for a new category of eligibility that was created in 2015 – long-term unemployment – and the increase in individuals in that category due to the COVID-19 pandemic.

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,[17] which contains information on over 13 million individuals. We use linked data from quarterly earnings records, SNAP receipt, 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 an ideal state in which to study WOTC because it is fairly typical in its implementation of the program: for example, Appendix Figure A12 shows that per capita utilization is almost exactly the national average.

Quarterly earnings records: We use quarterly earnings records between 2004-2020 that are collected for Wisconsin's Unemployment Insurance (UI) program from the Department of Workforce Development.[18] 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 (FoodShare is the name of Wisconsin's SNAP program) benefit records between 2003-2020 from the Department of Health Services. These records include benefit amounts for the household and individual identifiers of each eligible member of the household. We use this to measure eligibility for WOTC as well as whether access to WOTC makes an individual less likely to utilize SNAP benefits.

Monthly TANF receipt (2003-2019): We use monthly data on whether an individual is receiving TANF benefits from the Department of Children and Families. This includes benefit amounts and individual-level identifiers for benefit recipients. We use this to measure eligibility for WOTC as well as whether access to WOTC makes an individual less likely to utilize TANF benefits.

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 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, type of crime,

[17] IRP has ongoing data usage agreements with many Wisconsin state government agencies to link and house data from the past two decades.

[18] 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.

incarceration status, date of conviction, and dates of entry and exit from incarceration. We use this to measure eligibility for WOTC as well as whether access to WOTC makes an individual less likely to engage in criminal activity.

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, starting hourly wage, whether the applications 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.

4 Effects of WOTC eligibility on individual outcomes

In this section, we use our linked administrative data to estimate the effects of WOTC eligibility on individual labor market outcomes – employment, new hires, and earnings – as well as spillovers to usage of social assistance and criminal activity. We use three separate identification strategies: first, we exploit a 2007 expansion in eligibility among the SNAP recipient target group to older ages 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 of WOTC subsidies, comprising around two-thirds of WOTC certifications. 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 eligble for WOTC. In 2007, this target group was expanded to individuals between the ages of 25-39. Figure 2, which graphs total WOTC certifications by application date in our data, 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]

[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.

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, and thus are WOTC-eligible if also under age 40. We then compare individuals in the sample who are slightly younger than 40 (eligible for WOTC) before and after the policy change to individuals in our sample aged 40 and slightly over (ineligible for WOTC). This design works well because the age cutoff was not used as a cutoff for other programs experiencing reforms around this time, nor is the control group endogenous to employment, which would be the case if we used individuals who were no longer SNAP recipients as the control group.[20] We focus on the sample period between January 2005 through December 2008 and run event studies and difference-in-differences regressions.

The event study specification is:

$$Y_{i,t} = \sum_{s=-8, s\neq -1}^{7} \beta_s Treated_{a(i)} + \eta_t + \gamma_a + \varepsilon_{i,t} \tag{1}$$

where $Y_{i,t}$ is an outcome measured in quarter t, η_t are year-quarter fixed effects, and γ_a are age (in months) fixed effects. $Treated_{a(i)}$ is a binary indicator for whether individual i's age in quarter t, a_t, puts them in the treatment group (i.e., aged less than 40 in time t) or the control group (i.e., older ages). The treatment group consists of individuals of ages between 37 years and 9 months and 39 year and 9 months 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 8 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:

$$Y_{i,t} = \beta^{DD} \times Treated_{a(i)} \times 1\{t \geq 2007q1\} + \eta_t^{DD} + \gamma_a^{DD} + \epsilon_{i,t} \tag{2}$$

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

[20] One concern with this strategy is that WOTC could have spillovers across workers, whereby subsidized employment for workers in the treatment group may displace employment in the control group. Such spillovers would tend to *increase* any differences in employment outcomes that wage subsidies produce between treatment and control rather than bias estimates towards zero. Our precise null effects shown below, however, dispel this concern. Furthermore, substitution is unlikely to come purely from the control 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 control group (SNAP recipients aged 42-43) but SNAP recipients aged above age 43 or non-SNAP recipients in any age ranges.

We begin by examining three main labor market outcomes. Our first outcome is employment, defined as an indicator for whether individual i had positive earnings in quarter t. Our second 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. An advantages of this outcome over employment is that individuals may be persistently employed, but this focuses on flows into employment. Our third outcome is earnings in quarter t, which captures the combination of job tenure and wages, 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 t, and so for whom WOTC may be particularly relevant.

Panels (a)-(c) of Figure 3 reports event study coefficients from Equation (1) for these three labor market outcomes for the full sample. Columns (1)-(3) of Table 1 run analogous difference-in-differences specifications. For all three outcomes, there is no evidence of a pre-trend in outcomes prior to the policy change that expanded WOTC eligibility to SNAP recipients below age 40, and also no detectable effect of the expansion on the outcomes in the eight quarters after the expansion.[21] The confidence intervals on β_{DD} are tight: for example, in the full sample, the upper bound of the 95% confidence interval on being hired would be a 0.18 percentage point increase (or 1.8% off a base new hiring rate of 10% for this population) and a $38 increase in quarterly earnings (or 2.4% off of $1,595 in average quarterly earnings for this population).

These results suggest that WOTC eligibility does not meaningfully improve labor market outcomes among the SNAP target group. This is not driven, however, from a lack of use of WOTC, as Figure 2 suggests. To get a sense of how the labor market estimates compare to WOTC take-up, Panel (d) of Figure 3 and Column (4) of Table 1 show event study coefficients and difference-in-differences estimates for the outcome of being in a WOTC-certified job. The results show a sharp 1.6 percentage point increase in WOTC-certified jobs for the newly eligible (treated) group relative to the never eligible (control) group. Combining this estimate with the confidence interval for effects on employment indicates that between 0% and 12% (0.0018/0.016) of new hires are caused by WOTC at a 95% confidence level, i.e., that at least 88% of spending is windfall wastage.

Our results are robust to alternative specifications. First, Appendix Figure A5 and Appendix Table A1 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. Second, Appendix Figure A6

[21]The estimated coefficients for employment for the periods 6 to 8 quarters prior to expansion are somewhat negative, with a modest trend upwards over that period, but we do not see this over the five periods immediately prior to policy implement. This is likely due to chance fluctuations that may occur when running many regressions; when instead using 40-41 year olds as the control group in Appendix Figure A6, the event study results are robust, with no evidence of pre-trends. Furthermore, even if there were a positive pre-trend, this would bias our estimates upwards, which there is little evidence of.

shows robustness to alternative age windows for the treatment and control groups, such as defining the control group as 40-41 year olds. Finally, given that we find precise null effects on labor market outcomes, we would expect to also find null effects on outcomes that could have been affected if there had been a labor market effect, such as usage of social assistance and criminal activity. 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 at time t. Panels (e) and (f) of Figure 3 show similar null effects for these two outcomes.

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. In contrast to our other two empirical strategies, this method allows us to estimate the consequences of WOTC eligibility throughout the sample period rather than at just a point in time (SNAP expansion in 2007; introduction of electronic filing in 2017). It also generates a very large sample, which we use to explore potential heterogeneity in treatment effects.

We combine two sharp regression discontinuity designs: around age 25 for the period 1997 to 2006 and around age 40 for the period 2007 to 2019. Our estimates are based on the following specification:

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

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 $\geq$ 2007. The coefficient γ_1 captures the 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. 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 heterogeneity-robust standard errors clustered at individual level.[22]

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, as those are difficult

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

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 A7. The p-values are 0.25 and 0.27, indicating a lack of manipulation in both cases. 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.[23]

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.[24] 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 also 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 A2 and appendix figure A8 find no evidence of any of these variables varying discontinuously across the age threshold.

We first examine how WOTC eligibility affects labor market outcomes in Table 2 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 A4 and A5 report the results separately for the pre- and post-2007 periods. Column (1) of panel A of table 2 find that employment does not respond to WOTC eligibility, while column (3) finds no effect on earnings. These null estimates are even more precise than the estimates based on SNAP expansion – with standard errors that are roughly three times smaller – reflecting the significantly greater sample size in the RD analysis.

Column (2) focuses on new hires. We prefer this outcome because it isolates flows into jobs, removing relatively persistent employment that we would not expect to respond to WOTC. The estimate is close to zero (-0.03 percentage points) and non-statistically signif-

[23]We also use the full WADC data on Wisconsin residents to test this directly, finding that likelihood of receiving SNAP benefits does not vary around the age threshold.

[24]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.

icant ($p = 0.7389$), with the upper bound of the 95% confidence interval equal to a 0.22 percentage point increase in employment in response to WOTC.

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 construct a "first-stage" estimate of the extent to which individuals above and below the threshold differ in their likelihood of being in a WOTC subsidized job. Column (4) of 2 and panel (d) of figure 4 show that individuals below the discontinuity are 0.99 percentage points more likely to be in a WOTC subsidized job.[25] Comparing this to the 95% confidence interval for effects on hiring, it appears that the vast majority of WOTC subsidized jobs are infra-marginal, where between 78 to 100% of WOTC subsidized jobs are windfall wastage.

One concern with this analysis is that individuals may remain in a job for multiple quarters. An individual who receives 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 2 and Appendix Figure A9, 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-subisized jobs are very short-term, as we will show in Section 6, reducing the extent of holdover.

Even though our estimates suggest that most firms do not respond to WOTC eligibility in their hiring decisions, it could be that there is a sub-set that does. We check for differential responses among three types of firms that may be most likely to respond to WOTC. First, we focus on employment in the 50 firms with the largest number of WOTC certifications over the sample period; these presumably may have the best WOTC screening procedures. Second, we refine the measure of attentiveness to WOTC by calculating the fraction of WOTC eligible employees for which each firm actually applies for WOTC. We then focus on employment in firms whose application rate is in the top 25% of WOTC-using firms. Finally, 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. In columns (1) to (3) of appendix table A3, we re-estimate the main RD specification, but redefine the outcome variable as whether the individual is hired in each of these three categories of firms. Even among these active users of WOTC, we still see no response in employment (panel A) or new hiring (panel B).

One concern with estimates based on WOTC expansion to older SNAP recipients in 2007 is that the WOTC program has grown significantly over time. It may be that the program became more effective at encouraging employment after its major expansion, which may

[25] 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.

have induced HR departments to implement screening for WOTC-eligible job applicants. An advantage of the RD approach is that we can re-estimate the discontinuity at different points in time. The remaining columns of appendix table A3 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 roughly the contemporary period (2014-2019), in which number of WOTC certifications stabilized. However, we find no evidence of differences over time for either labor market outcome.

Another concern is that other policies may use the same age thresholds; for example, if there were a policy that improves labor market outcomes for those above age 40, that would bias our estimates downwards, and could explain the null effect. As a final robustness check, we examine 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 affect labor market outcomes, we should observe that in this data. Appendix Table A6 finds no differences over these placebo age thresholds[26], consistent with the RDD approach cleanly identifying the effect of WOTC.

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. To check that this increase is not driven by aggregate changes to labor markets, panel (b) uses quarterly state-level Department of Labor data on WOTC applications to compare WOTC uptake in Wisconsin to the neighboring state of Minnesota.[27] Although the two are similar prior to June 2017 in both levels and trends, certifications increased markedly and persistently in Wisconsin following its adoption of eWOTC. The blue line in panel (a) shows that this sharp increase in Wisconsin also appears among SNAP recipients, with a 26% increase in certifications for the SNAP target group. We examine whether this increase in certifications also caused increases in employment and earnings of eligible SNAP recipients.

[26]The coefficient on WOTC is just statistically significant at the 5% level for the post-2007 period. This is entirely due to the year 2007 – i.e., the year that the new age threshold was put into place – where the relationship is no longer statistically significant when this year is removed. That is likely because it takes time to learn about the new age eligibility cutoff, and so some firms may have initially continued to operate under the age 25 cut-off in 2007.

[27]This comes from state-level quarterly data from the US Department of Labor rather than WOTC micro-data as in panel (a). Within this aggregated data, we are only able to look at applications rather than certifications.

This specification estimates a fundamentally different treatment effect in that it picks up how lower participation costs affects the consequences of the program (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 – lowering those costs – has desirable effects for employment. Our results also serve as a policy evaluation of the consequences of switching to electronic filing, which is relevant to other states considering adoption.

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 SNAP in three of the past five months who were slightly younger and slightly older than 40 (i.e., aged 38-39 and 42-23, respectively). Figure 6 and table 3 analyzes the effect of electronic filing on our three main labor market outcomes, WOTC certifications, public benefit usage, and criminal convictions. As in the other two analyses, we find no evidence that WOTC eligibility affects labor market outcomes or spillover outcomes, despite an effect on WOTC certifications.[28] This provides further evidence against the efficacy of wage subsides for promoting employment among this population, as well as suggesting that one obvious step for program improvement – lowering access costs – is unlikely to achieve desired outcomes.

5 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 discontinuities built into the program. The subsidy is exhausted at a subsidy of $2400 per worker, which typically corresponds to $6000 in worker earnings.[29] Churning firms would be expected to terminate workers after reaching

[28]The coefficient on earnings is negative and statistically significant at the 5% 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 may result when running a large number of regressions.

[29]At the 40% subsidy rate, $6000 in earnings is binding for subsidy exhaustion. 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.

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 (kink): 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 combine the WOTC certifications data with the UI wage records to measure earnings and hours worked in WOTC subsidized job stints. Panel (a) of Figure 7 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 $6000. However, it could be that churning behavior is concentrated among certain types of firms that are most attentive to WOTC. Appendix Figure A10 examine the distribution of worker earnings prior to separation for WOTC subsidized workers who were employed at the top 50 WOTC-using firms (panel a), firms with high success rates in applying for WOTC (panel b), and employment services firms (panel c), but again finds no evidence of firms responding to subsidy exhaustion. The (lack of) relationship is also present when we split the sample by year of employment (panels d and e), where there is no evidence of churning within more recent years when firms may be more attentive to WOTC or have better payroll processing technology that makes churning easier. While there is no obvious bunching or change in slope visually, we test for this formally. Using a simple local polynomial density estimator from (Cattaneo et al., 2020), we do not find evidence of bunching above the threshold in full sample ($p = 0.86$) or any of the subsamples.

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 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 bunch around those thresholds. Panel (b) of Figure 7 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.[30] Appendix Figure A11 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 may be that managers are not aware of the discontinuous benefit

[30]This second analysis is similar to a figure 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 2,622), and examining particular types of firms.

schedule for the firm or that training costs are sufficiently high that firms prefer to keep trained workers rather than churn through them in order to get WOTC wage subsidies.

6 Discussion: firm characteristics and mechanisms

The results of the previous section raise a number of interesting questions and puzzles. First, given that the benefits of WOTC appear to accrue to employers rather than workers, what types of firms are these, and is it reasonable for policymakers to subsidize their operations?[31] Second, why are firm hiring and employment practices not responding to these sizable subsidies?

6.1 Firm characteristics

Figure 8 provides a measure of the concentration of WOTC benefits among the universe of firms in our linked data. 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. 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 uses the same ranks, but instead plots the cumulative fraction of hires. These firms receive around 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.[32]

For more details on the firms that use WOTC, we use data from FOIA requests made to the Wisconsin Department of Workforce Development, which provide the total number of WOTC applications and certifications by firm between 2018 and 2020 (Corwin, 2022).[33] We focus on the fifty firms with the most WOTC certifications over this period, who account for over half of all certifications. Just over half (52%) are temporary staffing services agencies,[34] which is notable given experimental work showing that employment in temporary-help positions may actually decrease future employment and earnings (Autor and Houseman, 2010).

[31] Benefits could also accrue to consumers if the tax credit is passed through onto consumer 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.

[32] Appendix Figure A4 calculates a Herfindahl index of the concentration of WOTC applications by firms. Concentration in WOTC benefits has declined over time and now stands at around half of where it was in 2010. Nonetheless, a large majority of the benefits continue to accrue to a relatively small fraction of firms.

[33] 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).

[34] Because workers at temporary staffing agencies are directly employed by the staffing agency (and not the other firm), it is the staffing agency that receives WOTC subsidies, although there could be pass-through.

It is thus unclear whether subsidizing these type of firms is desirable policy. Most of the rest are very large firms: among those that are publicly listed (24%), the median market capitalization is 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 a large private companies with annual revenues in excess of $5 billion annually (4%).

6.2 Mechanisms

These findings present a puzzle: why might profit maximizing firms fail to respond to subsidies like WOTC in their hiring practices? This is particularly puzzling given that we see these firms do apply to receive the wage subsidies after hiring eligible workers, so lack of knowledge about the program cannot explain their lack of response. Understanding the mechanism underlying these results is essential in considering the extent to which wage subsidies are likely to benefit targeted workers across a broader range of contexts.

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, a wage subsidy provided to firms would shift up firm labor demand for subsidized workers by the amount of the wage subsidy, as firms now face a lower effective cost for their services. The lack of change in both employment and wages could only be explained by a model in which labor demand is perfectly inelastic: firm labor demand is fixed, and the full value of the subsidy accrues to them as the more inelastic side of the market.[35] However, this would imply an extreme lack of substitutability between quite similar eligible and ineligible workers. For example, our empirical approaches typically compare labor outcomes of SNAP recipients who are just above and below the age of 40. For this model to hold, it would be need to be the case that firms cannot substitute workers just above age 40 with those just below (who are eligible for the subsidy), which seems unlikely.

To empirically examine the substitutability of workers who are just-eligible and just-ineligible for WOTC, we examine replacement hiring practices after exits of WOTC-eligible and WOTC-ineligible workers. If production processes are such that WOTC-eligible workers are not substitutable with other types of workers (producing perfect inelasticity in demand for their services), the exit of this type of worker from a firm would necessitate the hiring of another of this type of worker as a replacement, 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),

[35] If, instead, labor supply were perfectly inelastic, then the subsidy would fully pass through to the worker as an increase in wages. If labor supply were perfectly elastic, 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.

as well as those who received SNAP and were between the ages of 42-44 (ineligible exits). Column (1) of Appendix Table A7 looks at how the number of new hires of eligible workers (SNAP recipients aged 37-39) in quarter t responds to these exit variables, while column (2) 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). Indeed, the coefficients on "Eligible Exits" are quite similar across specifications, suggesting a high degree of substituability between these types of workers and so that perfectly inelastic demand does not explain our results.

Negative signal value of subsidies. The previous model assumed that subsidy eligibility is independent of firm labor demand, i.e., firms do not infer anything about worker productivity from their eligibility for the subsidy. However, it could be the case that eligibility for wage subsidies conveys a negative signal to firms, 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 explain a lack of firm response to WOTC eligibility in their hiring practices.

Our results point against this hypothesis. In particular, even if 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 whom expected benefit of the subsidy and negative signal value of WOTC eligibility were previously equal. However, our analysis in Section 4.3 does not find any employment response, which is inconsistent with the negative signaling mechanism.

Information about eligibility. Another potential reason why firms may not respond to WOTC would be if they lack the appropriate information on WOTC eligibility at the time of hiring decisions. To investigate this explanation and to better understand how WOTC integrates into hiring processes more generally, we collected two types of original data: (1) information from job applications for openings at a sample of WOTC-using firms, and (2) an online survey of individuals conducting hiring at WOTC-using firms.

For our job applications data, we constructed a sample of WOTC-using firms using data from FOIA requests to the Wisconsin Department of Workforce Development. This data provides us with each WOTC application/certification between 2018 and 2020, including the name of the associated firm. We drew a random sample of these firms using probability proportionate to size sampling, searched for current job postings by the firm (available for

83% of firms), and completed initial applications for a position in the firm.[36] We recorded data on characteristics of the job application process, including whether the application asked WOTC-related eligibility questions (and, if so, the specificity of the questions).

Table 4 reports summary statistics from these applications. One striking fact from this table is the relatively small number of job applications that ask questions about WOTC eligibility at this stage. Firms do not typically have access to government data that could indicate whether a potential hire is eligible for WOTC. As a result, they must ask applicants about criteria related to eligibility (e.g., receipt of SNAP benefits) in order to identify WOTC-eligible hires.[37,38] However, even among this set of firms, which do eventually file for WOTC for many of their hires, only 13% of their initial job applications collect information that would allow firms to determine WOTC eligibility. Furthermore, in 44% of these cases, the firm itself does not collect the information; instead, the applicant clicks on a link and is taken to a separate website of a hired consultant or the firm's payroll processor that collects this information. Our discussions with firms indicate that this information is not typically shared with the manager making hiring decisions, and as seen in the job application form in panel (a) of Appendix Figure A13, some application forms explicitly note this. Instead, if the worker is hired, the outside party uses this information to file for WOTC tax credits on behalf of the firm. In other cases, firms that file for WOTC collect information on eligibility after the hiring decision is made, such as during onboarding, and then use the information to file for the wage subsidy. Overall, our job application data suggests that the person making hiring decisions for WOTC eligible workers is aware of their eligibility in less than a tenth of cases.[39]

This exercise uncovered a plausible mechanism: firm personnel decisions are not responsive to WOTC eligibility because the person making hiring decisions lacks information to do so. However, it is still a puzzle as to why firms elect not to collect this information and provide it to hiring decision makers. To address this second puzzle, we conducted surveys with individuals involved in making hiring decisions at firms employing low-wage workers. Respondents were sampled and screened through the Prolific platform and compensated at a rate of $30 per hour for taking our survey. Our survey asked questions about hiring practices at their firm, and, if relevant, questions about practices around WOTC such as their screening and application procedure as well as how WOTC eligibility affects their decisionmaking.

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

[37] 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.

[38] Two examples of how firms collect this information can be found in Appendix Figure A13.

[39] Note that this lack of screening on WOTC eligibility does not necessarily imply WOTC will have no effect on employment of eligible workers. For example, if firms advertised more heavily to pools of potential job applicants that are WOTC-eligible, this could still increase employment of WOTC-eligible workers even if the firm does not explicitly incorporate WOTC eligibility into eventual hiring decisions.

One of the most common reasons listed for why firms do not screen for WOTC was concerns related to legal liability. The survey asked respondents who were familiar with WOTC (29%) if knowledge of a job applicant's WOTC eligibility would affect their likelihood of hiring. 60% say that it has no effect, and of those, 47.8% say this is because of concerns that preferring a WOTC-eligible individual could risk lawsuits for hiring discrimination. Furthermore, among the individuals who state that their firm does not collect information on WOTC eligibility, 57% say this is due to concerns about discrimination lawsuits, making this the most common stated reason for lack of screening. While discrimination-related lawsuits are a potential risk for any type of targeted subsidy, this issue is not prominent in the academic literature on wage subsidies. In countries with active discrimination protections, this will generally present a problem for the efficacy of wage subsidies; even if cases are very rare, the high cost of legal proceedings can outweigh the benefits of subsidies.[40]

A second issue is related to agency issues within the firm. Among those who say that WOTC eligibility doesn't affect their hiring decisions, 59% say that that is because only the company benefits from the subsidies rather than the individual making the hiring decisions. Especially given that individual making hiring decisions may be responsible for managing the hire or face potential sanctions for making poor quality hires, hiring managers do not have strong incentives to respond to the subsidy as compared to hiring the individual who will perform best in the job. While firms could try to design incentives to align firm and hiring agent decisions, this runs the risk of overindexing hiring decisions on the incentive relative to hire productivity, which firms may prefer not to do.

Finally, a number of respondents mentioned that explicit screening for WOTC can make it more difficult to attract applicants. Among firms that do not have WOTC screening on their job applications, 42.9% note that it is hard to explain why they are collecting this information to applicants. In follow-up phone interviews with hiring managers conducted by the authors, multiple managers noted that WOTC eligible workers often fear replying in the affirmative to questions about their eligibility as they perceive it could lead to their being screened out. Particularly in high turnover jobs like many of those in which WOTC certifications are common, firms need to continue to attract applicants. It may be that explicit pre-screening on WOTC deters applications to such an extent that it is preferable to wait until after hiring decisions are made, at which point hires will have less of an incentive to lie about their WOTC eligibility.

[40]Individuals making hiring decisions will also have incentives to avoid costly litigation, which could result in their termination from the firm, especially given that they are not direct claimants on the subsidy.

7 Conclusion

Hiring subsidies are a potentially important tool to promote economic mobility for disadvantaged workers, but there is a lack of evidence on their efficacy in the US context. Using data from the Work Opportunity Tax Credit and multiple complementary empirical approaches, we find no evidence that these wage subsidies promote hiring of target groups. We further find that they are not passed through to worker earnings in any meaningful way, but instead primarily accrue to a small set of large firms.

These findings suggest a need to rethink when and where subsidies can be effective in boosting employment, and in particular, how features of low-wage labor markets affects the efficacy of subsidies. In the specific case of the Work Opportunity Tax Credit, it appears that the billions of dollars spent on it annually could be better allocated to other forms of support for disadvantaged workers. Future work should investigate other means of encouraging employment among these groups, as well as whether hiring subsidy programs like WOTC can be redesigned to achieve this purpose.

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Tables

Table 1: Effect of WOTC on individual outcomes, SNAP expansion

	(1) Employed	(2) New hire	(3) Earnings	(4) WOTC certified	(5) Public benefit ($)	(6) Criminal conviction
Treat x post	0.00647	-0.00405	-41.60	0.0155***	17.15	0.000341
	(0.00692)	(0.00301)	(40.84)	(0.00115)	(13.21)	(0.00110)
Dep var mean	0.387	0.101	1595.3	0.00383	763.1	0.0144
Observations	228873	228873	228873	228873	228873	228873

Note: Table reports difference-in-difference estimates from the 2007 expansion to SNAP recipients aged 25-39 in Equation (2) for 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 2: Effect of WOTC on employment, earnings, and program utilization (RDD)

Panel A: Full sample						
	(1) Employed	(2) New Hire	(3) Earnings	(4) Certified	(5) Public benefit	(6) Criminal conviction
RD_Estimate	-0.0012	-0.0003	-9.8844	-0.0099***	1.4172	0.0000
	(0.0021)	(0.0010)	(12.9896)	(0.0008)	(4.3813)	(0.0002)
	[0.5731]	[0.7389]	[0.4467]	[0.0000]	[0.7463]	[0.9258]
Dep var mean	0.4479	0.1088	2063.8099	0.0145	1029.5041	0.0102
Bandwidth	3.0860	2.8546	4.1217	1.5234	3.6525	5.3727
Effective Obs	2918661	2639630	3824755	1380852	3399547	5081469
Panel B: Unemployed Sample						
	(1) Employed	(2) New Hire	(3) Earnings	(4) Certified	(5) Public benefit	(6) Criminal conviction
RD_Estimate	-0.0007	-0.0006	-2.5439	-0.0084***	-1.5944	-0.0000
	(0.0014)	(0.0012)	(7.4932)	(0.0004)	(6.0044)	(0.0003)
	[0.6059]	[0.6009]	[0.7342]	[0.0000]	[0.7906]	[0.9252]
Dep var mean	0.1351	0.0961	582.2024	0.0023	1134.3555	0.0124
Bandwidth	2.8950	2.8303	3.1969	2.4575	3.5409	5.1449
Effective Obs	1668471	1595372	1842776	1416137	2070615	3029621

Note: Table reports regression discontinuity estimates for employment, earnings, program utilization and criminal activity in 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 are clustered at the individual level.

Table 3: Effect of eWOTC on individual outcomes

	(1) Employed	(2) New hire	(3) Earnings	(4) Certified	(5) Public benefit	(6) Criminal conviction
Treat x post	-0.002	0.002	-61.946**	0.004**	1.936	0.000
	(0.004)	(0.002)	(30.783)	(0.002)	(7.220)	(0.001)
Dep var mean	0.4578	0.1125	2226.4808	0.0299	807.7597	0.0102
Observations	458986	458986	458986	458986	458986	458986

Note: Table reports difference-in-difference estimates from the 2017 shift to electronic filing of WOTC applications among our SNAP sample for 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 4: Initial Job Applications for a Sample of WOTC-using Firms

Panel A: All Applications (N=69)	
Characteristic	(% of applications)
WOTC Screening Questions	13.04
EEOC Questions	42.03
SSN Required	18.84
Consent to Background/Drug Test	23.19
Submit Resume	44.93
Education History	53.62
Employment History	66.67
References	8.70
Referral	33.33
Personality Test	2.90
Panel B: Applications with WOTC Screening Questions (N=9)	
Characteristic	(% of applications)
WOTC questions direct to third-party site	44.44
WOTC questions stated as voluntary	88.89
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

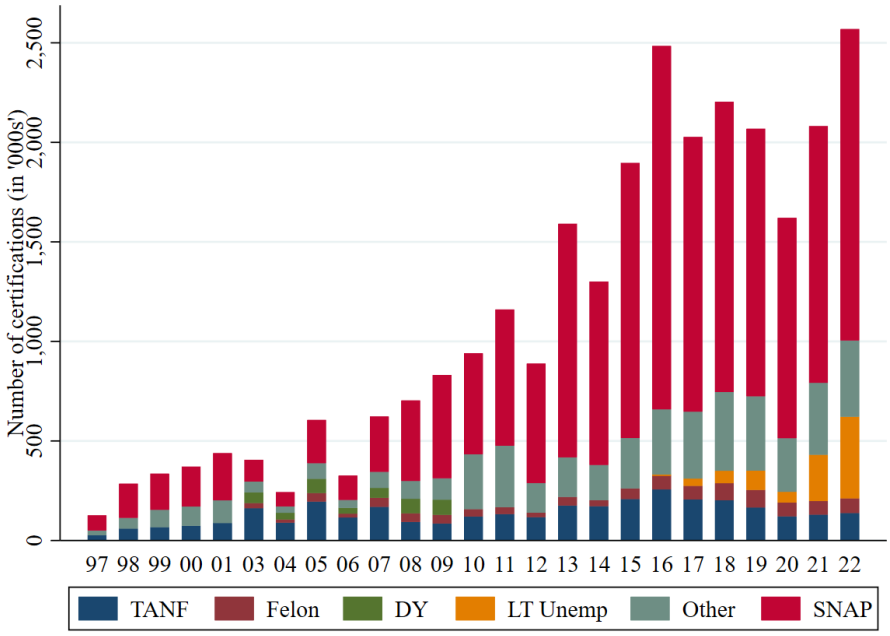
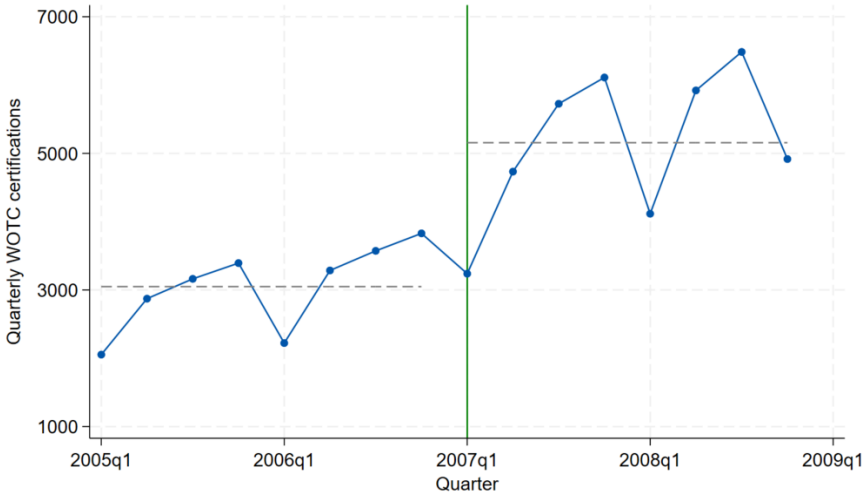


Figure 1: Number of WOTC certifications nationally (1997-2022)

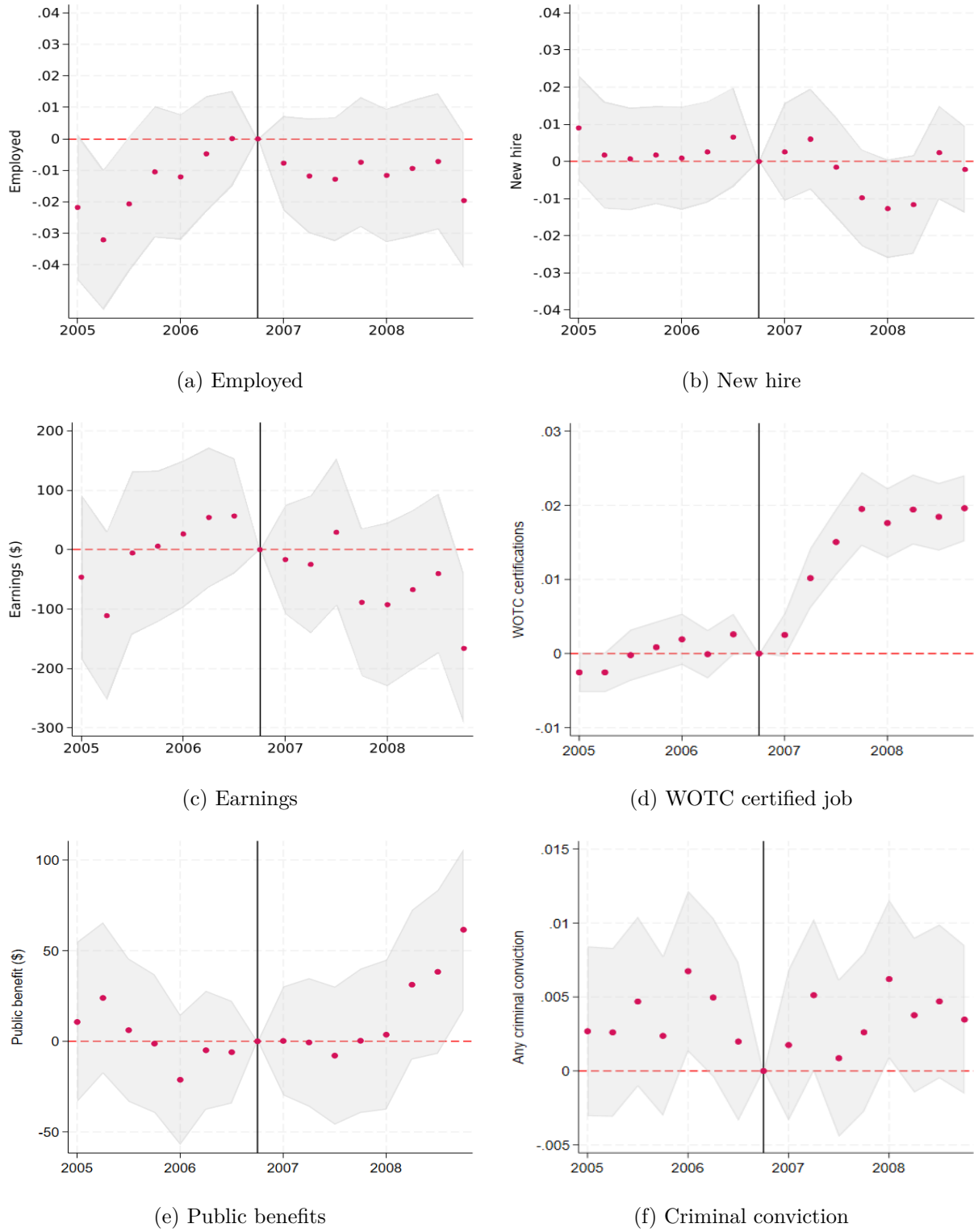
Note: This figure reports total national WOTC certifications in each year from 1997-2022. The data is from Department of Labor annual reports on WOTC certifications. It splits the certifications by the reason for eligibility, where the Other category includes smaller categories such as due to veteran status, summer jobs for youth, and long-term TANF, among other reasons. For 1997 to 2002, we do not observe the felon or disconnected youth categories separately, so this is included among "Other". For the years 1998, 2000, and 2001, we only observe the total national numbers, so we use the category percentages from the most recent preceding year with data to estimate the breakdowns.

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 SNAP expansion on individual outcomes



(a) Employed

(b) New hire

(c) Earnings

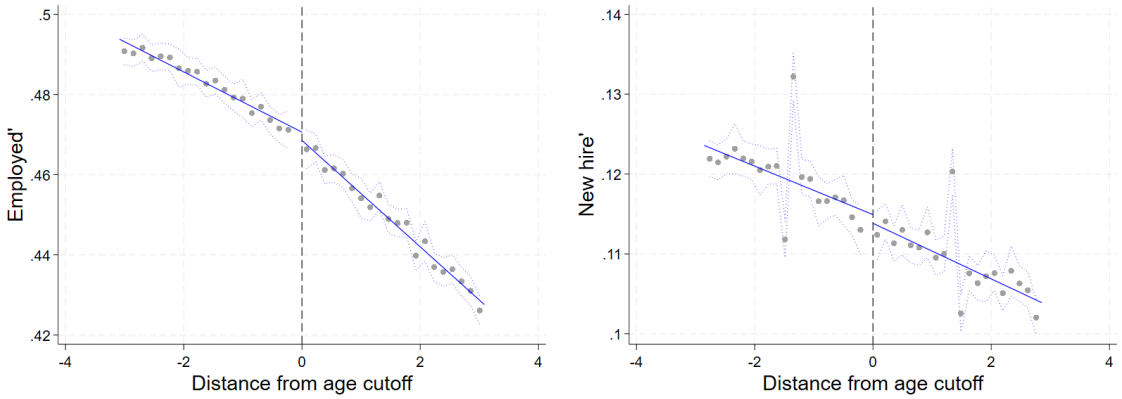
(d) WOTC certified job

(e) Public benefits

(f) Criminal conviction

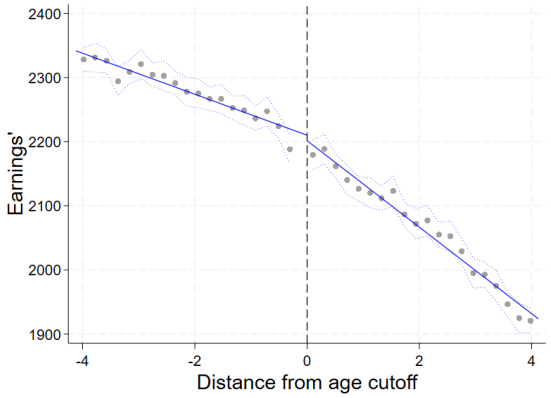
Note: Figure reports event study estimates from the 2007 expansion to SNAP recipients aged 25-39 in Equation (1) for employment, new hires, earnings, employment in a WOTC-certified job, social assistance utilization, and criminal activity. Controls include monthly age fixed effects and quarter-year fixed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

Figure 4: Effect of WOTC on employment, earnings, and program utilization (RDD)

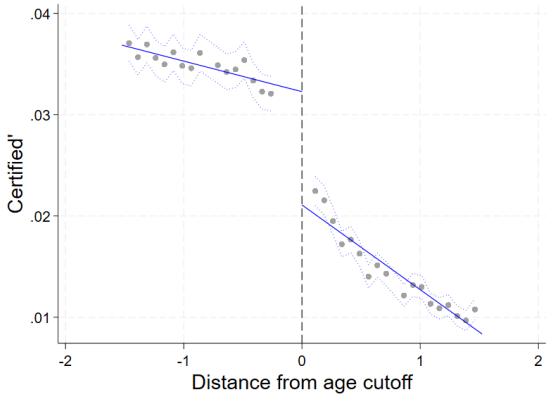


(a) Employed

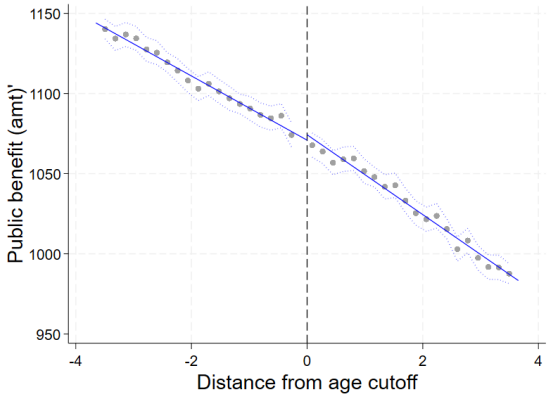
(b) New hire



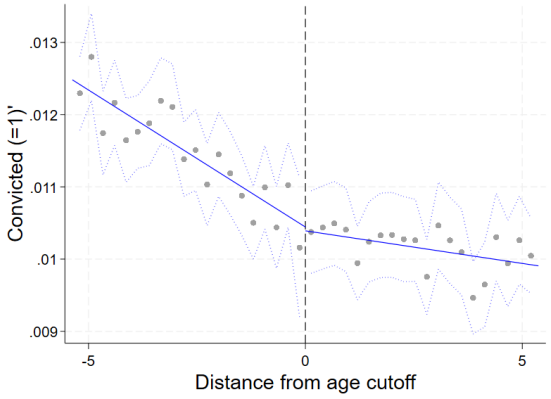
(c) Earnings



(d) WOTC certified job



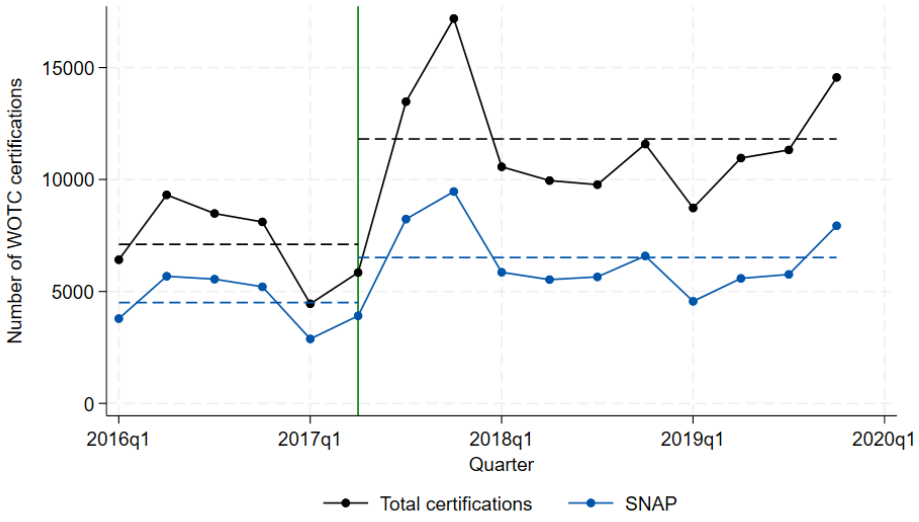
(e) Public benefits



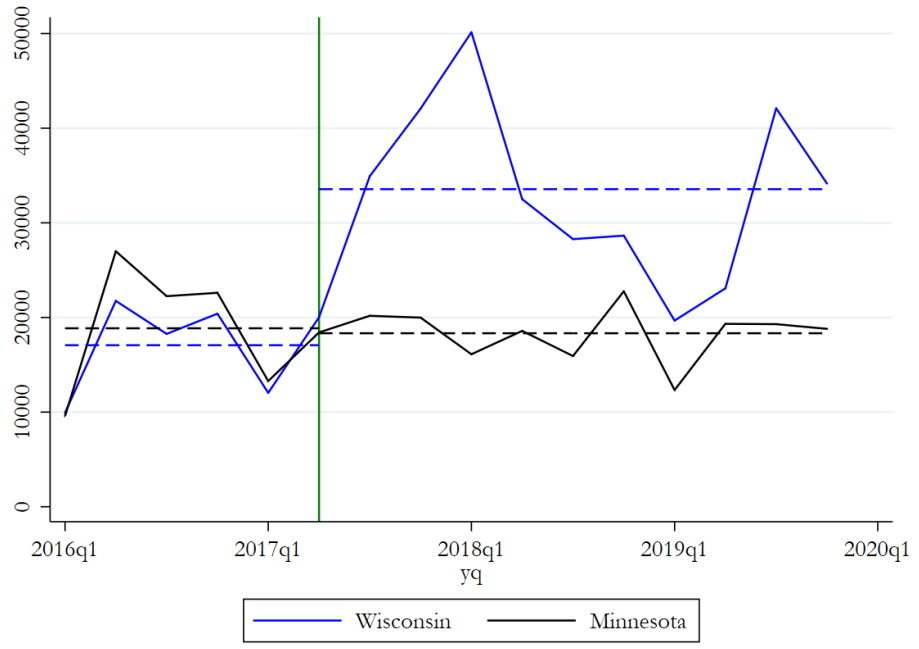
(f) Criminal conviction

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 employed, panel (b) focuses on whether the individual is hired into a new job in that quarter, 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 working in a job with an associated WOTC certification. Panel (e) measures the relationship with the dollar value of three forms of public benefits in a quarter (TANF, Unemployment Insurance, and SNAP), while panel (f) measures if the individual is convicted of a criminal offense in the relevant quarter.

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



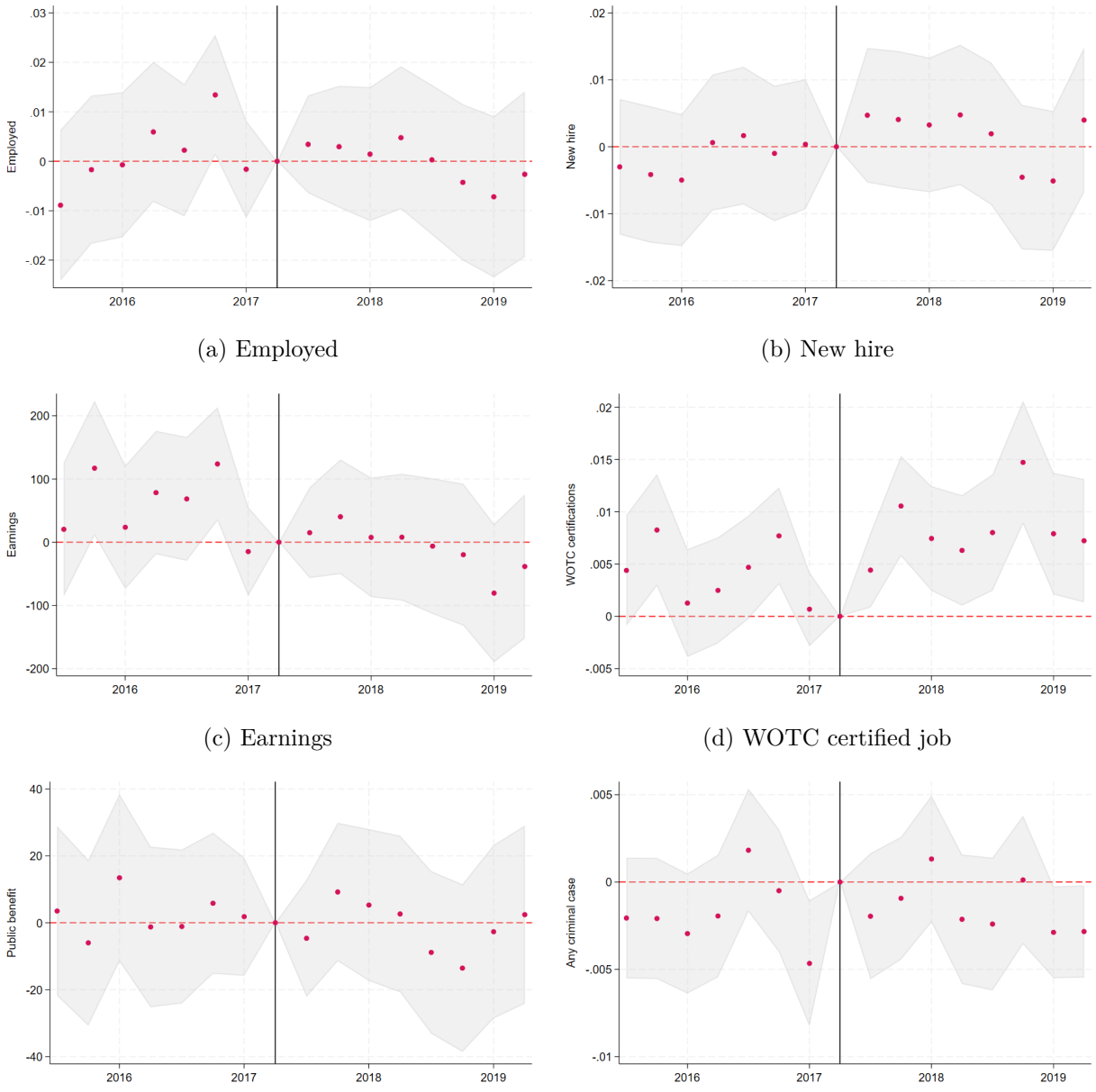
(a) Quarterly WOTC certifications in Wisconsin, 2016-2019



(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, SNAP sample



(a) Employed

(b) New hire

(c) Earnings

(d) WOTC certified job

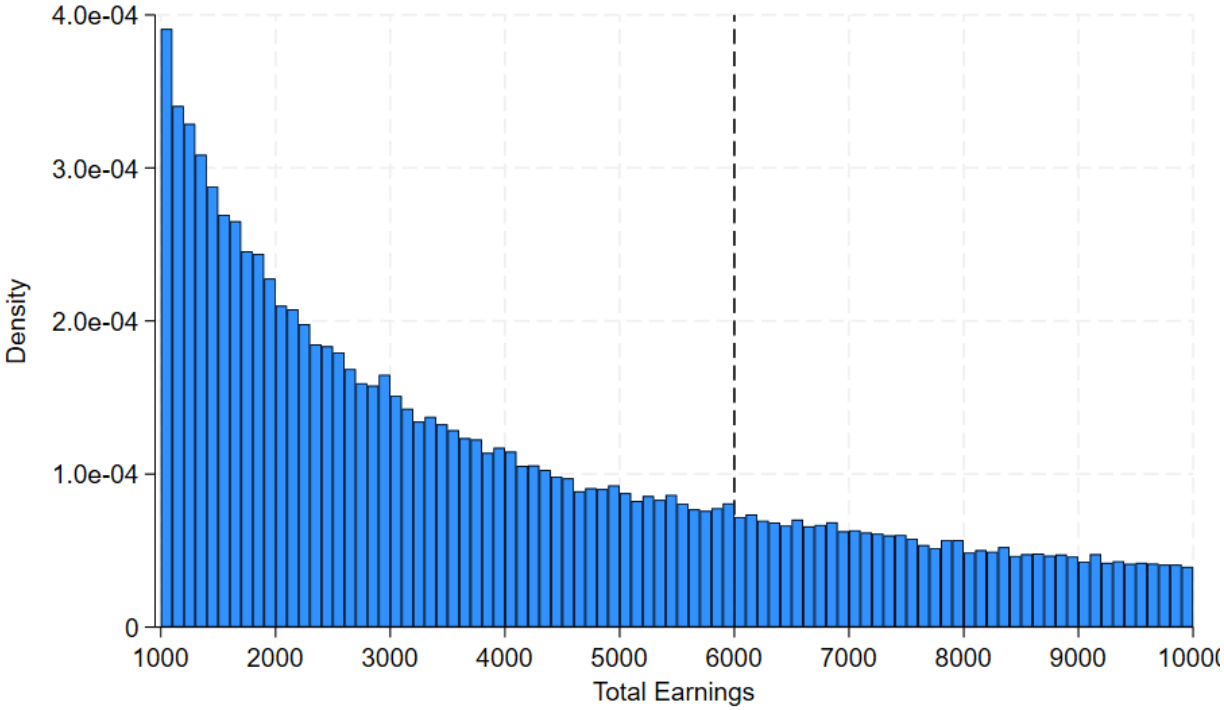
(e) Public benefits

(f) Criminal conviction

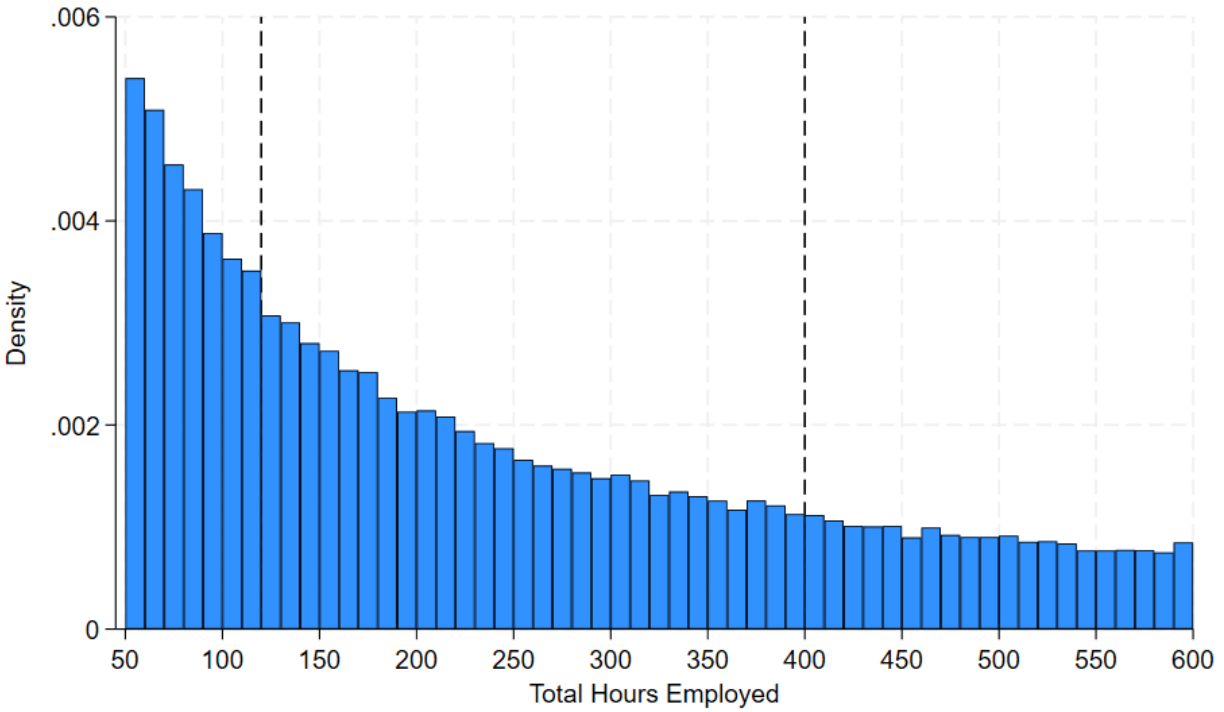
Note: Figure reports event study estimates from the 2017 shift to electronic filing of WOTC applications among our SNAP sample for employment, new hires, earnings, employment in a WOTC-certified job, social assistance utilization, and criminal activity. Controls include monthly age fixed effects and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

Figure 7: Histograms of total earnings and hours worked for WOTC workers

(a) Earnings threshold



(b) Hours thresholds



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

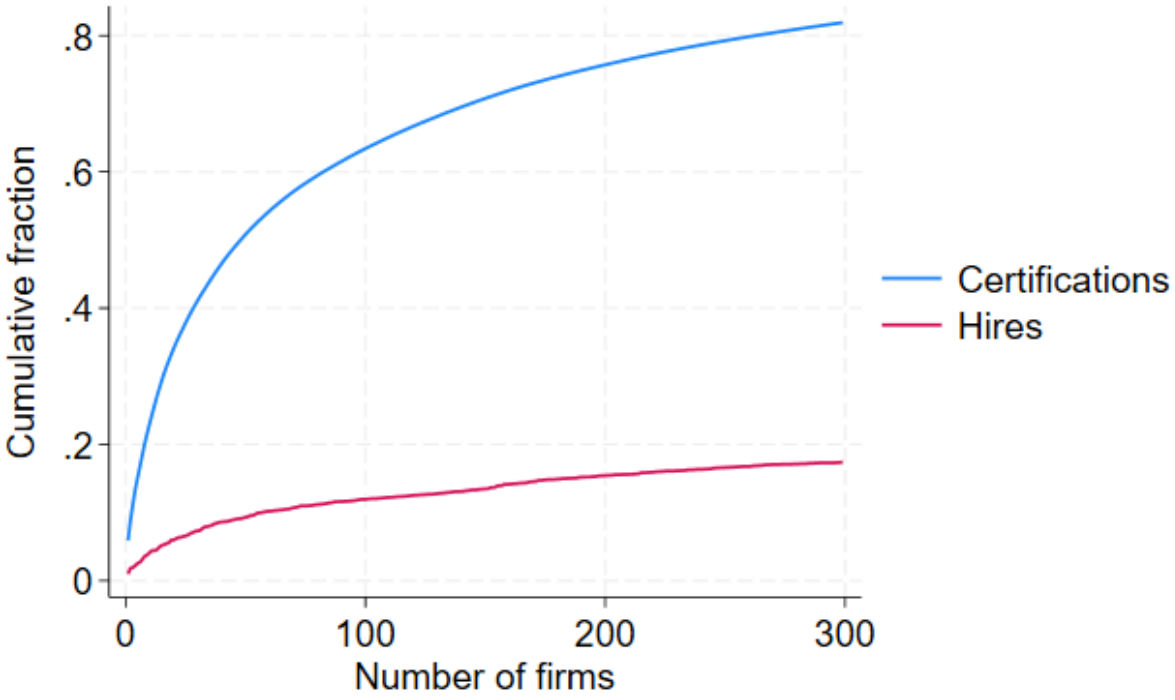


Figure 8: Cumulative density function of WOTC certifications by firm

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 individual outcomes among unemployed sample, SNAP expansion

	(1) Employed	(2) New hire	(3) Earnings	(4) WOTC certified	(5) Public benefit ($)	(6) Criminal conviction
Treat x post	0.000318	-0.00505	-16.18	0.00699***	26.63	0.000674
	(0.00398)	(0.00359)	(12.77)	(0.000652)	(17.28)	(0.00149)
Dep var mean	0.116	0.0945	247.0	0.00148	793.1	0.0169
Observations	150856	150856	150856	150856	150856	150856

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

Table A2: Balance on pre-determined characteristics for the regression discontinuity

	Demographics		Employed		Earnings	
	Female (=1)	Black (=1)	t-1	t-2	t-1	t-2
RD Estimate	0.0012	-0.0011	-0.0010	-0.0001	4.0375	8.9505
	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(12.4085)	(12.1032)
	[0.5844]	[0.6031]	[0.6268]	[0.9796]	[0.7449]	[0.4596]
Dep var mean	0.6492	0.3022	0.4791	0.4740	1991.2107	1878.0033
Bandwidth	2.5334	3.7409	3.2272	3.0156	4.1539	3.8703
Effective Obs	2355793	3470270	2850640	2617346	3592121	3356268

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 are clustered at the individual level.

Table A3: Effect of WOTC on employment and hiring by firm type and year (RDD)

Panel A: Employed						
	Top 50 firm	High succ firm	Staffing firm	1998-2006	2007-2013	2014-2019
RD_Estimate	-0.0004	-0.0004	-0.0001	-0.0039	0.0017	-0.0021
	(0.0009)	(0.0003)	(0.0009)	(0.0040)	(0.0031)	(0.0032)
	[0.6413]	[0.2797]	[0.9528]	[0.3362]	[0.5749]	[0.5192]
Dep var mean	0.0602	0.0085	0.0654	0.4995	0.3990	0.4403
Bandwidth	4.2116	4.7998	3.5746	2.9893	4.6504	4.6895
Effective Obs	3959626	4520407	3319703	675537	1693280	1676555
Panel B: New hire						
	Top 50 firm	High succ firm	Staffing firm	1998-2006	2007-2013	2014-2019
RD_Estimate	-0.0001	-0.0002	-0.0003	-0.0021	0.0010	-0.0011
	(0.0004)	(0.0001)	(0.0004)	(0.0020)	(0.0012)	(0.0016)
	[0.7526]	[0.1440]	[0.4937]	[0.3113]	[0.3956]	[0.4602]
Dep var mean	0.0168	0.0026	0.0259	0.1532	0.0811	0.1034
Bandwidth	2.6510	3.5037	3.9370	3.7194	4.3604	3.4402
Effective Obs	2436080	3319703	3719518	835786	1596542	1159243

Note: Table reports regression discontinuity estimates testing how labor market outcomes are related to WOTC eligibility. Panel A examines whether the individual is employed at one of the 50 firms that are heaviest users of WOTC (column 1), have a WOTC application success rate above the 75th percentile (column 2), or are an employment services firm, i.e. NAICS 5613 (column 3). The remaining columns examine effects on employment by year, were column (4) restricts to the period when age 25 was the cut-off, column (5) focuses on the period during which there was significant growth in WOTC, and column (6) examines the current period, in which number of WOTC certifications has roughly stabilized. Panel B focuses on the same set of outcomes, but examines whether the individual is newly hired rather than employed. 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 are clustered at the individual level.

Table A4: Effect of WOTC on employment, earnings, and program utilization for the age 25 discontinuity (pre-2007)

Panel A: Full sample						
	Employed	New hire	Earnings	Certified	Public benefit (amt)	Convicted (=1)
RD_Estimate	-0.0039	-0.0021	-42.0503*	-0.0063***	4.5988	0.0000
	(0.0040)	(0.0020)	(21.7102)	(0.0009)	(8.2018)	(0.0005)
	[0.3362]	[0.3113]	[0.0528]	[0.0000]	[0.5750]	[0.9377]
Dep var mean	0.4995	0.1532	2060.3934	0.0045	1023.1455	0.0093
Bandwidth	2.9893	3.7194	3.6274	2.4318	3.0028	3.8546
Effective Obs	675537	835786	818259	563541	693719	870689
Panel B: Unemployed sample						
	Employed	New hire	Earnings	Certified	Public benefit (amt)	Convicted (=1)
RD_Estimate	-0.0031	-0.0030	-25.7435**	-0.0041***	4.1445	0.0004
	(0.0029)	(0.0023)	(12.7925)	(0.0004)	(10.8589)	(0.0007)
	[0.2922]	[0.1934]	[0.0442]	[0.0000]	[0.7027]	[0.5090]
Dep var mean	0.1917	0.1454	754.7819	0.0017	1192.4208	0.0108
Bandwidth	3.6737	4.3571	4.2399	4.2828	3.7430	4.3104
Effective Obs	523572	612154	590019	601255	523572	601255

Note: Table reports regression discontinuity estimates for employment, earnings, program utilization and criminal activity in the pre-2007 period. Panel A examines outcomes for the full sample, while Panel B restricts to individuals who are unemployed at the start of the quarter. 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.

Table A5: Effect of WOTC on employment, earnings, and program utilization for the age 40 discontinuity (post-2007)

Panel A: Full sample						
	Employed	New hire	Earnings	Certified	Public benefit (amt)	Convicted (=1)
RD_Estimate	-0.0006	-0.0001	-8.4991	-0.0119***	-2.3544	-0.0000
	(0.0023)	(0.0010)	(15.9081)	(0.0010)	(5.1929)	(0.0003)
	[0.7975]	[0.9308]	[0.5932]	[0.0000]	[0.6503]	[0.9922]
Dep var mean	0.4208	0.0921	2076.4474	0.0175	1032.7704	0.0105
Bandwidth	4.3417	3.2758	3.8853	1.5884	3.5746	5.5862
Effective Obs	3147648	2287744	2717541	1095326	2518766	4107950
Panel B: Unemployed sample						
	Employed	New hire	Earnings	Certified	Public benefit (amt)	Convicted (=1)
RD_Estimate	-0.0002	-0.0002	1.4067	-0.0101***	-4.2790	-0.0002
	(0.0014)	(0.0012)	(7.9139)	(0.0004)	(6.9884)	(0.0004)
	[0.8986]	[0.8689]	[0.8589]	[0.0000]	[0.5403]	[0.6119]
Dep var mean	0.1143	0.0773	513.8389	0.0024	1111.4315	0.0129
Bandwidth	3.1732	3.3236	3.8996	3.0363	3.6924	5.0189
Effective Obs	1413635	1425921	1694028	1336616	1647264	2279953

Note: Table reports regression discontinuity estimates for employment, earnings, program utilization and criminal activity in the post-2007 period. Panel A examines outcomes for the full sample, while Panel B restricts to individuals who are unemployed at the start of the quarter. 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.

Table A6: Placebo RDD analysis

Panel A: Pre-2007						
	Employed	New hire	Earnings	Certified	Public benefit (amt)	Convicted (=1)
RD_Estimate	-0.0050	-0.0010	-35.7618	-0.0003	-4.1644	0.0002
	(0.0039)	(0.0017)	(23.8756)	(0.0003)	(8.6194)	(0.0004)
	[0.2046]	[0.5812]	[0.1342]	[0.3292]	[0.6290]	[0.6074]
Dep var mean	0.3244	0.0914	1390.3404	0.0009	732.0424	0.0091
Bandwidth	5.3543	4.5135	4.7266	3.7060	4.4671	6.6637
Effective Obs	909355	770656	798357	632157	757995	1111903
Panel B: Post-2007						
	Employed	New hire	Earnings	Certified	Public benefit (amt)	Convicted (=1)
RD_Estimate	-0.0021	0.0004	-15.2422	-0.0021**	-1.2009	0.0001
	(0.0018)	(0.0010)	(11.4645)	(0.0010)	(3.8865)	(0.0003)
	[0.2665]	[0.6962]	[0.1837]	[0.0320]	[0.7573]	[0.6638]
Dep var mean	0.5712	0.1527	2402.7144	0.0672	1079.7536	0.0149
Bandwidth	2.9171	3.3941	2.7079	3.6028	2.8533	3.3756
Effective Obs	2950287	3300282	2677709	3576673	2871644	3343457

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.

Table A7: Substitutability of WOTC-eligible and ineligible SNAP beneficiaries

	Eligible Hires	Ineligible Hires
Eligible Exits	0.0686	0.0737
	(0.0009)	(0.0008)
Ineligible Exits	0.0886	0.0636
	(0.0010)	(0.0009)
Firm FEs	Yes	Yes
Year-Quarter FEs	Yes	Yes
Total Exits FEs	Yes	Yes
Observations	1,694,247	1,694,247

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.

Appendix Figures

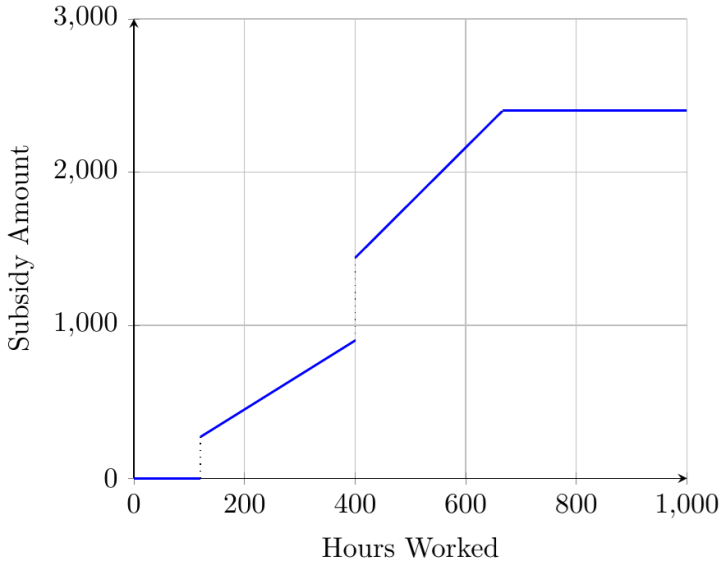


Figure A1: WOTC subsidy schedule

Note: Figure reports the subsidy amount by hours worked for the median worker earning $9 per hour. Over 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.

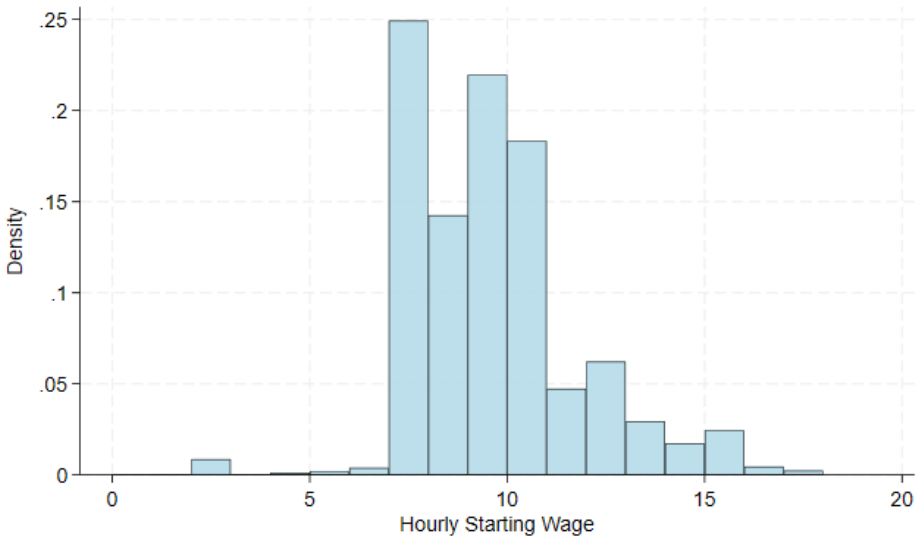
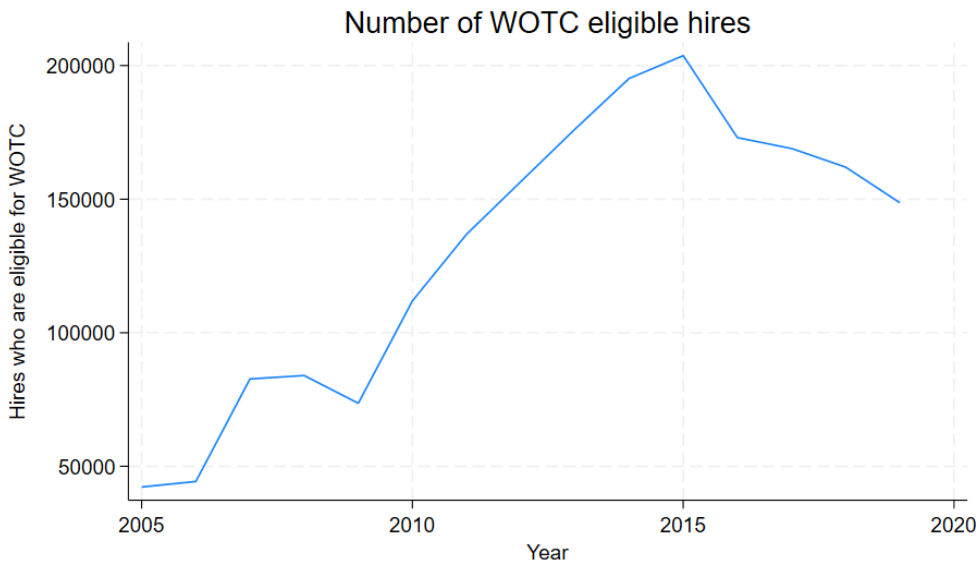


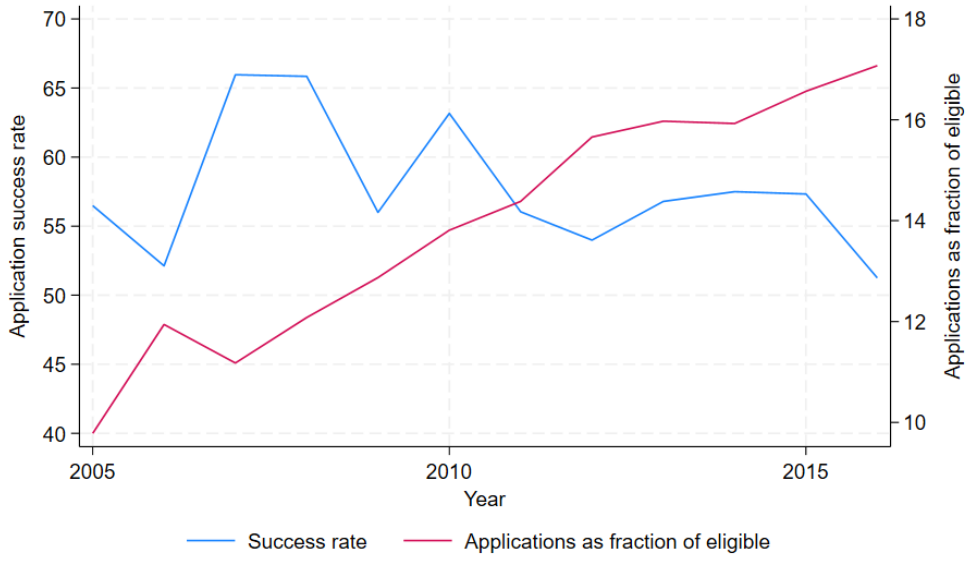
Figure A2: Hourly Starting Wage

Note: Figure reports the distribution of starting hourly wage for workers certified for WOTC.

Figure A3: Decomposition of changes in WOTC over time



(a) Eligibility



(b) Application behavior

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.

Figure A4: Herfindahl index of WOTC certifications by year



Note: Panel b calculates a Herfindhal index for WOTC across firms in each year.

Figure A5: Effect of SNAP expansion on individual outcomes, unemployed sample



(a) Employed



(b) New hire



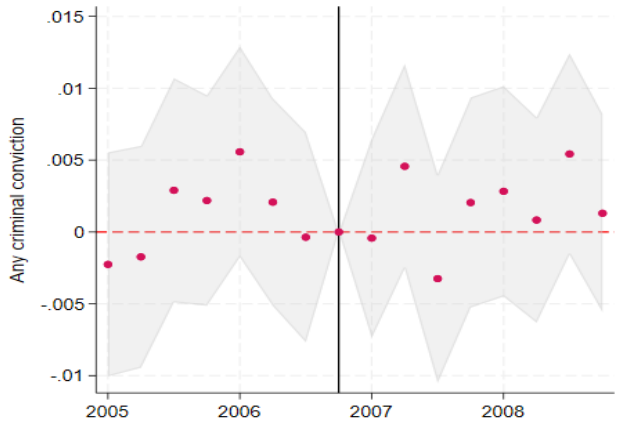
(c) Earnings



(d) WOTC certified job



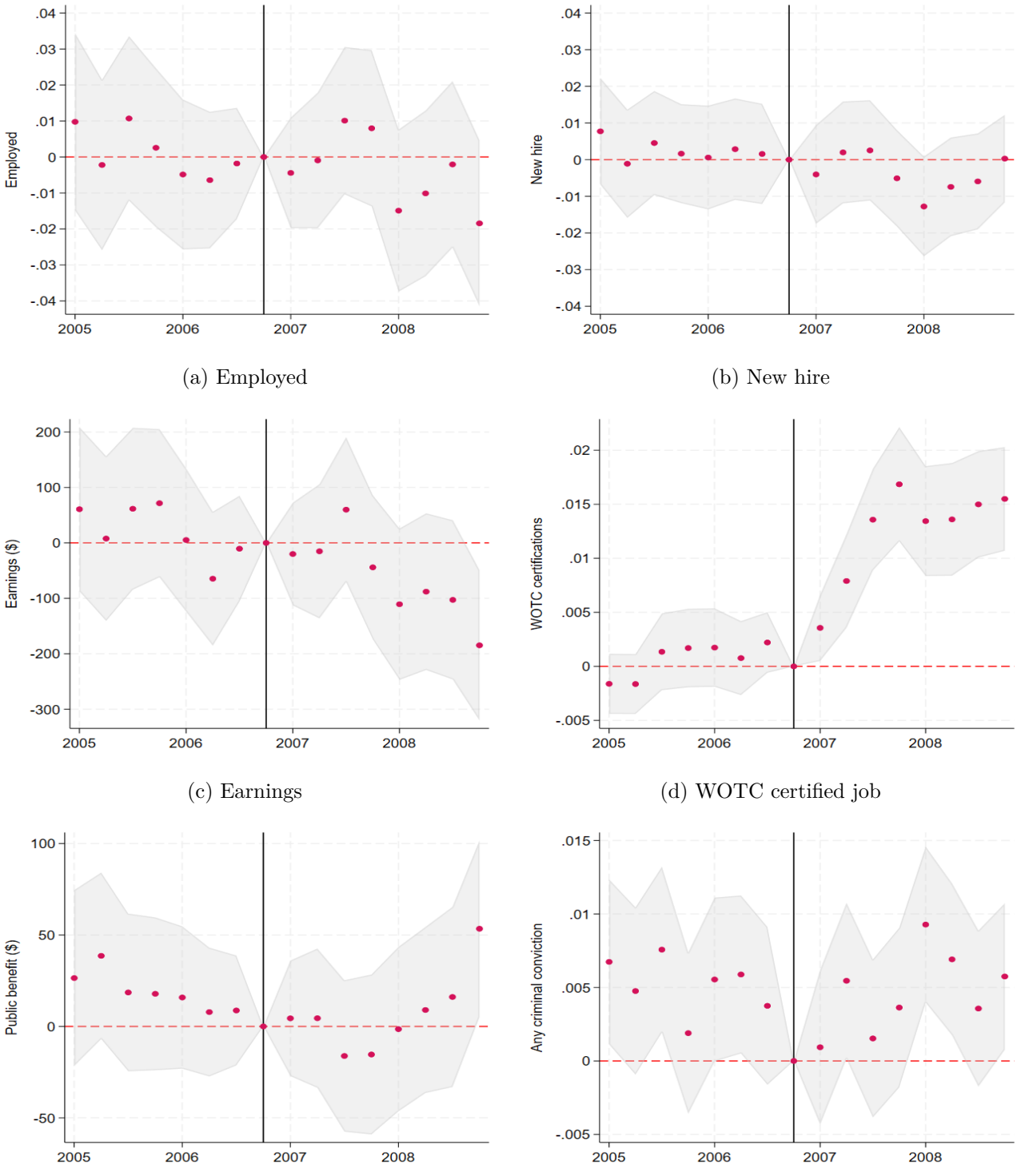
(e) Public benefits



(f) Criminal conviction

Note: Figure reports event study estimates from the 2007 expansion to SNAP recipients aged 25-39 in Equation (1) for employment, new hires, earnings, employment in 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 fixed effects. Standard errors clustered at the individual level.

Figure A6: Effect of WOTC on individual outcomes, SNAP expansion, alternative control group



(a) Employed

(b) New hire

(c) Earnings

(d) WOTC certified job

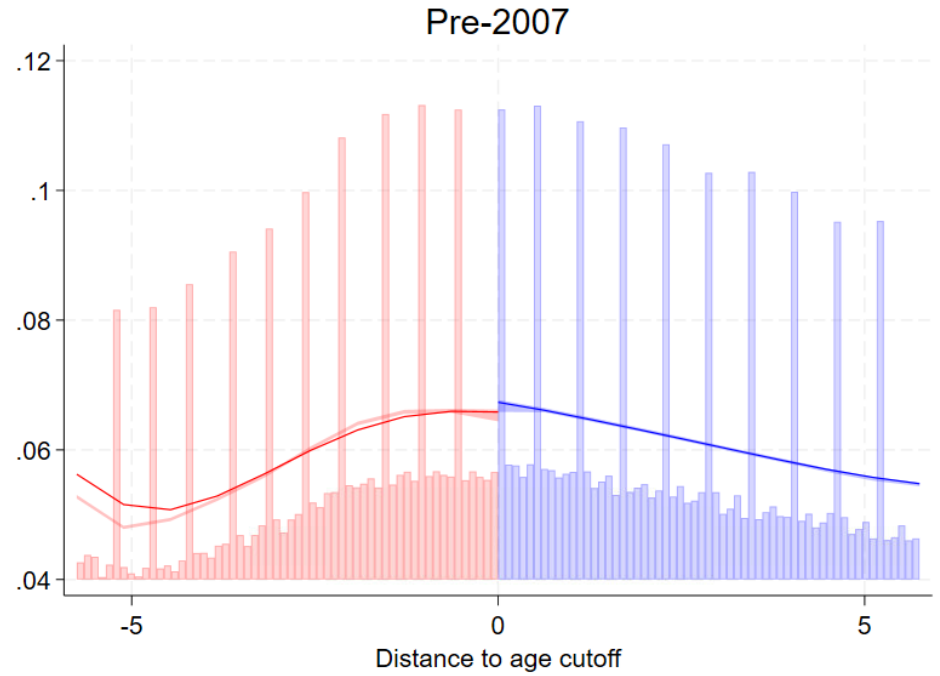
(e) Any public benefits

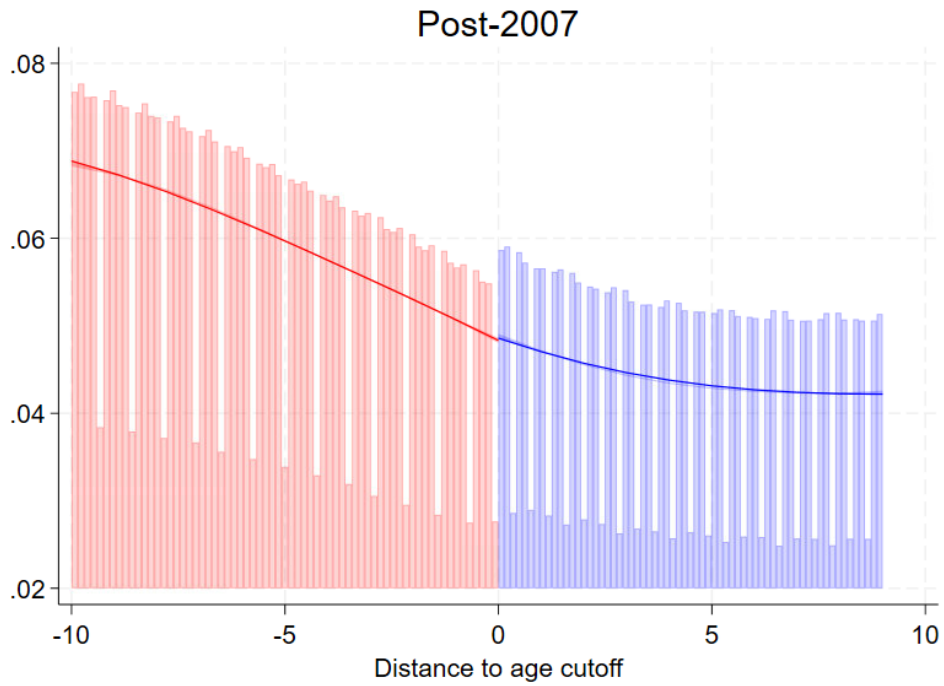
(f) Criminal conviction

Note: Figure reports event study estimates from the 2007 expansion to SNAP recipients aged 25-39 in Equation (1) for employment, new hires, earnings, employment in a WOTC-certified job, social assistance utilization, and criminal activity. The control group comprises of individuals aged 40-41. Controls include monthly age fixed effects and quarter-year fixed effects. Standard errors clustered at the individual level.

Figure A7: Distribution of the running variable

(a) Age 25 cutoff (1997 to 2006)

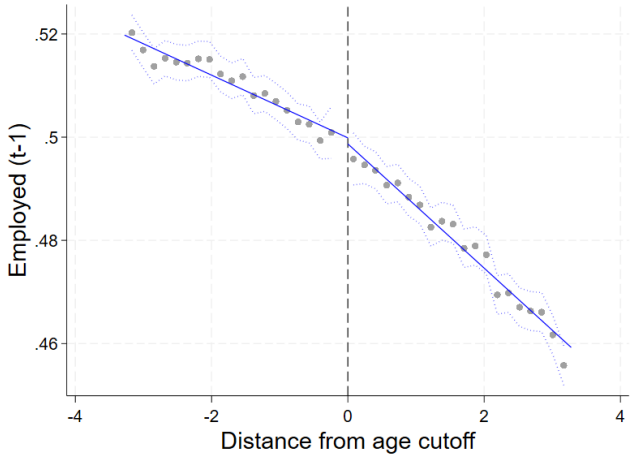




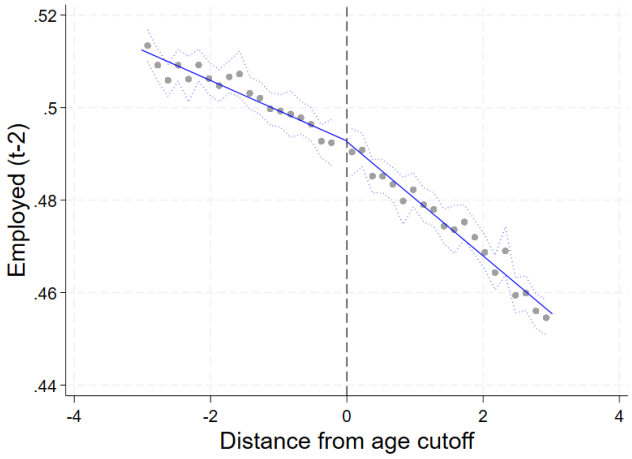
(b) Age 40 cut-off (2007 to 2019)

Note: These figures plot 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).

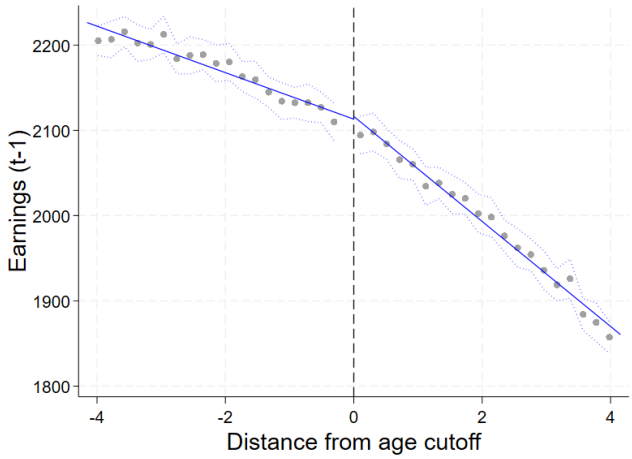
Figure A8: Balance on pre-determined characteristics for the regression discontinuity



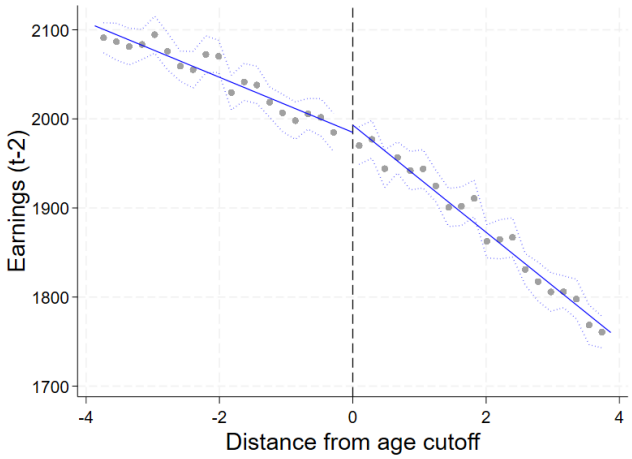
(a) Employed (t-1)



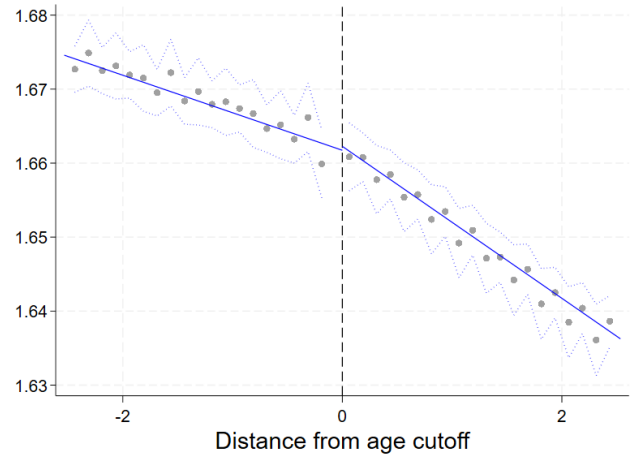
(b) Employed (t-2)



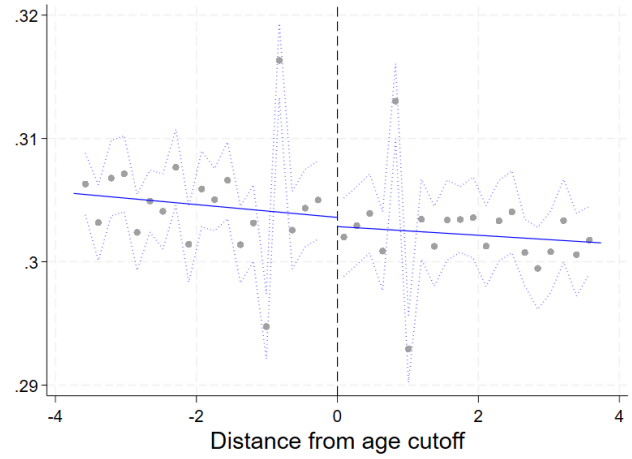
(c) Earnings (t-1)



(d) Earnings (t-2)



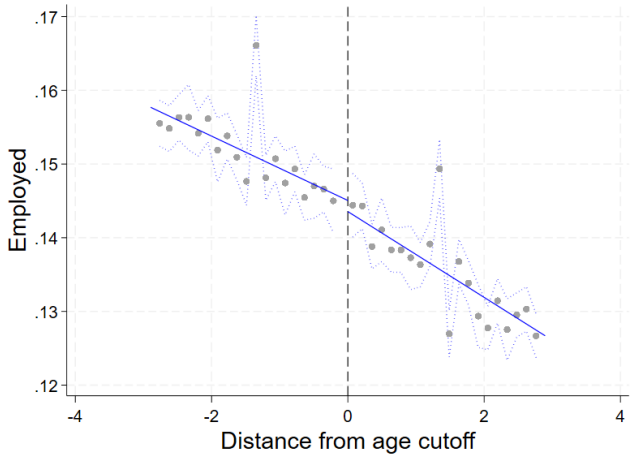
(e) Female



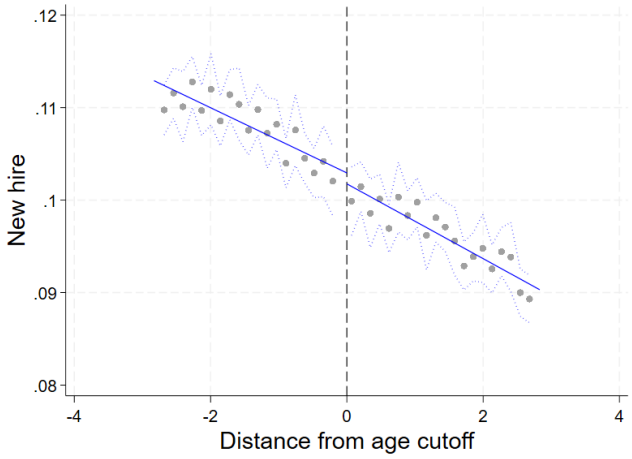
(f) Black

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.

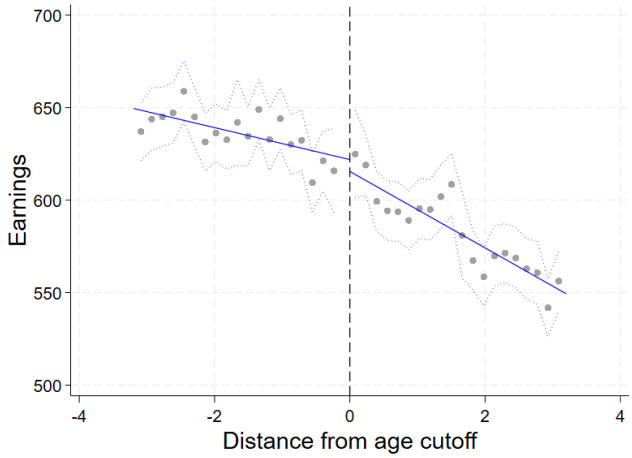
Figure A9: Effect of WOTC on employment, earnings, and program utilization (RDD, unemployed sample)



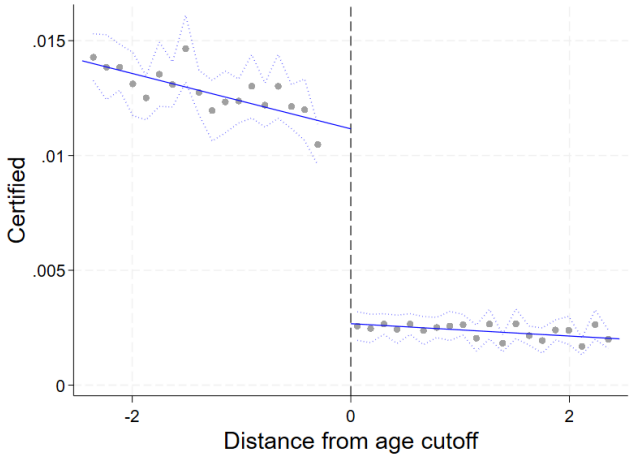
(a) Employed



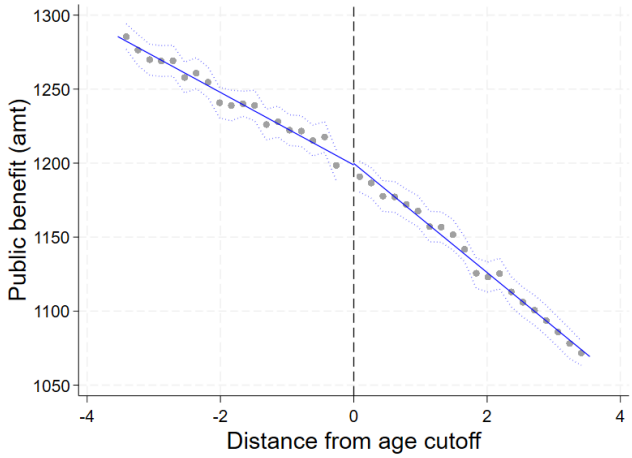
(b) New hire



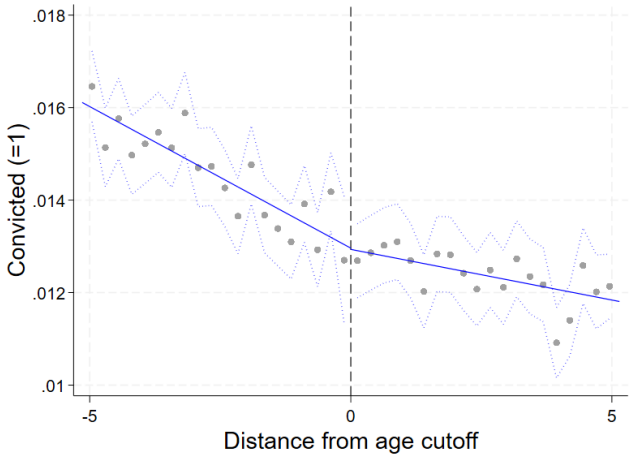
(c) Earnings



(d) WOTC certified job



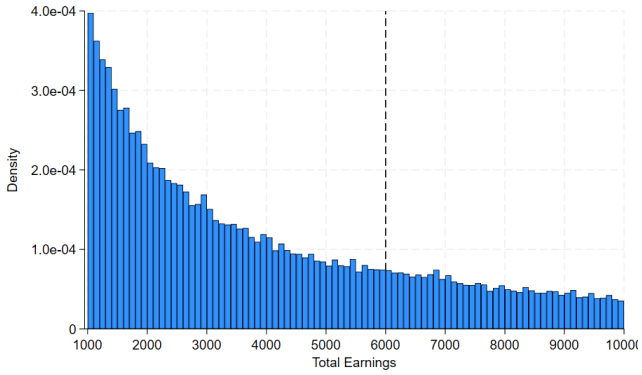
(e) Public benefits



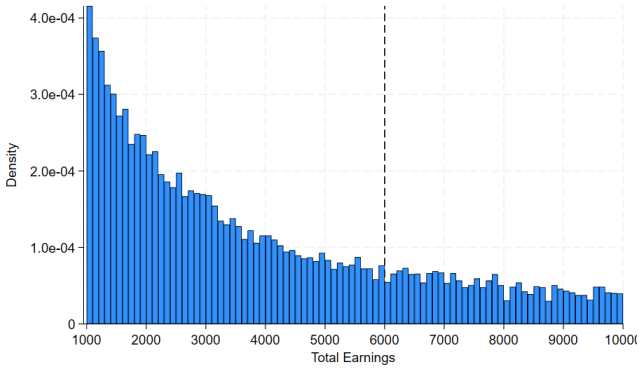
(f) Criminal conviction

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, 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 working in a job with an associated WOTC certification. Panel (e) measures the relationship with the dollar value of three forms of public benefits in a quarter (TANF, Unemployment Insurance, and SNAP), while panel (f) measures if the individual is convicted of a criminal offense in the relevant quarter.

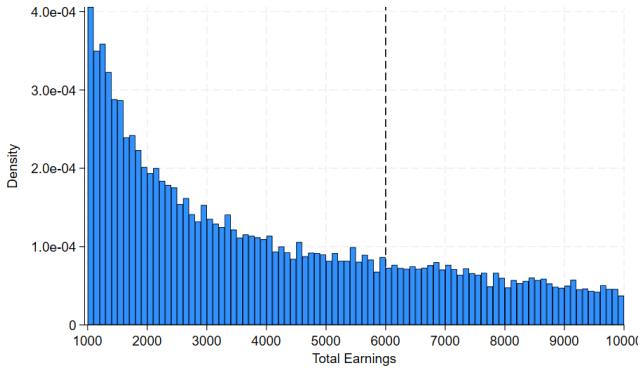
Figure A10: Histograms of total earnings for WOTC workers



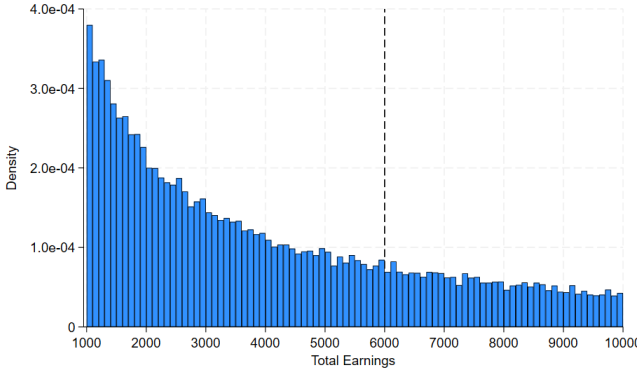
(a) Top 50 WOTC firm



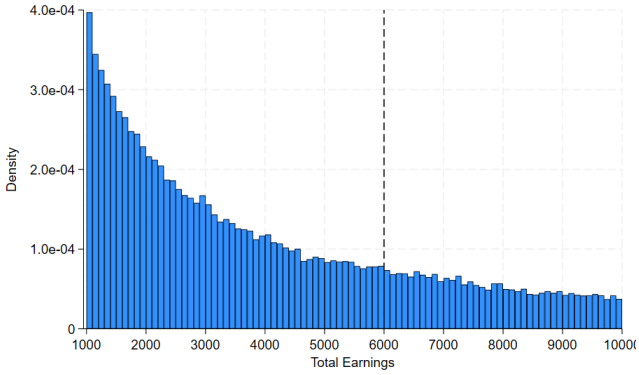
(b) WOTC high success firm



(c) Staffing firm



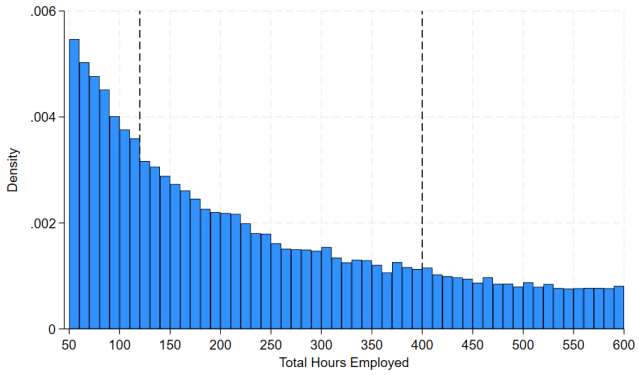
(d) 2007 to 2013



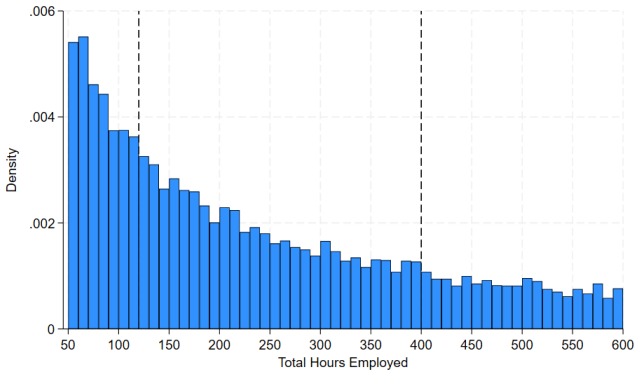
(e) 2014 to 2019

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.

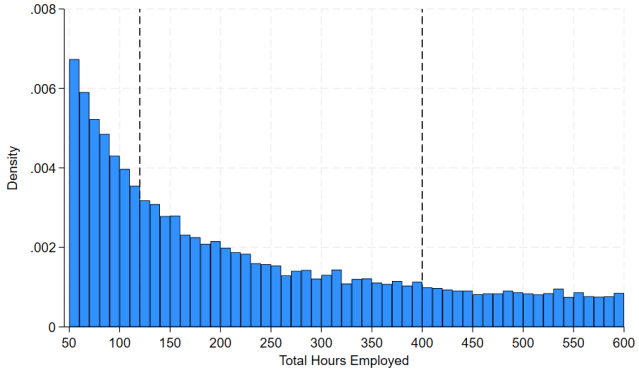
Figure A11: Histograms of total hours worked for WOTC workers



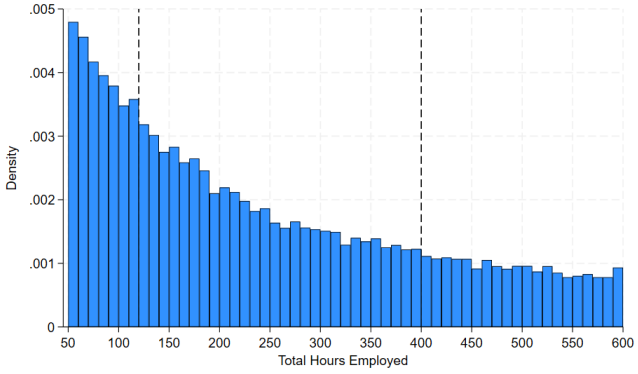
(a) Top 50 WOTC firm



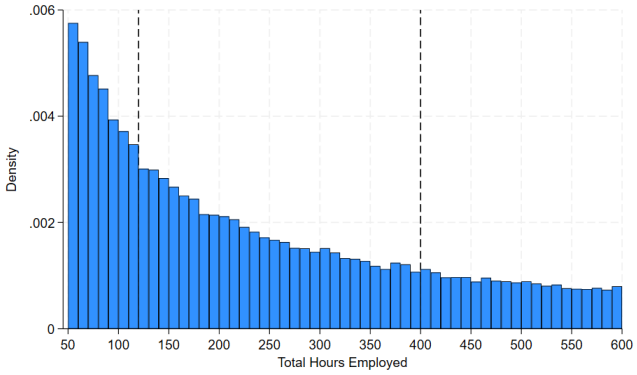
(b) WOTC high success firm



(c) Staffing firm



(d) 2007 to 2013



(e) 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.

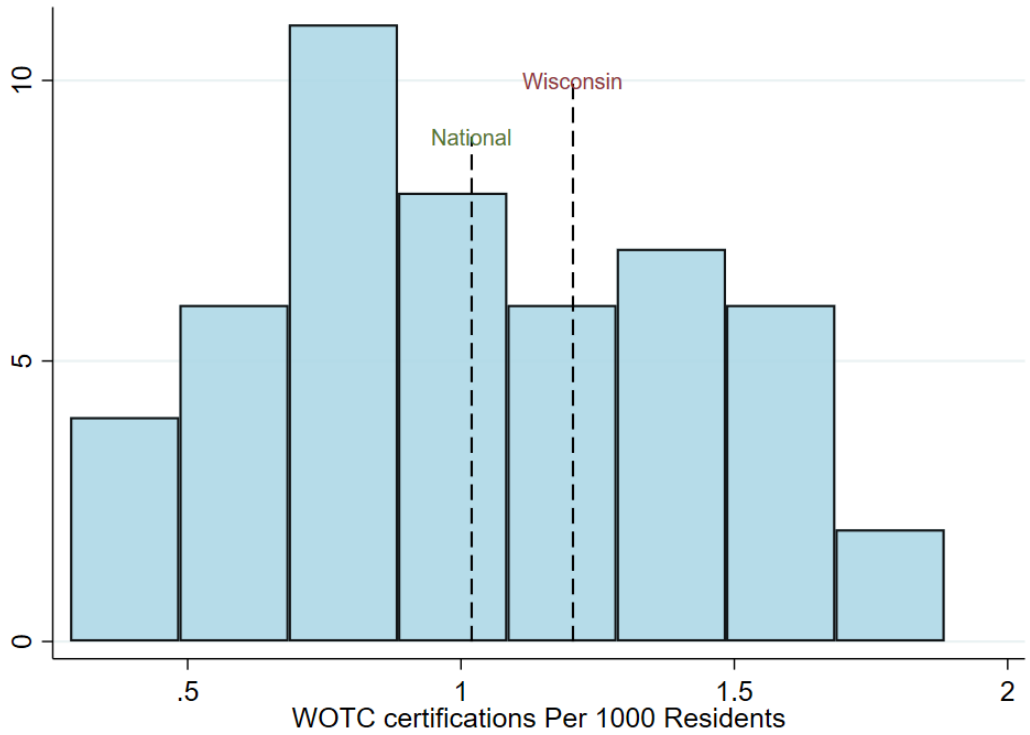
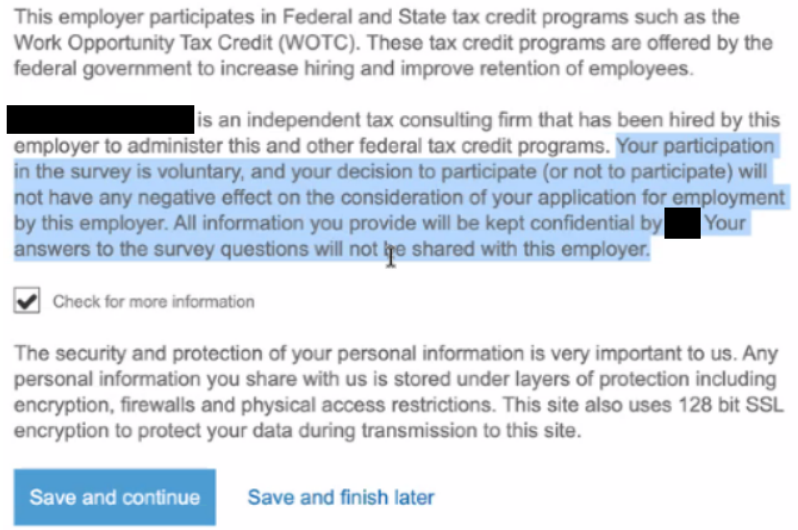


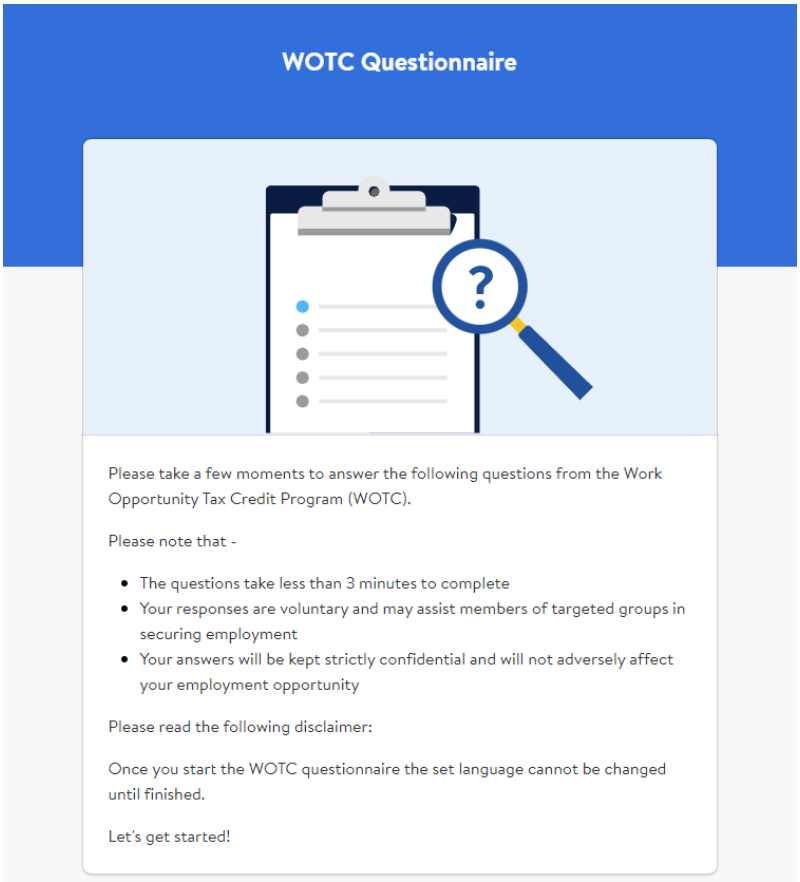
Figure A12: Average Quarterly WOTC applications by State (Per 1000 residents)

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 A13: Examples of WOTC information collection on job applications



(a) Example of third-party WOTC screening



(b) Example of direct screening by the company

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