Job Sorting and the Labor Market Effects of a Criminal Record

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Abstract

We examine the effects of a criminal record on labor market outcomes and the mediating role of job sorting using Swedish register data. Prime-age adults with criminal records earn about 30% less than observably similar adults without records and are concentrated in specific employers and occupations. To estimate the causal effect of a criminal record, we use an event study design that compares outcomes for adults charged with an offense for the first time to matched adults who were suspected of a similar offense but not charged. Acquiring a criminal record reduces months employed by 2% and annual earnings by 5%, with these effects persisting for over a decade. These negative effects are roughly twice as large for more serious or subsequent charges and are not driven by job displacement or incapacitation. We classify firms by their propensity to hire workers with criminal records, holding suspected offense history fixed. A criminal record reduces employment at firms classified as less willing to hire workers with criminal records, increases employment at other firms, and decreases monthly wages across firm types. Firms are more willing to hire workers with criminal records if they operate in certain industries, have fewer employees, do not mention conducting background checks in their job ads, or have a manager with a record history or more exposure to people with records through family or former coworkers.

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1 Introduction

In the United States and increasingly in Europe, it is common for firms to conduct background checks when screening job applicants. Evidence from surveys and audit studies indicates that many firms have strong preferences against hiring workers with criminal records (WCRs) for at least some roles.[1] However, we know little about the extent to which having a criminal record harms labor market prospects or the role of heterogeneity in employer preferences. For example, the labor market effects of a criminal record may depend on whether WCRs can avoid more discriminatory employers and work elsewhere, as well as the pay associated with those jobs (Becker, 1971).

In this paper, we address four questions: (1) How do workers with and without criminal records differ in their labor market outcomes, including their earnings, employer, and occupation? (2) What is the causal effect of a criminal record on employment and earnings? (3) How does worker sorting across employers and jobs mediate this effect? (4) To what extent, and why, do employers vary in their willingness to hire WCRs? The answers to these questions have important implications for policies aimed at improving the labor market status of WCRs.

We explore these questions using comprehensive Swedish register data from 1990 to 2015. Like much of Europe, Sweden has historically had stronger privacy protections around criminal records than the United States. However, reforms throughout this period have expanded access to criminal record registries, altered which offenses are visible and for how long (through changes in expungement rules), and implemented mandatory background checks for specific occupations. In a 2014 government survey (SOU 2014:48), more than 50% of large firms reported using background checks.[2]

We begin by presenting the first population-wide description of the labor market for WCRs, focusing on earnings and sorting across employers and occupations. Next, we estimate the causal effect of a criminal record by comparing the labor market trajectories of adults charged with a criminal offense to a matched group of adults suspected of a similar offense but not charged. We then decompose these effects into changes in employment by employer type and monthly wages within employers. Finally, we measure and characterize heterogeneity in employers' willingness to hire WCRs.

During the study period, over 9% of working-age men and 2.5% of working-age women have

[1] For survey evidence, see Holzer et al. (2006b,a, 2007); Raphael (2014); Cullen et al. (2023); Bushway and Pickett (2024). For audit study evidence, see Pager (2003); Uggen et al. (2014); Agan and Starr (2018), and Ahmen and Lång (2017) and Baert and Verhofstadt (2015) for evidence from Europe in particular.

[2] Consistent with this statistic, we also analyze data on job ads and find that around 30-50% of ads, depending on the year, are at firms that sometimes signal that criminal background checks will be conducted during hiring.

an active criminal record, and 28% of men and 9% of women have ever had a record. Conditional on education, age, gender, and immigrant status, prime-age WCRs earn 31% less than prime-age adults without records. Conditioning further on cognitive test scores only slightly reduces this gap. Conditional on worker demographics, WCRs work about 20% fewer months annually. Among those employed, the (residual) monthly wage gap between WCRs and non-WCRs is 23 log points.

There is also considerable workplace segregation by criminal record status. Compared to demographically similar non-WCRs, WCRs work in establishments where the proportion of coworkers with active records is about 70% higher. Differences in firm pay premiums explain about 40% percent of the (residual) monthly wage gap, where pay premiums are estimated using a standard worker-firm wage decomposition (Abowd et al., 1999; Card et al., 2016).

To study the kinds of occupations into which WCRs are sorted, we match Swedish occupation codes to O*NET occupation data and annual background check laws. Conditional on other worker characteristics, WCRs are less likely to work in occupations involving interactions with vulnerable populations, opportunities for theft or financial responsibility, customer exposure, high educational or skill requirements, non-hazardous work conditions, and mandatory background checks.

To isolate the causal effect of a criminal record, we use a novel research design within an event study framework. We compare labor market outcomes for adults charged with a criminal offense to matched adults deemed by police to be reasonable suspects for a similar offense but not charged, typically due to a lack of evidence. While the latter group, often arrested during the investigation, would typically acquire a criminal record accessible to employers in the United States, this is not the case in most of Europe, including Sweden. The motivation for this research design is that charged and non-charged suspects are plausibly similar in their precipitating circumstances and conduct that led police to suspect them. We focus on a sample of adult suspects between the ages of 22 and 40 who have no prior charges. Among those charged, nearly all will acquire a criminal record, with most receiving a fine or probation as punishment. Supporting the validity of our research design, we find that charged and matched non-charged suspects exhibit similar employment and earnings trajectories before the suspected offense and are suspected of future offenses at comparable rates.

We find that a person's first criminal charge decreases their months employed by 2% and their earnings by 5%. These effects are larger for more serious offenses (4% and 8%) and subsequent charges (5% and 10%). Moreover, these effects persist for over a decade, after most offenses are automatically expunged. The roles of job displacement and incarceration are, at most, limited: effects are proportionally similar for those working and not working at the time of the suspected

offense and incarceration sentences are rare in our context (8% of our event study sample).

We then unpack these employment and earnings reductions by investigating how a criminal record affects: (1) where people work and (2) how much they earn at a given employer. We extend the charged versus non-charged suspect research design to classify firms by their willingness to hire WCRs. Focusing on hired workers with a suspected offense in the recent past, we measure each firm's tendency to hire WCRs conditional on the suspected offense history of their hires. Under this approach, we classify a firm as less willing to hire WCRs if, relative to other firms, they are more likely to hire non-charged suspects than otherwise comparable charged suspects. We find that the overall decrease in months worked is concentrated at firms less likely to hire WCRs, consistent with these firms discriminating on the basis of criminal record status. The employment decrease at these firms is partially offset by an increase in employment at more WCR-"friendly" firms. Among those working, monthly wages decrease by 4%. This mostly reflects a decrease in monthly wages within firms, including "friendly" firms, though a criminal record also leads to a modest shift from higher- to lower-paying firms.

Finally, we relate firm-level propensities to hire WCRs to a set of firm characteristics geared towards testing potential reasons why some firms are more willing to hire WCRs than others. We have four findings. First, firms in some industries (e.g., construction) are systematically more willing to hire WCRs than firms in other industries (e.g., public administration and defense, health care, and education), which include many occupations for which background checks are mandated upon hiring or licensing. Second, small firms are more willing to hire WCRs than large firms. Third, firms that signal criminal background checks in their job ads are less willing to hire WCRs, consistent with these firms using checks to screen out applicants with records. Fourth, firms with managers who have a past criminal record themselves or have been exposed to records via family members or past coworkers are more willing to hire WCRs.

This paper contributes to three areas of research on the labor market outcomes of people with criminal records.[3] The first is an active debate on how various criminal justice system interactions, including pretrial detention, diversion, and prison time, affect labor market outcomes (Dobbie et al., 2018; Mueller-Smith and Schnepel, 2021; Mueller-Smith, 2015; Bhuller et al., 2020; Garin et al., 2023). Such effects may arise through several channels, including the persistent effects of job displacement, depreciation of human and social capital while in prison (Western et al., 2001), or stigma of a resulting criminal record. Our paper advances this literature by isolating the effects of a

[3]See Hjalmarsson et al. (2024) for a recent survey of the field.

criminal record *per se*—that is, the extensive margin effect of whether a person has a criminal record visible in a background check. A fundamental challenge in answering this question is finding an appropriate comparison group. Existing studies on the labor market effects of arrest and conviction (Grogger, 1995; Rose, 2021; Agan et al., 2024b) typically compare those charged at younger ages to those charged later at older ages in an event study framework. While broadly applicable, this design has two limitations: (1) it does not account for the immediate circumstances leading up to an offense and (2) the comparison group is mechanically more likely to commit an offense in the future. Our novel research design, which uses non-charged suspects as the comparison group, addresses both limitations: it nets out the potential effects of the circumstances leading to an alleged offense—indeed, our matched non-charged suspects also experience a dip in their employment rate growth—and compares two groups with comparable risks of committing future offenses.

A second body of literature examines how a criminal record affects firm labor demand and employer discrimination. Measuring the effects of firm discrimination—whether based on criminal record status, race, or other attributes—on employment and earnings is challenging due to the many correlated unobservables present in observational data (Charles and Guryan, 2011). Audit and correspondence studies, which overcome this challenge, generally find lower callback rates for job applicants who disclose or signal that they have a criminal record (Pager, 2003; Uggen et al., 2014; Agan and Starr, 2018; Ahmen and Lång, 2017). Furthermore, surveys indicate that many—though not all—employers are reluctant or unwilling to hire WCRs, particularly for positions involving customer contact (Holzer et al., 2006b,a, 2007; Raphael, 2014; Cullen et al., 2023; Bushway and Pickett, 2024).

While this literature suggests that some firms discriminate against WCRs, it has two fundamental limitations. First, it measures callback rates or firm stated preferences rather than actual employment or earnings outcomes, and it typically relies on a small and selected sample of firms. Evidence of disparate treatment by participant firms does not necessarily imply disparate outcomes for real-world job applicants with criminal records. For instance, if there are enough non-discriminatory employers, the effects of discrimination may be moderated by the workers' ability to sort to those employers (Becker, 1971). On the other hand, in models with search frictions, workers from disfavored groups may experience longer unemployment spells and receive lower wages, even at nondiscriminatory firms, because they have worse outside options (Black, 1995; Bowlus and Eckstein, 2002). Sorting to less discriminatory firms may decrease earnings if the most discriminatory firms also offer higher wages (Card et al., 2016; Gerard et al., 2021). Our population-wide

employee-employer matched registers allow us to address this knowledge gap. Consistent with frictional models, we find that a criminal record reduces employment at more discriminatory firms, increases time spent unemployed, and decreases monthly wages within employers. We also find that more discriminatory firms provide higher wage premiums.

The second limitation is that much of the literature is based in the United States, an outlier compared to the rest of the world when it comes to the accessibility, visibility, and breadth of criminal records.[4] In the US, unlike most of Europe, including Sweden, arrests are often included in background checks, background checks are widespread, records are often public, and automatic expungement rules are the exception. We provide the first study of how records affect employment and earnings in Europe and our findings can inform an active US debate about policies aimed at mitigating the negative consequences of a criminal record.[5]

A third related literature examines the role of firms and managers in hiring workers from disadvantaged groups. The firm surveys and studies of hypothetical hiring scenarios discussed above show substantial variation in employer preferences and WCR-related hiring policies. But do these differences influence actual hiring decisions? Why are some firms, even within the same industry, more receptive to hiring WCRs than others? To what extent does manager heterogeneity contribute to these patterns? The existing literature (see Hoffman and Stanton (2024) for a recent survey and Lazear and Shaw (2007) for an older review) has little to say on these questions.[6] We find that both explicit firm-level policies and manager characteristics play a role. While worker-manager concordance in race, immigrant status, and gender have been studied in prior work (Giuliano et al., 2011; Åslund et al., 2014; Benson et al., 2022; Cullen and Perez-Truglia, 2019), criminal record exposure is a novel dimension. More generally, our findings are consistent with a broader literature on how contact, experience, and exposure shape attitudes towards disadvantaged groups (Paluck et al., 2019; Dahl et al., 2021), including in the labor market more specifically (Miller, 2017; Li et al., 2020; Benson and Lepage, 2024; Lepage, 2024).

The remainder of the paper proceeds as follows. Section 2 describes the Swedish criminal justice system, including the rules related to criminal records and background checks. Section 3

[4]See Ahmen and Lång (2017) and Baert and Verhofstadt (2015) for two exceptions in terms of audit and correspondence studies, Bhuller et al. (2020) for the effects of prison time in Norway, and Dasgupta et al. (2021) for record expungement in New Zealand. A contemporaneous study Forsberg (2024) in Sweden aims to evaluate the effects of introducing the online record depository, Lexbase, in 2014.

[5]See Rose (2021), Agan and Starr (2018), and Doleac and Hansen (2020) for studies of US ban the box laws and Dasgupta et al. (2021), Agan et al. (2024a), Agan et al. (2024b) for evaluations of expungement and clean slate laws.

[6]One recent exception is Adams-Prassl et al. (2024), who study the role played by managers, and manager gender, after violent conflicts between coworkers.

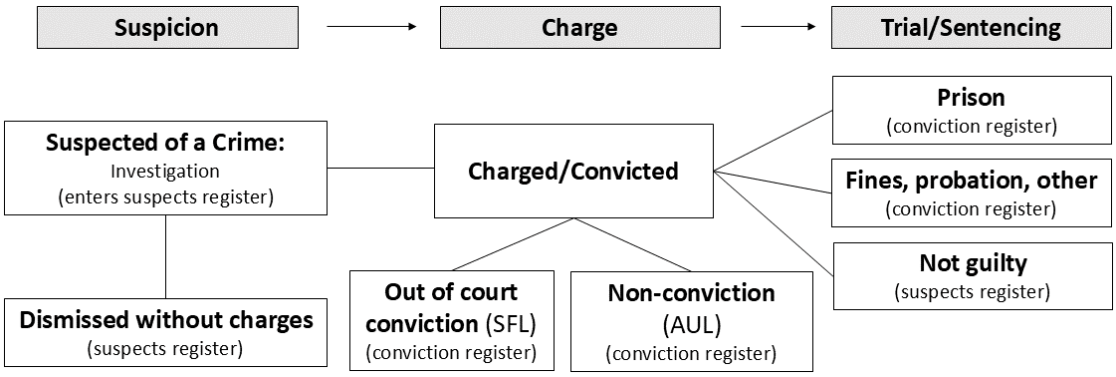
describes the Swedish crime and employer-employee registries and supplementary data. Section 4 presents new descriptive facts about the labor market for WCRs. Section 5 presents the charged versus non-charged suspects research design and results. Section 6 measures and characterizes firm heterogeneity in willingness to hire WCRs. Section 7 concludes.

2 Institutional background

2.1 Crime and the criminal justice system

Figure 1 depicts how a suspect progresses through the Swedish criminal justice system. This will inform our charged versus non-charged suspect research design in section 5.1. When a crime is reported, the police are in charge of the initial investigation and identification of suspects. The case is then passed to a prosecutor who decides if there are sufficient and reasonable grounds for an arrest of the suspect(s). Only suspects meeting this threshold are included in the suspect register. All "reasonable" suspects are informed of their status and they are typically arrested. The prosecutor (or police for minor offenses like shoplifting, traffic violations, or petty theft) continues the investigation. Depending on the evidence obtained, the prosecutor decides whether to charge the suspect or dismiss the case without charges. The reason for dismissal is often recorded in the suspects register. The most common stated reason is insufficient evidence; it is rare for prosecutors to state that a suspect is innocent.

FIGURE 1
SWEDISH JUSTICE SYSTEM FLOWCHART



Note: This figure demonstrates the possible paths an individual can flow through the Swedish criminal justice system, from being suspected of a crime, the decision to dismiss or charge, disposition decisions, and trial as well as sentencing outcomes. Within each cell, we also label the Swedish data registers in which the case outcomes are recorded.

Charged individuals can have four possible outcomes: (i) non-conviction (AUL or åtalsunderlåtelse), (ii) out-of-court conviction (SFL or strafföreläggande), (iii) in-court conviction by a judge, and (iv) in-court acquittal.[7] Non-convictions and convictions (in and out of court) include a determination of guilt and lead to a criminal record. Convictions in and out of court can result in punishment, though prison is only possible from in-court convictions. We illustrate the frequency of these different outcomes with a snapshot of the more than 174,000 individuals suspected of at least one crime in 2010. 54% were found guilty of their most serious charge: 5% AUL, 15% SFL, and 34% in-court. Only 6% of all suspects are eventually sentenced to prison.

2.2 Background checks

Until the emergence of online companies like Lexbase in 2014, Swedish firms could conduct background checks through two channels. First, some specific employers (e.g., in criminal justice, public employment, energy, health, transportation, and defense) have direct access to criminal record registries (termed in Swedish *belastningsregistret*). Second, employers without direct access can ask applicants to obtain an extract (at no cost) from the register maintained by the police. Swedish guidelines recommend that employers (i) only request this extract at the end of the hiring process, (ii) avoid keeping or copying it, and (iii) accept it as valid for one year, allowing applicants to use the same document at multiple employers. Though it is not illegal to discriminate on the basis of criminal records in Sweden, the police website emphasizes that a criminal record is not disqualifying (even if the background check is mandatory).[8]

The information visible in the extract depends on the type and timing of the request. Since 1989, individuals can independently obtain a "general extract", which includes all offenses, regardless of type, that are not yet expunged. As described in Appendix A.3, starting in the early 2000s, mandatory checks were introduced for certain jobs in education (2001), insurance (2006), residential and foster care homes (2007), children with disabilities (2011), and children in non-school activities (optionally, 2014). Such occupation-specific mandatory extracts only show selected offenses deemed relevant (by the government) to such jobs.[9]

Figure 2 shows the annual number of Swedish registry extracts overall and by type (general

[7] According to statistics provided by Dobbie et al. (2018), just 6% of Swedish in-court trials result in acquittal.

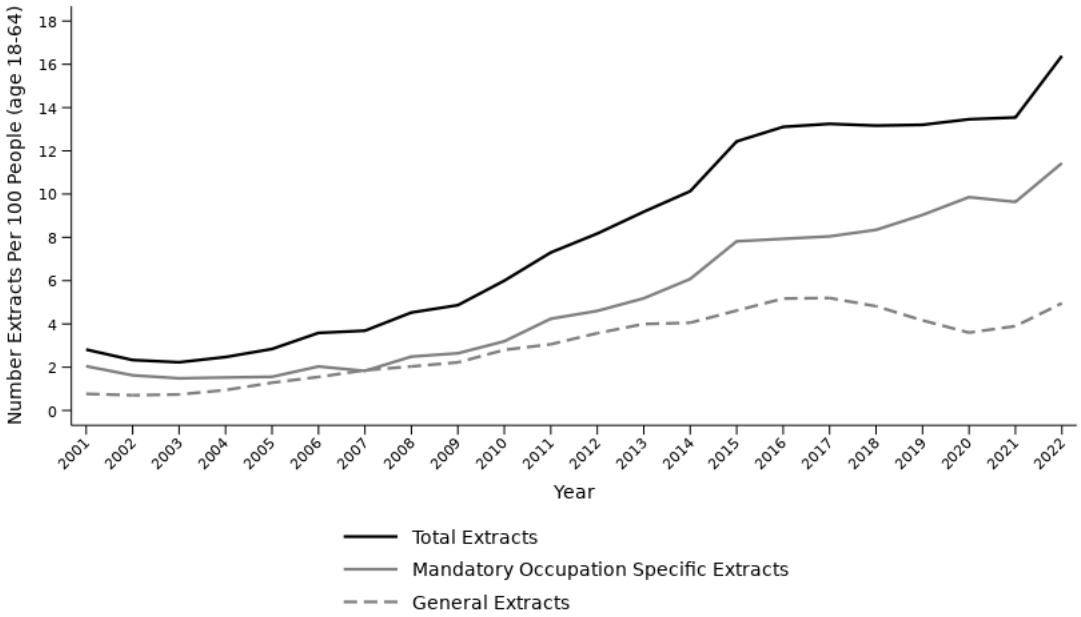
[8] Though we do not know the extent to which firms adhere to *all* of these recommendations, a 2014 government investigation (SOU 2014:48) found that 78% of surveyed firms that reported conducting background checks did not request the extract until offering employment.

[9] For a list of selected offenses by type of extract, see https://polisen.se/en/services-and-permits/police-record-extracts/police-record-extracts-for-employment-in-a-school-or-a-preschool/.

versus occupation-specific) per 100 people aged 18 to 64. The number of extracts per 100 people increased from around 2.8 in 2001 to 16.4 in 2022, when there were more than one million extracts.[10]

Further insights into the prevalence of background checks—over time and across firms, industries, and occupations—can be gained from a novel supplementary data set of Swedish job ads (described in section 3.3), in which we measure whether a firm signals in each of its ads that a background check will be conducted during the recruiting process. There is substantial variation in the prevalence of these signals across occupation categories, ranging from less than 4% of ads for resources/agriculture, construction, and manufacturing jobs to 18% of ads for elementary unskilled jobs. In 2022, about 55% of ads were at firms that at least sometimes signal background checks, making clear that many jobs are with employers who use background checks. These patterns are consistent with a 2014 survey of Swedish firms (SOU 2014:48) presented in Appendix Figure E.5; 14% of firms, but more than 50% of the largest, report background checks for all or some new hires.

FIGURE 2
ANNUAL EXTRACT REQUESTS FROM POLICE REGISTRY



Note: This figure presents the annual number of occupation-specific mandatory extracts (gray solid line) and general extracts (gray dashed line) obtained from the Swedish police, as well as the combined total (black line). after 2007 were provided by the police while those from earlier years are sourced from Backman (2012). All statistics are scaled by the population size each year from ages 18 to 64.

[10] A media analysis presented in Appendix Figure E.6 further demonstrates the increasing prevalence of criminal record extracts over time. It also shows that they were already salient before the 2014 introduction of Lexbase, which made records publicly searchable (Forsberg, 2024).

There are some stark differences between Sweden and the United States, where background checks are primarily conducted by specialized companies (Agan et al., 2024b) and information concerning many criminal justice interactions, often including arrests, are accessible to the public. European privacy laws sharply restrict access to criminal record information, especially arrest records. However, European employers (including those in Sweden) generally have the right to ask candidates for record extracts or about their criminal history. Finally, though background checks are sometimes mandatory and employers may screen records to minimize risks to their reputation, customers, and employees, hiring WCRs does not expose Swedish employers to negligent hiring liability as it may in the US.

2.3 Record expungement rules and reforms

In Sweden, all criminal offenses are automatically expunged from an individual's criminal record—and hence no longer visible during a background check—regardless of severity. The timing of expungement depends on three factors: (i) age (under 18) at the time of offense, (ii) the sentence received, and (iii) any subsequent offenses. This automatic expungement system is fairly representative of Europe, but in sharp contrast to the US, where clean slate laws remain uncommon.

According to current regulations, most offenses will be visible for 10 years if committed when 18 or older but only three or five years if committed when younger than 18. For all ages, offenses resulting in a prison sentence are cleared 10 years from the date of release. For minor offenses where fines or tickets are the primary sanction, expungement occurs after five years. In general, an offense is only expunged if the offender has not committed another offense in the interim; recidivism can extend the retention period to a maximum of 20 years. However, once an offense is cleared, it remains permanently cleared.

Appendix A.1 details changes in the expungement regulations from 1990 to today, which are needed to code whether an individual has a 'visible' or 'active' criminal record in a given year and the nature of that record.

3 Data

3.1 Swedish registers and key variables

For the entire population born between 1923 and 2000, we combine matched employee-firm registers with two core crime data sets from the Swedish National Council for Crime Prevention. The

Convictions Register spans 1973 to 2015 and provides a complete history of an individual's convictions and sentences, including offense and conviction dates, crime types, and sanctions (e.g., prison, probation, fines). We use these data to calculate whether a person has an *Active Criminal Record* each year. Specifically, we measure whether a person has been convicted of an offense (excluding traffic tickets) in the past that is not yet expunged from the background check register (according to the rules in place each year; see Appendix A.1).

The Suspects Register is available from 1995 onward, and also includes crime types and offense and/or decision dates. Suspects are added to this register as soon as they are arrested or connected to a specific crime. The causal design in section 5 takes advantage of the fact that offenses remain in this register and are observable to researchers (but not employers), even if they do not lead to a conviction.

Our labor market data span 1990 to 2015 and are sourced from Statistic Sweden's Register for Labor Market Statistics. They include unique firm and workplace identifiers, which allow us to trace out monthly employment and earnings histories for each worker in each job. We also observe key firm characteristics, including industry, number of employees, sales, and geographic location. These are drawn from Statistics Sweden's Company Register. In later sample years, we also observe detailed 4-digit occupation codes for almost all workers. Our ability to track WCRs across establishments and types of work as well as identify their coworkers (and their criminal history) is a novel aspect of Swedish registers.

Along with occupational and workplace sorting, we study the effects of having a criminal record on annual earnings, months employed during the year, and monthly wages. Annual earnings are measured in real Swedish krona (SEK) using 2015 prices.[11] These are pre-tax earnings reported by employers to the tax authorities. We also know the start and stop month for each job spell, which allows us to calculate an average monthly wage for each job a worker has. Job spell data also allow us to measure the number of months during a year that a worker is gainfully employed.

Finally, these data are combined with registers that provide demographic information on each individual, including gender, immigrant status, birth year, and educational attainment, as well as military enlistment test scores for several older cohorts of men.[12]

[11] On December 31, 2015, there were about 8.4 SEK per US dollar.

[12] Education is recorded in 7 levels, to which, per the standard in the literature (e.g., Hjalmarsson et al. (2015)), we assign the following years of schooling: 7 for old primary school, 9 for new compulsory school, 11 for short high school, 12 for long high school, 14 for short university, 15.5 for long university and 19 for a Ph.D.

3.2 Core analysis sample

We create a person by year level data set that tracks each person's criminal record status and labor market outcomes from 1990 to 2015. We observe about 10 million individuals who are alive and living in Sweden during at least one of these years. The baseline data set includes workers between the ages of 18 and 55. Our analysis sample is composed of 126.8 million person-year observations from 8.6 million people. These individuals are observed to work in more than 1.4 million firms, but the composition of firms changes over time; about 330,000 unique firms per year are observed. We use this sample to characterize the labor market for workers with and without criminal records in section 4, but make additional sample restrictions in our event study analysis in section 5. We also use samples of newly-hired workers in sections 5 and 6 to measure firm heterogeneity in hiring of WCRs.

3.3 Supplementary data: occupational characteristics and Swedish job ads

Occupational characteristics: To characterize occupations, we use the US Department of Labor's Occupational Information Network (O*Net). These data measure a wide range of occupational characteristics (e.g., average education, job preparation, and hazardous work conditions) and allow us to generate custom characteristics that are, according to firm surveys, especially salient to the WCR context, including: (i) extent of customer interactions, (ii) exposure to vulnerable populations (i.e., children, disabled, elderly, mentally ill, and substance use-related), and (iii) opportunities for theft or financial responsibility. The O*NET data, variable creation, crosswalk and matching procedure to Swedish occupation codes are described in Appendix A.2. Second, for each Swedish occupation code and year, we create variables characterizing whether background checks are required upon hiring or licensing. The underlying laws are described in Appendix A.3.

Job advertisement background checks: We use a data set of over 9 million job advertisements from 2006 to 2023 from the job board maintained by the Swedish Public Employment Service–Platsbanken. We search the text of each ad for keywords—'belastningsregist', 'registerkontroll', 'bakgrundskontroll'—to measure whether the employer signals that a background check is part of the recruitment process. We were able to link about 70% of ads to the firms that posted them in our employer-employee register using employer identification numbers. This allows us to investigate how background check signals in ads translate to actual hiring of WCRs—a first in the literature, beyond self-reported measures from firm surveys. See Appendix A.4 for details on the job ad data,

additional variables, and linking procedure.

4 Descriptive facts about the labor market for WCRs

4.1 Prevalence of WCRs

We begin by describing the prevalence of criminal records in Sweden. Figure 3 shows the percentage of workers with an active criminal record from 1990 to 2015 (panel A) and by worker age in 2015 (panel B). Over the sample period, the average percentage of men and women with a record has been 9.4% and 2.5%, respectively, rising from 8.4% and 1.9% in 1990 to 9.2% and 2.6% in 2015. There is a notable jump in the percentage with an active record in 2000; this is not driven by a jump in crime, but rather by a reform that included more minor offenses in the record registry (see Appendix A.1). Consistent with the typical age profile of criminal behavior, the percentage of adults with an active record initially increases in age, peaks at 24 for men and 20 for women, then decreases and plateaus around 40. Among those ever convicted of an offense, the median age at first conviction is 22. About 25% of men and 9% of women have been found guilty of a crime at least once. These rates are comparable to those documented in the United States and Europe.[13]

Among workers with a record, the median person has been convicted of one offense in the past 10 years, while the average is four offenses. Approximately 27% were convicted of a violent offense, 46% of a property offense, 32% of a traffic offense, 18% of a narcotics offense, 2% of a sex offense, and 19% of some other type of offense.[14] Out of the workers with a record, 19% were sentenced to prison in the last 10 years, for a median combined sentence of 120 days.[15]

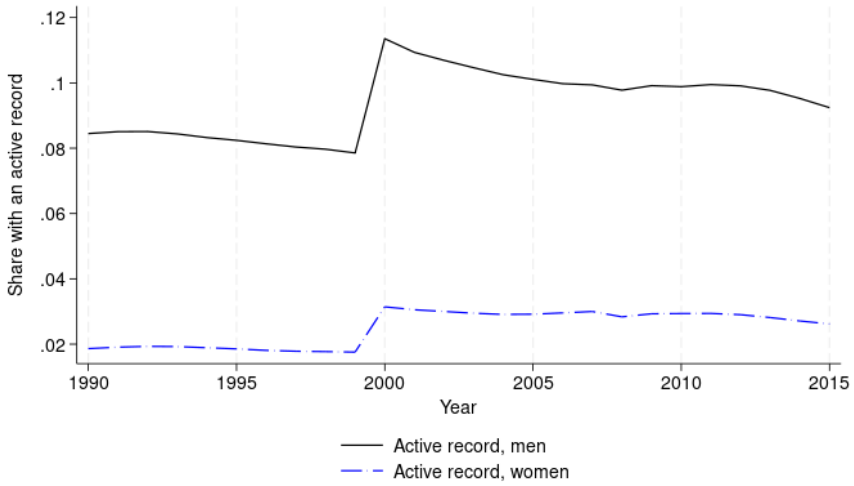
[13] A commonly cited statistic is that one in three US adults have been arrested by age 23. Brame et al. (2012) estimate for instance using the NLSY97 that 30-40% have been arrested by age 23. Shannon et al. (2017) estimate that 8% of all adults (male and female) in the US have a felony conviction. In Denmark, Dustmann and Landersø (2021) report that 34% of young (age 14-25) fathers have a conviction before pregnancy, while the rate is 17% for other young men in the same neighborhood.

[14] The five most common criminal offenses are: theft, non-DUI traffic (typically driving without a valid license), assault, narcotics use, and narcotics possession.

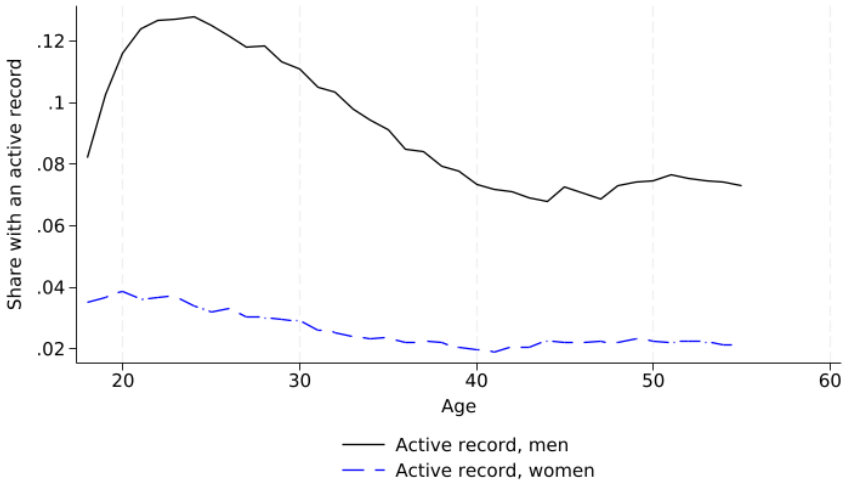
[15] Sweden has historically had shorter prison sentences than the US and Western Europe: the average time spent in prison for Swedish inmates convicted from 1991 to 2001 was 4.7 months, compared to about 8 months in Western Europe in 2001 and more than 30 months in US state and federal prisons (Hjalmarsson and Lindquist, 2022).

FIGURE 3
PREVALENCE OF WORKERS WITH CRIMINAL RECORDS

(a) Share of workforce with a record over time



(b) Share of workforce with a record by age, 2015



Note: Panel A plots the percentage of prime-age adults in each year of our sample with a criminal record while panel B shows the same percentage by age in 2015. In both panels, the solid black line is for men and the dashed blue line is for women.

4.2 Characteristics of WCRs

Table 1 compares the demographic characteristics, labor market outcomes, and employer characteristics of WCRs and non-WCRs. Compared to non-WCRs, WCRs are more likely to be male (79.53% versus 48.96%), less likely to be Swedish-born (78.46% versus 86.26%), younger (average

age of 33.83 versus 36.99) and less educated (average years of schooling of 10.78 versus 11.97).

In the labor market, WCRs work on average two and a half fewer months per year (6.99 versus 9.59), have average earnings that are about 40% lower (122k SEK versus 204k SEK).[16] Among those working, WCRs have lower tenure in their job (35 months versus 56 months). WCRs also tend to work in establishments and firms that are smaller and in establishments where a higher share of their coworkers also have records (8.8% versus 3.8%). They are more likely to work in construction, hotels and restaurants, and manufacturing and less likely to work in education, health care, public administration, and defense.

We next examine the extent to which demographic differences between WCRs and non-WCRs can account for their earning differences. We also measure the extent to which remaining differences in earnings can be explained by differences in months worked, industry, and employer. We estimate linear regression models via OLS of the form

$$\mathrm{Y}_{i,t} = \beta \mathrm{RECORD}_{it} + \tau_t + X_{it}\gamma + \sigma_{s(i,t)} + \epsilon_{it}, \tag{1}$$

where i indexes individuals, t indexes years, tau_t are year fixed effects, and X_{it} is a fully saturated set of interactions between year and demographic characteristics. Demographic characteristics include age, education level, gender, and an indicator for Swedish-born. $\sigma_{s(i,t)}$ are sector fixed effects, where the sector is either defined as industry or firm. We examine three outcomes: earnings, months worked, and log monthly wages.

The results are shown in Table 2. In columns 1 and 2, the outcome is total earnings. The specification in column 1 includes only RECORD_i and year fixed effects as explanatory variables. The β coefficient is -85.42, meaning that, conditional on year, the difference in earnings between WCRs and non-WCRs is about 85,000 SEK. This is 42% of the average earnings among non-WCRs. Column 2 replaces year fixed effects with fully saturated interactions between year and demographic characteristics. The residual earnings gap is -63.68. Demographic differences explain about one-quarter of the overall earnings gap. The remainder represents an earnings gap of 31%.

One reason that WCRs have lower earnings than non-WCRs is that they are less likely to work. In columns 3 and 4 we replace the outcome with months worked in a given year. Column 3 includes only RECORD_i and year fixed effects as explanatory variables. The β coefficient is -2.59, indicating that WCRs work for about two and a half fewer months than non-WCRs. Column 4 includes the

[16] Appendix Figure E.7 demonstrates that substantial labor market gaps between workers with and without records are seen throughout the sample period and appear larger during periods of high unemployment.

Table 1
Individual characteristics by WCR status

	No record	Active record
Male (%)	48.96	79.53
Swedish born (%)	86.26	78.46
Age	36.99	33.83
	(10.79)	(10.63)
Years of education	11.97	10.78
	(2.255)	(1.902)
Earnings (1000s SEK)	204.3	122.3
	(197.6)	(149.7)
Months employed during year	9.588	6.994
	(4.483)	(5.502)
Ever employed during year	85.59	67.58
	(35.11)	(46.81)
Tenure in main job (in months)	56.47	35.15
	(56.15)	(40.99)
Workplace size	451.1	287.2
	(1271.0)	(964.2)
Firm size	6467.2	4413.5
	(13582.2)	(11762.0)
Average coworker monthly wage (1000s SEK)	19.58	17.26
	(11.09)	(9.699)
Average firm coworker monthly wage (1000s SEK)	18.60	16.98
	(10.48)	(9.250)
Firm pay premium	0.298	0.242
	(0.730)	(0.757)
% of coworkers with active records	3.822	8.809
	(8.357)	(15.64)
% of firm coworkers with active records	3.931	8.081
	(7.655)	(14.52)
Workplace industry		
Agriculture and resources	3.203	3.608
Care and social services	10.11	9.106
Construction	4.825	9.611
Education	8.405	4.139
Health care	6.541	2.426
Hotels and restaurants	2.981	5.767
Manufacturing and industry	14.63	18.73
Public administration and defense	4.745	2.120
Retail and wholesale	11.15	11.45
Services	20.88	20.80
Unknown	0.934	1.757
Missing	11.60	10.49
Observations	107,454,183	6,945,896

For the baseline sample of working-age (18-55) adults each year, this table presents summary statistics separately for those with and without a record that year. Firm pay premiums are estimated using a standard worker-firm wage decomposition (Abowd et al., 1999; Card et al., 2016). See Appendix B for details.

TABLE 2
LABOR MARKET OUTCOMES BY WCR STATUS, 1990-2015

	Earnings		Months Worked		Log Monthly Earnings			
	Raw	+Demo.	Raw	+Demo.	Raw	+Demo.	+Industry	+Firm
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Criminal record	-85.42	-63.68	-2.59	-1.98	-0.30	-0.23	-0.20	-0.14
	(0.08)	(0.07)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Demographics		✓		✓		✓	✓	✓
Industry FE							✓	
Firm FE								✓
Non-WCR outcome mean	204.35		9.59		2.69			
Observations	114,400,079				96,668,650			

This table presents the results of estimating equation 1 for our baseline sample of working-age adults from 1990 to 2015. The dependent variable is earnings in columns 1 and 2, number of months worked in columns 3 and 4, and log monthly earnings in columns 5 through 8. The sample is restricted to those with positive earnings in columns 5 through 8. The columns labeled "Raw" only control for year fixed effects. Demographic controls (fully saturated interactions between year, age, education level, gender, and an indicator for Swedish-born) are included in columns 2, 4, and 6 through 8. Industry and firm effects are included in columns 7 and 8, respectively. Only the coefficient on RECORD is reported; standard errors clustered at the person level are reported in parentheses.

same demographic controls as in column 2. The residual gap in months worked is -1.98. Conditional on individual demographics, WCRs work about 20% fewer months than non-WCRs.

In columns 5 through 8, the outcome is log monthly earnings and the sample is limited to person-years with positive earnings. In column 5, where the specification includes only RECORD_i and year fixed effects as explanatory variables, the β coefficient is -0.30, indicating a 30 log point wage gap. This decreases in magnitude to 23 log points with the inclusion of demographic controls in column 6.

The next two columns add different sets of fixed effects for the job sector. Column 7 includes 1-digit industry fixed effects. The β coefficient is reduced to -0.20. WCRs work in industries where average pay is lower. Column 8 replaces industry fixed effects with firm fixed effects, reducing the gap to 14 log points. Even within an industry, WCRs work in firms where pay is lower.

In Appendix Table E.5 we focus on the cohorts of Swedish-born men for whom we have cognitive test score data measured during military conscription. These men were born between 1951 and 1987, excluding a few intervening years where scores are unavailable. We augment the demographic controls with test scores interacted with age and year. Conditional on demographic characteristics, further conditioning on these scores has a limited effect on the estimated earnings and wage gaps.[17]

In Table 3, we examine the extent to which demographic characteristics can account for differences in workplace characteristics between WCRs and non-WCRs. In columns 1 through 3 the outcome is the firm pay premium. We estimate a standard worker-firm decomposition for log monthly wages as in Abowd et al. (1999); Card et al. (2018) (details can be found in Appendix B). Column 1 includes only RECORD_i and year fixed effects as explanatory variables. The β coefficient is -0.06, indicating that WCRs work in firms that pay about 6% lower wages. Interestingly, adding demographic controls in column 2 increases the magnitude of the coefficient to -0.10. Column 3 adds fixed effects for 1-digit industry, reducing the coefficient magnitude to -0.08. Most of the sorting by firm pay premium is within industry. In columns 4 through 6 the outcome is the percentage of establishment coworkers that have an active criminal record. Column 4 includes only RECORD_i and year fixed effects as explanatory variables. The β coefficient is 5.66, indicating that WCRs work in establishments with a 5.66pp higher share of coworkers with an active record. Adding demographic controls (column 5) reduces the coefficient to 3.44pp. Adding industry fixed effects (column 6) makes little difference. The residual segregation by WCR status is almost entirely

[17] This in part reflects the fact that residual test score differences between WCRs and non-WCRs are modest, about 0.17 of a standard deviation.

TABLE 3
FIRM CHARACTERISTICS BY WCR STATUS, 1990-2015

	Firm pay premium			% of coworkers with record		
	Raw	+Demo.	+Industry	Raw	+Demo.	+Industry
	(1)	(2)	(3)	(4)	(5)	(6)
Criminal record	-0.06	-0.10	-0.08	4.89	3.11	3.02
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Demographics		✓	✓		✓	✓
Industry FEs			✓			✓
Non-WCR outcome mean					3.82	
% difference				128	81	79
Observations		94,870,182			86,928,644	

This table presents the results of estimating equation 1 where the dependent variable is the firm pay premium in columns 1 through 3 and percent of coworkers with a criminal record in columns 4 through 6. The sample includes working-age (18-55) adults from 1990 to 2015 with positive earnings in that year. The columns labeled "Raw" only control for year fixed effects, while demographic controls (fully saturated interactions between year, age, education level, gender, and an indicator for Swedish-born) are included in columns 2 and 5. Industry fixed effects are included in columns 3 and 6. Only the coefficient on RECORD is reported; standard errors, clustered at the individual level, are reported in parentheses.

within industry.

4.3 Segregation of WCRs across occupations

The occupational composition of firms varies both across and within industries. This section considers the extent to which WCRs also work in different occupations than non-WCRs. Appendix Table E.6 lists the 20 4-digit occupations in which WCRs are most and least prevalent in 2015, as well as their corresponding share of WCRs. This share is less than 0.5% in the 20 least WCR-prevalent occupations, which includes therapists, judges, prosecutors, chemists, and a number of education and care-related occupations. Background checks are mandatory for employment or occupational licensing in more than half of these occupations. One can also see from the 1st digit of the occupation code that WCRs are least prevalent in the broad occupation categories of managers, professionals, and technicians. In contrast, WCRs are most concentrated in construction and manufacturing, industry and transport, and elementary unskilled occupations. Some tangible examples include taxi, car and van drivers (12%), as well as many construction and manual jobs (e.g., painters, 12.3%; floor layers, 12.6%; building frame workers, 14.4%; roofers 15.5%; construction laborers, 18.9%; scaffold builders 26.3%).

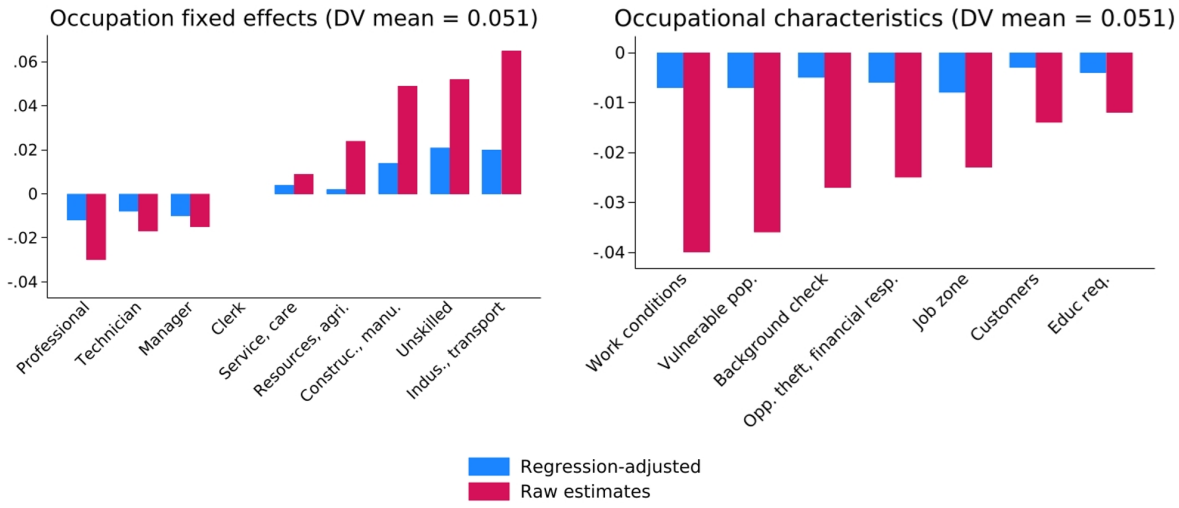
Such occupational sorting could simply occur from selection on the basis of observable charac-

teristics (e.g., gender, age, education) that are correlated with WCR status. We thus characterize how WCRs are distributed across occupations after conditioning on demographic characteristics and broad industry categories using the following linear regression specification:

$$\text{RECORD}_{it} = X_{it}\gamma + \mu_{d(i,t)} + \gamma_{k(i,t)} + \sigma_{s(i,t)} + \epsilon_{it}, \tag{2}$$

where t indexes year. We estimate equation (2) using data from 2005-2015.[18] The vector X_{it} includes fully saturated interactions between year, age, education level, gender, and an indicator for Swedish-born. $\gamma_{k(i,t)}$ are fixed effects for 1-digit industry categories, and $\sigma_{s(i,t)}$ are fixed effects for 1-digit occupation categories.

FIGURE 4
DISTRIBUTION OF WCRS ACROSS OCCUPATIONS AND OCCUPATIONAL CHARACTERISTICS



Note: These figures present the results of estimating equation 2 for 2005 to 2015 without controls (raw estimates, red bars) and with controls (regression-adjusted, blue bars). The panel on the left presents the estimates for each 1-digit occupation code in a single regression, where the omitted category is clerks. The panel on the right presents the estimated coefficients on a set of occupation characteristics, which are included one at a time in a series of regressions. All characteristics are measured in the O*NET data, with the exception of background check regulations. Confidence intervals are omitted from the figure since they are too small to visualize. All estimates are statistically significant at the 1% level.

Panel A of Figure 4 reports the $\sigma_{s(i,t)}$ coefficient estimates from Equation (2) when the other controls are excluded (*Raw*) and included (*Regression-adjusted*). Confidence intervals are omitted since most are too small to visualize. All estimates are statistically significant at the 1% level. Conditional on demographics and industry, WCRs are (relative to clerks, the omitted category) more

[18] Occupation information is missing for 17.6% of observations during this time period. We eventually plan to update this section using data from more recent years where the missing rate of occupation is much lower.

likely to be employed in service and care, resources and agriculture, construction and manufacturing, industry and transport, and elementary unskilled occupations, but less likely to be employed as professionals, technicians, or managers. The adjusted differences can be substantial–WCRs are about 40% less likely to be employed as professionals than in elementary unskilled occupations.

To better understand the nature of this sorting, we look at O*NET occupational characteristics and occupation by year mandatory background check requirements. See section 3.3 as well as Appendices A.2 and A.3 for descriptions of these data. Panel B of Figure 4 reports raw and adjusted coefficient estimates from Equation (2), replacing occupation fixed effects with a series of occupation characteristics. The raw estimates indicate that WCRs are less likely to work in occupations with: (i) high external customer contact, exposure to vulnerable populations, or the opportunity for theft and financial responsibility (i.e., when there is a perceived risk to the firm), (ii) mandatory background checks, (iii) higher education and skill (job zone) requirements, and (iv) better work conditions (i.e., when risk to the worker is low). Though markedly smaller when adjusting for observables, these relationships remain statistically significant and sometimes substantial. For example, WCRs are more than 10% less likely to work in occupations with better-than-average work conditions, involve contact with vulnerable populations, or with higher-than-average skill/experience requirements, and 6% less likely to work in occupations with mandatory background checks.[19]

5 Causal effects of a criminal record

There are large residual differences in employment and earnings between WCRs and non-WCRs with similar demographic characteristics, including education and cognitive test scores. This gap may reflect the causal effect of a criminal record on labor market outcomes, but it may also reflect selection. WCRs may have low earnings or limited attachment to the labor market even before they acquire criminal records. Causality may also flow in the reverse direction. Suspects with low income may, for instance, be more likely to be charged and end up with a record. Furthermore, limited opportunities in the labor market may increase the chances that someone engages in crime. We use a novel research design to estimate the causal effect of a criminal record on labor outcomes.

[19] This specification also controls for whether background checks are sometimes but not always mandatory (coef. 0.0013, sd 0.0001); this has little impact on the estimated coefficient for always mandatory background checks.

5.1 Identification strategy

To isolate the causal effect of acquiring a criminal record, we compare the employment and earnings trends of two groups of workers in an event study framework. Previous studies have compared people convicted at a young age to those convicted later (Grogger, 1995; Rose, 2021; Agan et al., 2024b), using the latter before their conviction to estimate the counterfactual for the former. This approach, though broadly applicable, has at least two limitations. First, it may conflate the effects of the conviction with the circumstances that led to the (alleged) offense and arrest. For example, a person convicted of possession of illicit narcotics may experience a decrease in earnings due to both the conviction itself and the circumstances that led to the arrest in the first place (e.g., the development of an addiction). Second, by construction, the comparison group is more likely to be convicted in the future than the treatment group. Hence, with foresight, an employer primarily concerned about the risk of future offenses would prefer to hire the past offender over the future offender.

Our approach leverages data on individuals suspected of an offense but not charged. We define the treatment group as adults who are both suspected of and charged with a criminal offense. We construct a comparison group of matched adults who are suspected of a similar offense but not charged.[20] Typically, people enter the suspects register as the result of a formal police investigation, and both those who are charged or not will be arrested. In Sweden, nearly all of the treatment group acquires a criminal record associated with the offense that employers can access, while the comparison group does not.[21] Our main identifying assumption is that, absent the charge, the two groups would follow similar labor market paths after the suspected offense.

This research design offers at least two key strengths compared to alternative approaches. First, the two groups likely share similar precipitating circumstances that led police to suspect them of similar offenses. These circumstances include the activities in which they engaged, the people with whom they associated, and their social and economic background and prospects.

Second, it is reasonable to believe the two groups have engaged in similar conduct. In particular, prosecutor charge decisions are influenced by important factors unrelated to a suspect's underlying conduct. Local prosecutor offices vary in their resources and practices, as does the assigned

[20] In practice, the control group also includes individuals who are charged but acquitted. These individuals also do not get a record. Given the extremely small numbers of individuals acquitted in court, we do not believe this will substantially affect the results, and will be able to confirm this with supplementary data on acquittals in the future.

[21] The names of individual crime suspects are rarely reported in Swedish media; two uncommon exceptions are for cases in the public interest (e.g., politicians) or when the police are searching for suspects of very serious offenses.

prosecutor. Even among comparable offenses, cases vary in the availability and quality of evidence.

Data from the suspects register support the idea that charge decisions often vary for reasons unrelated to suspect conduct. The reason prosecutors most frequently cite for not pursuing a charge is "insufficient evidence". For dropped charges where a reason is specified, prosecutors cite "insufficient evidence" for 60% of offenses, compared to just 2% for "not guilty" and 14% for "not a crime". We interpret this as evidence that, for prosecutors, factors like evidence quality—rather than the nature of the suspected conduct itself–are key determinants in the charge decision.[22]

Consistent with an important role for prosecutor discretion, charging rates vary substantially across prosecutor offices for the same suspected offense and even for the same individual suspect. In cases handled by prosecutor offices (accounting for about 80% of suspected offenses)[23], prosecutors pursue charges for 55% of suspected offenses. The standard deviation in charge rates across offices is 12.4%. This variation remains substantial even after conditioning on the specific offense (10.3%) or both the offense and the suspect involved (8.7%).

Ultimately, we use the data to assess the validity of this research design. Specifically, we will show that, once matched, the treatment and comparison groups (1) follow very similar earnings paths before the suspected offense and (2) are suspected of future offenses at similar rates.

5.2 Matching charged and non-charged suspects

Our goal is to create a sample of people who are charged with a criminal offense for the first time and match them with a comparison group who are suspected of a similar offense but not charged, under similar circumstances.

We collapse suspected offenses to the person-year level. For our core sample of events, we limit to person-years with at least one associated suspected offense where the person: (i) does not have a prior charged offense; (ii) is between the ages of 22 and 40 in the event year, and (iii) is present in Sweden (and hence, in our data) at least 4 years before and 5 years after the event. We make the first restriction to focus on the extensive margin of having any criminal record. (Later, we look at subsequent offenses.) We make the second restriction so that we can (1) observe pre-trends and compare earnings for charged and non-charged suspects before the event and when they are likely out of school and (2) evaluate long-term effects on earnings before retirement. Limiting to those 22 or older is the more meaningful age constraint: among those ever charged with an offense, 36%

[22] This is also consistent with evidence from the US. See for example Frederick and Stemen (2012).

[23] As discussed in section 2.1, police typically handle less serious offenses. A small percentage of cases are handled by more specialized authorities, e.g. those involving complex financial crimes.

are charged between the ages of 15 and 21. Given that the suspect register begins in 1995 and we require five years of post-event data, our core sample of events occur between 1995 and 2010.

Table 4 provides descriptive statistics on person-year events meeting these criteria. Statistics refer to either the focal suspected offenses or the suspect's characteristics in the year before the focal event. In 34% of events, a suspected offender is charged with at least one offense.[24] We define these suspects as *charged*.

Charged and non-charged suspects are suspected of different types of crimes. Non-charged suspects are more likely to be suspected of a violent offense (48.81% vs. 25.63%), and less likely to be suspected of property (31.38% vs. 39.45%), traffic (5.57% vs. 28.13%), or narcotics offenses (4.68% vs. 11.86%). These differences likely stem in part from varying challenges in evidence collection. For example, in cases where someone is suspected of driving while intoxicated, evidence from a breathalyzer test may meet the standard for both suspicion and conviction, making it rare to be suspected without ultimately being charged.

Charged and non-charged suspects are more similar in their demographic and job characteristics, though there are some key differences. Non-charged suspects are about three percentage points less likely to be Swedish-born (69.04% vs. 71.77%) and have higher baseline earnings (173.3K SEK vs. 156.0K SEK) and months of employment (8.222 vs. 7.990). Interestingly, the two groups work in similar industries and in establishments where 6% to 7% of coworkers have active records.

We match charged and non-charged suspects by partitioning events into detailed demographic and offense-based cells, then weighting non-charged cells to align with the distribution of charged cells. We define cells based on the following:

1. Year of suspected offense,
2. Suspect age in the year of suspected offense,
3. Number of prior years with suspected offenses,
4. Type and severity of suspected offenses,
5. Suspect gender, and
6. Suspect income in year before the suspected offense.

[24] This is comparable to the share of criminal charges that are pursued in US state courts rather than dropped or dismissed (Feigenberg and Miller, 2021).

Table 4
Characteristics for suspects and suspected offenses

	All		Matched and Weighted	
	Suspects	Convicted	Suspects	Convicted
Age at time of suspected offense	30.54	29.54	29.56	29.56
	(5.628)	(5.709)	(5.732)	(5.732)
Year of suspected offense	2003.8	2003.0	2002.8	2002.8
	(4.544)	(4.658)	(4.717)	(4.717)
Order of offense	1.353	1.279	1.136	1.136
	(0.715)	(0.632)	(0.404)	(0.404)
Violent (%)	48.81	25.63	23.85	23.85
Property (%)	31.38	39.45	40.34	40.34
Traffic (%)	5.572	28.13	24.28	24.28
Narcotics (%)	4.677	11.86	5.877	5.877
Sex (%)	4.107	2.246	1.423	1.423
Other (%)	15.85	12.65	8.004	8.004
Any major offense	0.392	0.262	0.209	0.209
Fine or less (%)	0	59.25	0	59.14
Probation and other (%)	0	31.98	0	33.28
Prison (%)	0	8.767	0	7.583
Male (%)	64.99	69.38	69.67	69.67
Swedish born (%)	69.04	71.77	73.13	72.82
Age	30.03	29.02	29.03	29.03
	(5.669)	(5.742)	(5.772)	(5.770)
Years of education	11.53	11.35	11.53	11.42
	(2.023)	(1.913)	(1.952)	(1.905)
Earnings (1000s SEK)	173.3	156.0	165.7	161.4
	(169.6)	(145.8)	(161.2)	(146.7)
Months employed year	8.222	7.990	8.138	8.128
	(5.168)	(5.221)	(5.190)	(5.187)
Ever employed during year	76.74	75.67	76.16	76.29
	(42.25)	(42.90)	(42.61)	(42.53)
Tenure in main job (in months)	37.09	34.77	35.72	35.73
	(36.43)	(34.41)	(34.70)	(34.93)
Workplace size	323.2	315.3	297.7	318.1
	(998.7)	(980.6)	(937.0)	(982.6)
Firm size	4934.7	4561.9	4346.3	4503.1
	(11595.2)	(11451.7)	(10926.2)	(11348.5)
Average firm coworker monthly wage (1000s SEK)	16.96	16.62	16.60	16.82
	(9.421)	(8.761)	(9.160)	(8.795)
% of firm coworkers with active records	6.266	6.601	6.142	6.357
	(13.51)	(10.58)	(15.63)	(10.01)
Firm pay premium at main job	0.182	0.206	0.192	0.229
	(0.794)	(0.798)	(0.800)	(0.786)
Agriculture and resources	3.204	3.653	3.881	3.854
Care and social services	11.24	10.52	9.652	10.08
Construction	6.686	7.660	7.837	7.769
Education	5.528	4.549	4.594	4.588
Health care	3.962	3.474	3.511	3.409
Hotels and restaurants	6.903	7.231	6.960	6.798
Manufacturing and industry	18.13	20.12	19.01	20.74
Public administration and defense	3.773	2.484	3.243	2.512
Retail and wholesale	13.85	14.82	14.70	15.21
Services	24.93	23.57	24.89	23.36
Unknown	1.780	1.898	1.681	1.665
Missing	0.0165	0.0125	0.0333	0.00627
Observations	158,932	81,261	100,186	60,302

This table describes the suspects and suspected offense combinations of people and years ("person-years") satisfying the sample criteria described in section 5.2. The first column includes all non-charged suspects. The second column includes all charged suspects. The third column includes all non-charged suspects that can be matched to charged suspects, re-weighting across cells to match the distribution among charged suspects. The construction of cells is described in detail in section 5.2. The fourth column includes all charged suspects that can be matched to non-charged suspects. The top panel describes suspected offenses in the event year. Because there can be multiple suspected offenses corresponding to an event, crime types sum to more than one. Order of offense indicates whether this is the first year, second year, or subsequent year that a person has been suspected of an offense. Sentence type refers to the most serious sentence for all suspected offenses in the event year. The bottom panel describes suspects in the year before the focal suspected offense. The construction of firm pay premiums is discussed in Appendix B.

Offense types are broadly characterized as violent, property, narcotics, traffic, sex, and other offenses. Severity is categorized based on whether any specific suspected offense code falls in the top quartile of expected prison sentence length, conditional on a charge. We denote these cases as *major* offenses.[25] We categorize income by dividing suspects into quintiles within each combination of year and age at the time of the suspected offense, including suspects with zero earnings.

We restrict our analysis to cells that contain both charged and non-charged suspects. While 56% of cells contain both types of suspects, these cells account for 74% of charged suspects. Columns 3 and 4 of Table 4 show the characteristics of events for our final sample of (weighted) non-charged suspects and charged suspects, which includes about 100,000 events in the comparison group and 60,000 events in the treatment group.

Note that the same person can be included multiple times in the analysis. For example, a person suspected of an offense at ages 22, 26, and 30, but only charged at age 30 would contribute three events: two events at ages 22 and 26 to the comparison group and one event at age 30 to the treatment group. We cluster standard errors at the person level.

By construction, matched charged and non-charged suspects have identical suspected offense characteristics. They also have more similar demographic and job characteristics, even on dimensions that we do not match directly; the share Swedish born and average months worked are now statistically indistinguishable.

5.3 Preliminary Analyses: Descriptives and Identifying Assumptions

Before discussing the matched event study design results in the next subsection, we first provide descriptive evidence illustrating the need for and value of our research design, as well as evidence of its validity.

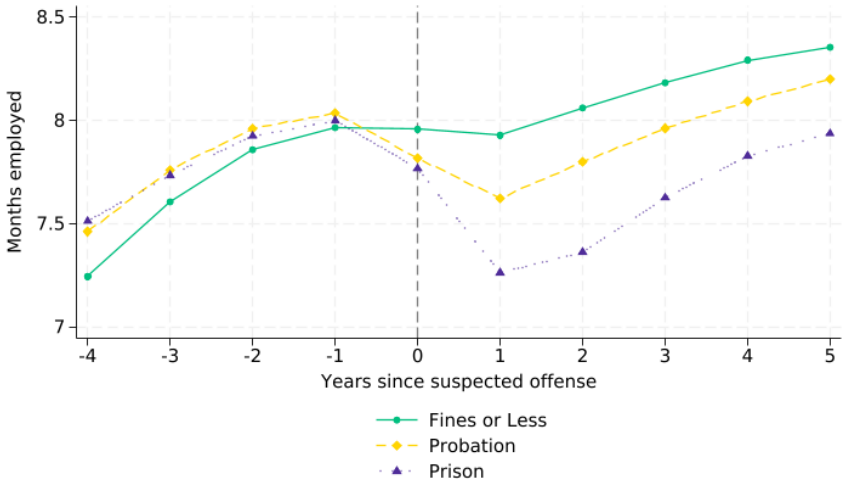
Figure 5 describes the labor market trends for the treatment group of charged suspects in our matched sample separately for three categories of sentences: fine or less (59.14%), probation (33.28%), and prison (7.58%). Specifically, panel A plots months employed while panel B plots earnings in event time for charged suspects, where the event is the year of the suspected offense. For both outcomes, charged suspects are on upward trends before their suspected offense. In the year of the suspected offense and the following year, months employed decrease significantly, and earnings decrease or plateau for those receiving probation and prison sentences. The fact that

[25] The five most common major criminal offenses are: threat, fraud, vehicular theft, tax fraud, and fencing (receiving or dealing stolen goods). The five most common minor offenses (and most common offenses more generally) are: theft, non-DUI traffic (typically driving without a valid license), assault, narcotics use, and narcotics possession.

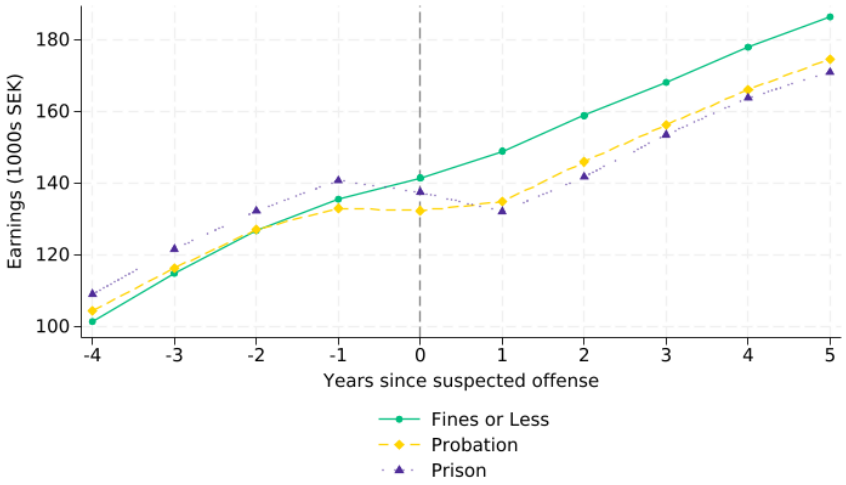
prison sentences are uncommon and earnings decrease significantly for probation sentences suggests a limited role for incapacitation effects in explaining the pooled effects we document below. For more minor offenses where the punishment is a fine or less, months employed plateau, while the change in earnings growth is more muted.

Figure 5
Employment and earnings after the first charged offense

(a) Months employed



(b) Earnings



Note: This figure plots months employed (panel A) and earnings (panel B) before and after suspected offenses for the sample of charged suspects described in section 5.2. We limit events to person-years with at least one associated suspected offense where the person (1) does not have a prior charge; (2) is between the ages of 22 and 40 at the time of the suspected offense; and (3) is present in Sweden at least 4 years before and 5 years after the suspected offense. Outcomes are plotted separately by the most serious sentence associated with suspected offenses in the event year.

While the patterns in Figure 5 suggest that a charged offense has negative effects on labor market outcomes, they do not tell us what counterfactual employment and earnings would look like. In the next section, we compare trajectories like these for matched charged and non-charged

suspects, where the latter group stands in for the counterfactual of the former.

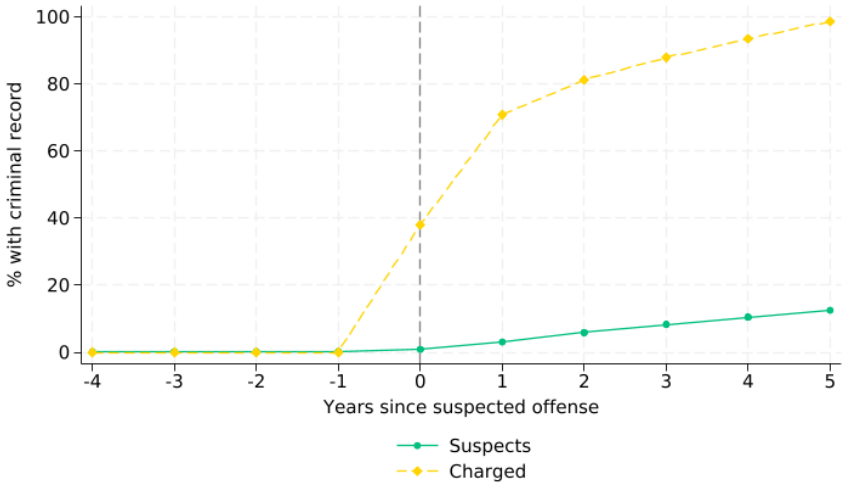
We next look at the percentage of suspects with a criminal record. This is akin to a first stage. Panel A of Figure 6 shows the percentage of charged and non-charged suspects with an active record over event time. By construction, no one in either group has an active record before the event. In the event year, the percentage with a record in the treatment group increases to 38%. This is below 100% because some suspects are not convicted in the year of the alleged offense. In addition, as discussed in section 2.3, some minor offenses were not included in background checks before 2000 and hence did not generate a criminal record. In the following year, the share with a criminal record increases to 71% and eventually reaches 99% five years post-event. The percentage of people in the comparison group with a record also increases after the event, as some non-charged suspects subsequently face charges for other offenses. Five years post-event, 13% of the comparison group has an active record, 86 percentage points less than the treatment group.

Finally, we examine the percentage of people who are suspected of an offense in a given year. A key concern with our research design is that the treatment group may be more likely at baseline to engage in criminal activity, independent of having a record. For example, they may be more likely to be guilty of the suspected focal offense. In that case, income differences between the treatment and comparison group that emerge after the event may reflect differences in future criminal behavior rather than the effects of a criminal record per se. On the other hand, acquiring a record may have criminogenic or, given expungement rules, specific deterrence effects.

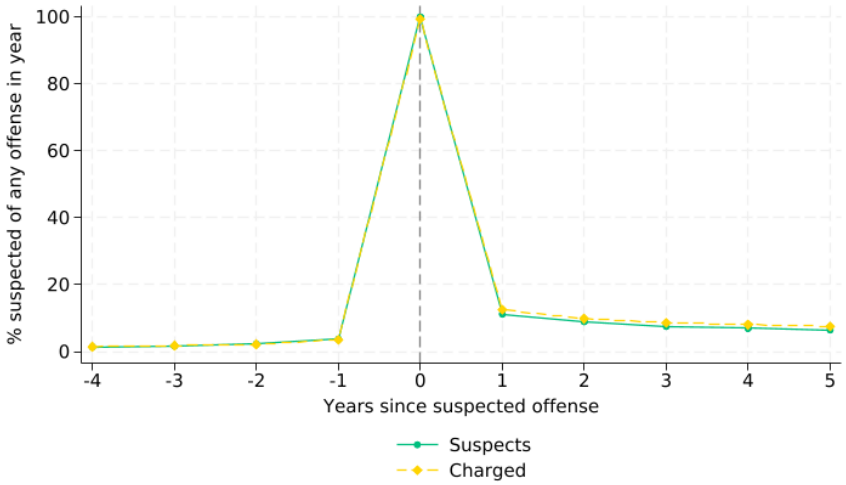
The results are shown in panel B of Figure 6. By construction, the share suspected of an offense is 100% for both the treatment and comparison groups at event time $t = 0$. The groups are matched on their number of years with suspected offenses before the event, though they were not matched on the timing of those suspected offenses. In practice, the two groups are suspected of offenses at nearly identical rates by year before the focal event. For example, in the year before the focal event, 3.9% of both groups are suspected of an offense. Following the focal event, the treatment group is suspected of offenses at slightly higher rates. One year post-event, 12.6% of the treatment group and 11.1% of the comparison group are suspected of another offense; by five years post-event, these rates are 7.7% and 6.5%. This modest difference may reflect slightly higher baseline propensities in the treatment group to engage in crime and/or slight increases in offending rates (or law enforcement suspicion rates) as a result of acquiring a criminal record.

Figure 6
Criminal record status and suspected offenses in event time

(a) Criminal record status



(b) Suspected offenses



Note: This figure plots the percentage of people with an active criminal record (panel A) and a suspected offense by year (panel B) before and after suspected offenses for the sample of charged and matched non-charged suspects described in section 5.2. We limit events to person-years with at least one associated suspected offense where the person (1) does not have a prior charge; (2) is between the ages of 22 and 40 at the time of the suspected offense; and (3) is present in Sweden at least 4 years before and 5 years after the suspected offense. Outcomes are plotted separately for non-charged (green solid line) and charged (orange dashed line) suspects.

5.4 Results

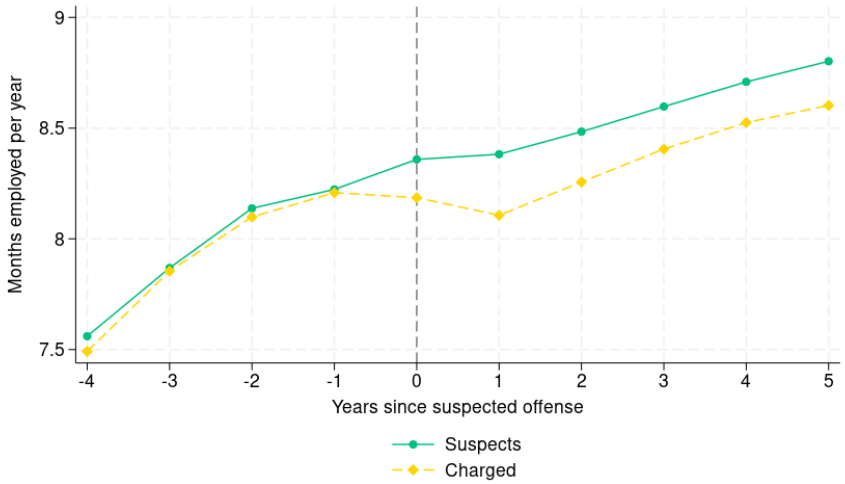
We present results in three ways. First, we plot (weighted) means for charged and non-charged suspects in event time. Second, we estimate traditional event study models using two-way fixed effects and report coefficient estimates. Our matching strategy circumvents recent concerns with these models by restricting the estimation to "clean" comparisons between charged and non-charged suspects within cohorts (Roth et al., 2023). Third, in the Appendix, we nonetheless construct and report event study estimates using the imputation-based methodology of Borusyak et al. (2024). These estimates are similar to those derived from traditional event study models.

We start with the labor market outcomes. We examine months employed in panel A and earnings in panel B of Figure 7. Although the treatment and comparison groups are only matched to have similar earnings in the year before the focal event, the two groups have virtually identical employment rates in each pre-event year. Average months employed increases from about 7.5 months four years before the event to 8.25 months in the year before the event. Interestingly, among non-charged suspects, the employment rate plateaus in the year following the event, and continues to increase thereafter. This plateau could reflect the effects of whatever circumstances led that group to be suspected of a crime in the first place. Charged suspects see a decrease in employment both in the year of the suspected offense and the following year. A gap between charged and non-charged suspects of about 0.2 months persists for at least four years, which is about 2% of employment in the comparison group. This in part reflects a difference in the share of people with significant unemployment spells. Charged suspects are 1.5 percentage points less likely to work more than 6 months in the year, compared to a baseline of about 70% among non-charged suspects.

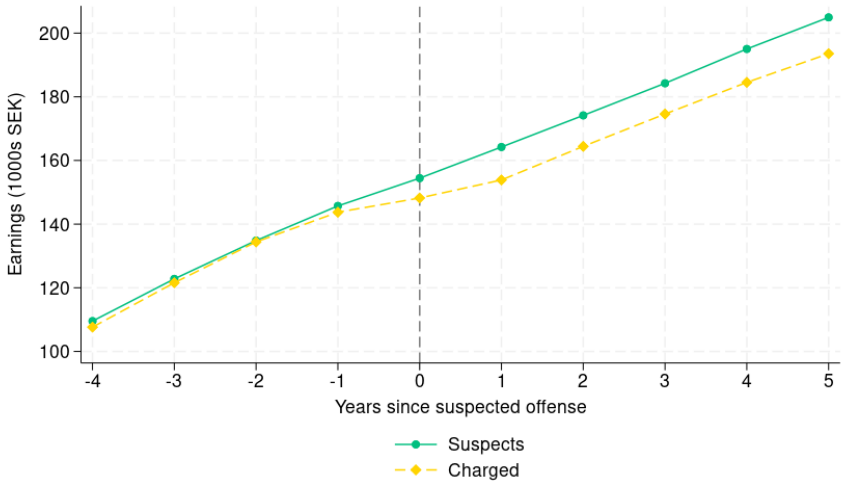
The two groups also follow very similar earnings profiles before the focal event, with earnings increasing by about 13,000 SEK each year. Non-charged suspects continue on this approximately linear trend after their focal suspected offense. By contrast, charged suspects experience a relative drop in earnings in the year of the focal suspected offense, and the gap between the treatment and comparison group grows to about 10,000 SEK by the year after the event. The gap in levels remains roughly constant for at least four years. For a smaller sample of events from 1995 to 2001, this gap in earnings persists for over a decade, after most records are expunged (see Appendix Figure E.11).

Figure 7
Acquiring a criminal record reduces employment and earnings

(a) Months employed



(b) Earnings



Note: This figure plots months employed (panel A) and earnings (panel B) before and after suspected offenses for the sample of charged and matched non-charged suspects described in section 5.2. We limit events to person-years with at least one associated suspected offense where the person (1) does not have a prior charge; (2) is between ages 22 and 40 at the time of suspicion; (3) is present in Sweden at least 4 years before and 5 years after the suspected offense. Outcomes are plotted separately for non-charged (green solid line) and charged (orange dashed line) suspects.

We replicate our findings using event study models of the form

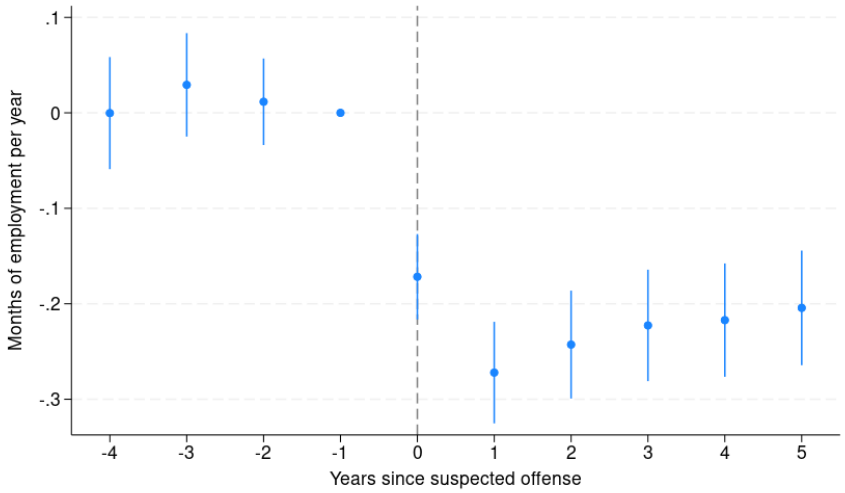
$$Y_{i\tau t} = \gamma_{c(i,\tau),t} + \sum_{j=-4}^{5} \lambda_j D^j_{i\tau t} + \epsilon_{i\tau t} \tag{3}$$

where i indexes people, τ indexes the year of focal suspected offense, and t indexes years. $\gamma_{c(i,\tau),t}$ are year effects that are specific to a given cell of suspects, $c(\cdot,\cdot)$, where cells are defined as above. The $D^j_{i\tau t}$ terms are event time indicators for the treatment group such that $D^j_{i\tau t} = D_{i\tau} 1_{t=\tau+k}$, where $D_{i\tau} = 1$ if (i,τ) corresponds to a suspected offense that leads to a criminal charge.

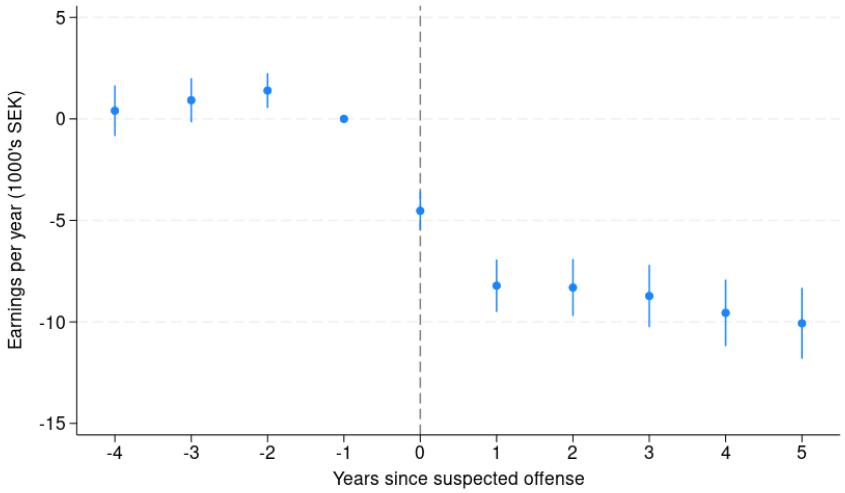
Figure 8 provides coefficient estimates (λ_j) for months employed (panel A) and earnings (panel B). The same patterns emerge: five years post-event, months employed decreases by about 0.2 months and earnings decrease by about 10,000 SEK.

FIGURE 8
EVENT STUDY ESTIMATES FOR EMPLOYMENT AND EARNINGS

(a) Months employed



(b) Earnings



Note: This figure plots the event time coefficients (λ_j) from the event study specification (3). In panel A the outcome is months employed. In panel B the outcome is earnings.

5.5 Heterogeneous effects

In this section, we measure the heterogeneous effects of acquiring a criminal record as a function of suspected offense characteristics, suspect characteristics, and contextual factors.

We first split the sample by whether the set of suspected offenses includes any major offense—

about 20% of events. We estimate the event study specification (3) separately for each subsample. Columns 1 and 2 of Table 5 report the five year post-event coefficients (λ_j) and the remaining coefficients are reported in Appendix Table E.7. Effects are larger in absolute terms for more serious offenses. Months employed decrease by about 0.15 for less serious offenses and about 0.4 for more serious offenses. Differences in proportional effects are even larger because those suspected of more serious offenses have fewer months of employment at baseline. Months employed decrease by about 2% for less serious offenses and 4% for more serious offenses. Earnings effects follow a similar pattern, decreasing by about 4% for less serious offenses and 8% for more serious offenses.

We next look at whether a suspect is employed at the time of their suspected offense. Acquiring a criminal record could worsen labor market outcomes because employers care about whether a job applicant or employee has a record. But acquiring a record could also worsen labor market outcomes because the adjudication process itself is disruptive and makes it difficult for suspects to work at pre-existing jobs.[26] This induced job displacement may have negative long-term labor market consequences that are separate from the effects of a record per se.

There is reason to be skeptical that job displacement plays a primary role here. In particular, both charged and non-charged suspects experience high job turnover rates: five years post-event, only 24.6% of non-charged suspects and 23.5% of charged suspects have the same employer they had at the time of their suspected offense. Nonetheless, we split the sample by employment status at baseline to clarify the role of job displacement.[27] If suspects with and without jobs both experience significant negative effects when charged, that suggests the role of job displacement is limited.

Columns 3 and 4 of Table 5 present results. As expected, those working at baseline have higher earnings. Yet, in proportional terms, the effects of acquiring a record are similar for both groups. We conclude that the effects we measure are not driven primarily by job displacement.

The remaining columns of Table 5 provide event study estimates for earnings effects by various additional splits. Columns 5 through 8 split the sample by the type of offense. We limit to events that include at least one of the following types of offenses: violent, property, traffic, and narcotics. Note that events including multiple types of suspected offenses are included in multiple samples. Columns 9 and 10 split the sample in half by suspect age. Columns 11 and 12 split the sample period in half.

Coefficient estimates are similar across samples. The one exception is that effects are much

[26] For example, a suspect may have to attend court hearings at times when they would typically work, potentially leading them to separate from their job.

[27] 66% of charged suspects are working in the month of their suspected offense.

TABLE 5
HETEROGENEITY IN THE EARNINGS EFFECT OF A CHARGED OFFENSE

	By offense severity		By baseline status		By offense type				By age		By time period	
	Minor	Major	Unemployed	Employed	Violent	Property	Narcotics	Traffic	22–29	30–40	'95-'03	'04-'10
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
θ_5	-7.83	-14.31	-4.00	-10.90	-8.85	-7.64	-24.88	-9.23	-9.96	-9.06	-8.77	-10.29
	(1.01)	(1.88)	(1.43)	(1.16)	(1.40)	(1.44)	(3.62)	(2.67)	(1.11)	(1.42)	(1.20)	(1.32)
Non-charged outcome mean	...	...	...	...	203.3631	170.3827	188.3137	243.666	194.6622	211.8024	186.7118	220.5373
Observations	1165480	420220	449150	1063670	597120	579170	71550	217680	801610	784090	773550	812150

This table shows event time coefficients (λ_j) from the event study specification (3), where the specification is estimated separately for various subsamples of events. Columns 1 through 4 split the sample by the type of offense (violent, property, narcotics, traffic). Events that includes multiple types of suspected offenses will be included in multiple samples. Columns 5 and 6 split the sample in half by suspect age: 22–29 in column 5 and 30–40 in column 6. Columns 7 and 8 split the sample period in half: 1995–2003 in column 7 and 2004–2010 in column 8.

larger for those suspected of a narcotics offense. In this subsample, a charge decreases earnings by 20,000 SEK to 25,000 SEK.

5.6 Subsequent offenses

To this point, we have focused on the first time a person is charged with an offense, where that person is at the margin of having any criminal record. We also apply the same research design to look at the effect of being charged with an offense for the *second time*.

We provide further details on this exercise in Appendix C. We find effects on months employed (5%) and earnings (10%) that are about twice as large.

5.7 Decomposition by firm type

A central goal of this paper is to document whether and how the negative employment and earnings effects of a criminal record are mediated by employer heterogeneity. In this section, we ask whether acquiring a criminal record causes WCRs to reallocate across employers—for example, from more discriminatory firms to less discriminatory firms or non-employment—and how any decreases in wages are distributed across employers.

We first characterize firms by how a candidate's criminal record affects the chances that the firm hires them. We interpret this as a measure of how discriminatory or "WCR-friendly" an employer is. We then examine how the overall effects of acquiring a record on months employed, earnings, and wages are distributed across employer types.

We follow the same intuition of our suspect research design in a more flexible way. Broadly, we ask: among recently hired workers with past suspected offenses, which firms are less likely to hire WCRs? If a firm's proportion of hires with records is unusually low compared to what we would expect based on the suspected offense history of its hires, we classify it as less willing to hire WCRs.

More concretely, we use data on new hires, where we define a worker as a new hire if that year is the first time the worker is observed at the firm since the beginning of our sample in 1990.[28] We divide people randomly into two groups. We use the first group to classify firms and the second group later to measure the heterogeneous effects of a criminal record by firm type. For each hire i at time t, we calculate their propensity score for having a criminal record that year based on their suspected event history. We denote this propensity by $P(\text{RECORD})_{it}$. To construct

[28] We explicitly exclude firm operators from the sample because we later use operator characteristics to describe firms. The firm operator is a high-level manager at the firm that is identified by the tax authority.

$P(\text{RECORD})_{it}$, we estimate a probit model for conviction for each suspect in each year they were suspected of a crime, focusing on the most serious suspected offense each year. We predict conviction based on age, gender, Swedish born status, suspected offense history, and suspected crime type. We then carry this probability of conviction forward for the number of years that a suspect convicted of said offense would have had a record (according to the expungement rules). We refer to the set of hires where $P(\text{RECORD})_{it} > 0$ as *at-risk hires*. Among all at-risk hires, 56% have a criminal record and the average value of $P(\text{RECORD})_{it}$ is 0.56.

Our goal is to measure firm-level tendencies to hire WCRs conditional on their hires' risk of having a criminal record. For each at-risk hire (i,t) we measure $\Delta_{it} = \text{RECORD}_{it} - P(\text{RECORD})_{it}$, the difference between whether that hire has a criminal record and their propensity score. We demean these values to have mean zero in each year. We define the firm measure as

$$\theta_j = E[\Delta_{it}|J(i,t)=j] = E[\text{RECORD}_{it} - P(\text{RECORD})_{it}|J(i,t)=j; P(\text{RECORD})_{it} > 0]. \quad (4)$$

where the expectation is taken over workers hired by firm j ($J(i,t)=j$). Most firms make few at-risk hires, so statistical noise is an important concern when classifying firms.[29] A firm that makes only a handful of at-risk hires may hire few WCRs by chance alone, even if they do not put weight on criminal records per se when hiring. To address this issue, we use an empirical Bayes (EB) approach (Walters, 2024). We construct a prior for each firm using a random forest trained with five features: 1-digit industry, 2-digit industry, number of employees, number of at-risk hires, and the proportion of their employees with criminal records. We estimate the sample analog of θ_j, $\hat{\theta}_j$, and take a weighted average of the same estimate and the prior to construct our EB measure, $\hat{\theta}_j^{EB}$. We put more weight on the prior when the sample estimate $\hat{\theta}_j$ is less precise. More details on our empirical Bayes procedure are provided in Appendix D.

We then categorize firms as follows. We take the non-charged suspects in the matched sample, limiting to the half of the sample *not* used to construct $\hat{\theta}_j^{EB}$, and look at the firms where they work during the event study window. We divide these firms into terciles based on their value of $\hat{\theta}_j^{EB}$, using the event-level weights used for matching described in section 5.2. We label these firm terciles as "low propensity", "medium propensity", and "high propensity", where propensity refers to how often a firm hires WCRs. Table 6 describes the workplace characteristics of suspects at these three categories of firms.

[29] For the set of firms with any at-risk hires, the median firm has four at-risk hires.

TABLE 6
FIRM DESCRIPTIVE STATISTICS BY TERCILE

	Firm WCR Hiring Propensity		
	Low	Medium	High
Firm size	6126.7	7373.9	884.4
	(11430.3)	(14524.1)	(2934.3)
Average firm coworker monthly wage (1000s SEK)	18.23	15.04	15.13
	(10.44)	(7.735)	(8.798)
% of firm coworkers with active records	3.051	5.395	11.67
	(3.745)	(3.721)	(11.23)
CR firm effect ($\hat{\theta}_j^{EB}$)	-5.069	-0.689	3.350
	(5.333)	(0.558)	(3.037)
firm pay premium	0.0403	-0.0885	-0.0574
	(0.984)	(1.074)	(1.096)
Log value added per worker	12.45	12.17	12.24
	(1.083)	(1.221)	(1.005)
Publicly-owned	0.392	0.373	0.0346
	(0.488)	(0.484)	(0.183)
Firm industry:			
Agriculture and resources	1.313	1.888	4.514
	(11.38)	(13.61)	(20.76)
Manufacturing and industry	9.842	14.31	35.59
	(29.79)	(35.01)	(47.88)
Construction	2.491	4.599	11.55
	(15.58)	(20.95)	(31.97)
Retail and wholesale	13.10	10.92	10.06
	(33.74)	(31.19)	(30.09)
Hotels and restaurants	4.663	8.066	11.11
	(21.08)	(27.23)	(31.43)
Education	5.927	16.51	1.330
	(23.61)	(37.13)	(11.45)
Health care	21.45	23.05	1.345
	(41.05)	(42.12)	(11.52)
Public administration and defense	7.417	2.199	0.276
	(26.20)	(14.67)	(5.244)
Services	30.51	16.52	22.38
	(46.04)	(37.14)	(41.68)
N firms	16,725	9,240	31,814

This table reports descriptive statistics for three categories of firms employing non-charged suspects in our final matched event study sample. We take the non-charged suspects in the final matched sample, limiting to the half of the sample *not* used to estimate $\hat{\theta}_j^{EB}$, and look at the firms where they work during the event study window. We divide these firms into terciles based on their value of $\hat{\theta}_j^{EB}$, using the event-level weights described in section 5.2. We label these firm terciles as "low propensity", "medium propensity", and "high propensity". Firm pay premiums are estimated using a standard worker-firm wage decomposition (Abowd et al., 1999; Card et al., 2016). See Appendix B for details.

The average values of firm fixed effects, $\hat{\theta}_j^{EB}$, are -5.07, -0.69, and 3.35 at low, medium, and high propensity firms, indicating that when medium and high propensity firms hire at-risk employees, they are 4.4 and 8.4pp more likely to hire WCRs than low propensity firms, conditional on worker risk. The percentage of coworkers with criminal records is 3.1% at low propensity firms, 5.4% at medium propensity firms, and 11.7% at high propensity firms. Interestingly, as measured by firm pay premiums, high propensity firms are higher-paying than than both medium propensity and low propensity firms. Low propensity firms are higher-paying than medium propensity firms.

5.7.1 Employment and earnings changes by firm type

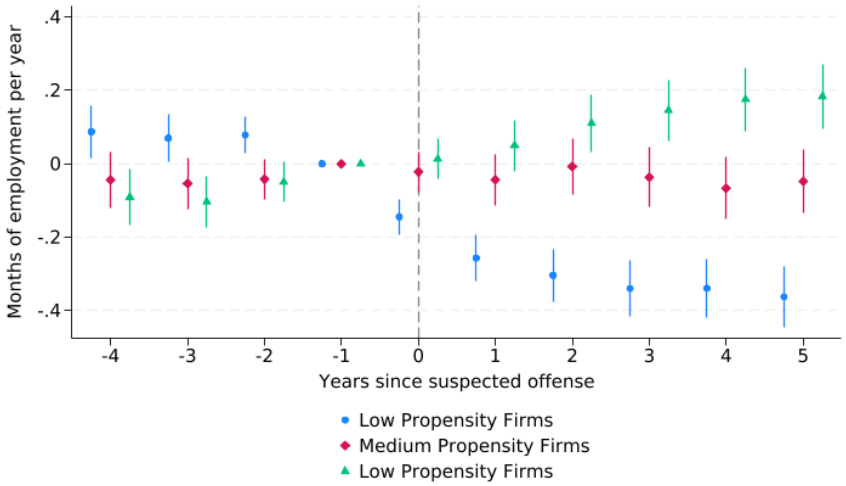
Next, we estimate event study specifications where the outcome is MONTHS EMPLOYED$_{i\tau t}$ or EARNINGS$_{i\tau t}$ interacted with an indicator for whether the firm where person i at time t is working is in a particular tercile. The coefficients can be interpreted as the employment or earnings losses (or gains) at a specific set of firms, unconditional on where people are working. For example, a criminal record could reduce earnings at a set of firms either because it decreases the chances of working in that set, or it decreases earnings conditional on working in that set. We estimate this model using the randomly selected half of workers that were *not* used to estimate $\hat{\theta}_j^{EB}$.

Event study estimates for each tercile are shown in Figure 9. Note that the coefficients are additive: the sum of coefficients across terciles will roughly equal the total earnings effect, except for the fact that some small firms are not classified.

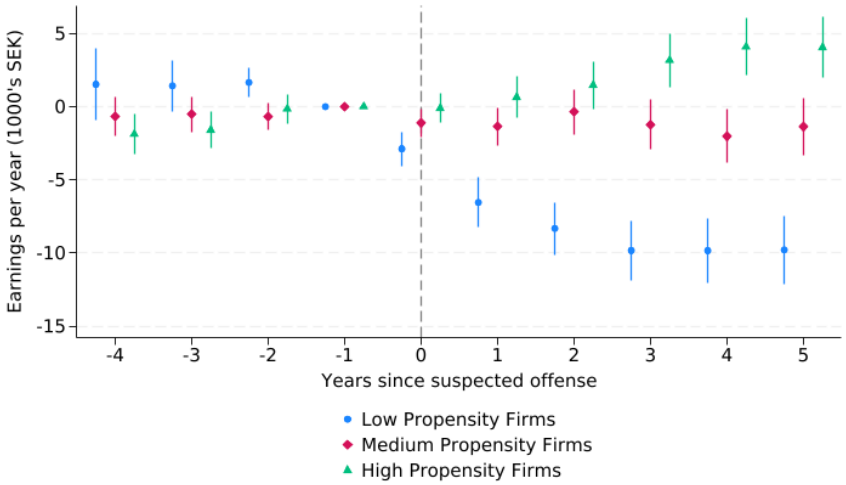
FIGURE 9

EMPLOYMENT AND EARNINGS LOSSES ARE CONCENTRATED AT MORE DISCRIMINATORY FIRMS

(a) Months employed



(b) Earnings



Note: This figure plots the event time coefficients (λ_j) from the event study specification (3) for months employed (panel A) and earnings (panel B) interacted with indicators for three firm types: low propensity, medium propensity, and high propensity. See section 5.7 for a description of how firm types are constructed.

In describing the coefficients, we focus on the effects five years post-event. Months employed decrease by about 0.4 at low propensity firms. These decreases are partially offset by a 0.2 month *increase* in employment at high propensity firms. Earnings follow a similar pattern, decreasing most at low propensity firms (by about 9,800 SEK), decreasing by less at medium propensity firms (by about 1,900 SEK), and increasing (by about 4,000 SEK) at high propensity firms.

5.7.2 Wage changes by firm type

We find that a criminal record decreases both months employed and earnings, and reallocates workers from more to less discriminatory firms. In this section, we examine the effects of a criminal record on monthly wages. We are particularly interested in (1) the extent to which wage effects reflect between-firm reallocation versus within-firm wage changes and (2) whether and how wage effects vary by firm type.

Compared to months employed and earnings, studying wages is complicated by the fact that we can only measure them for people who are employed and we want to distinguish between overall and within-firm effects. Given these considerations, we simplify our research design and compare suspects before and after their suspected offense. We estimate regression specifications of the form

$$\log(\text{Monthly wage})_{i\tau t} = \beta \text{POST}_{i\tau t} + \gamma_{tg(i,\tau)} + \alpha_{i\tau} + \psi_{J(i,t)} + \epsilon_{i\tau t} \tag{5}$$

where $\text{POST}_{i\tau t}$ is an indicator for whether the suspect is charged and $t \geq \tau$, $\alpha_{i\tau}$ are person-event fixed effects, $\psi_{J(i,t)}$ are firm fixed effects, $g(i,\tau)$ groups events by the year of the offense (τ) and the suspect's age at the time of the suspected offense, and $\gamma_{tg(i,\tau)}$ are group by year fixed effects. We estimate versions of equation (5) with and without firm fixed effects and with and without interactions between $\text{POST}_{i\tau t}$ and the firm type. We limit the estimation sample to the half of the sample *not* used to estimate $\hat{\theta}_j^{EB}$.

The results are shown in Table 7. Column 1 excludes firm fixed effects. The coefficient on $\text{POST}_{i\tau t}$, -0.032, indicates that a criminal record reduces wages by 3.2 log points. Column 2 includes firm fixed effects. The coefficient is reduced to -0.024, indicating that nearly one log point of the wage decrease reflects a reallocation to lower-paying firms. The remaining decrease in wages represents within-firm wage reductions. In column 3, we interact $\text{POST}_{i\tau t}$ with indicators for our three firm categories: low, medium, and high propensity firms. Interestingly, the within-firm wage decrease is larger at medium and high propensity firms.

6 Characterizing firm heterogeneity

Firm heterogeneity plays an important role in explaining the labor market outcomes of WCRs. Some firms are more likely than others to hire WCRs, and acquiring a criminal record shifts workers away from what we label "low" and "medium" propensity firms and toward "high" propensity firms.

Table 7
Wage effects and firm heterogeneity

	(1)	(2)	(3)
POST	-0.032	-0.024	
	(0.007)	(0.007)	
Low Propensity Firm × POST			-0.010
			(0.010)
Medium Propensity Firm × POST			-0.029
			(0.010)
High Propensity Firm × POST			-0.032
			(0.009)
Observations	50,3859	50,3859	50,3859

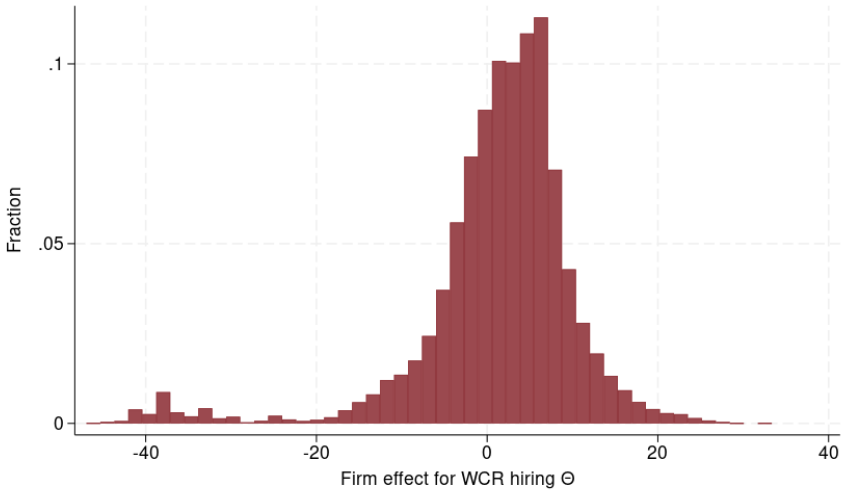
This table shows estimates of the specification (5), where the outcome is log monthly wages. All columns included person-event fixed effects and fixed effects for the combination of the year, the year of the suspected offense, and the suspect's age at the time of the suspected offense. Column 2 includes firm fixed effects. Column 3 interacts $\text{POST}_{i\tau t}$ with fixed effects for the three firm categories defined in section 5.7: low, medium, and high propensity firms.

This section explores firm heterogeneity in hiring WCRs, focusing on four key characteristics: (1) industry, (2) size, (3) background check policies, and (4) manager exposure to WCRs.

We first describe the distribution of $\hat{\theta}_j^{EB}$ across firms.[30] Figure 10 plots the distribution of θ_j^{EB} across firms for all firms that make at least one at-risk hire. There is substantial dispersion in θ_j^{EB}. The inter-quartile range is 8.0pp and the standard deviation is 9.8pp. The implied standard deviation of θ_j is 12.7pp. Firms vary in their propensity to hire WCRs, which is consistent with firms varying in how they use criminal records to screen workers in the hiring process.

[30] In this section we use $\hat{\theta}_j^{EB}$ and $\hat{\theta}_j$ estimates derived using all at-risk hires from 2005–2015 rather than a split sample.

FIGURE 10
DISTRIBUTION OF WCR HIRING FIRM EFFECTS ($\hat{\theta}_j^{EB}$)



Note: This figure plots the distribution of firm effects for WCR hiring ($\hat{\theta}_j^{EB}$). See section 5.7 for a description of how these firm effects are constructed.

Table 8 correlates estimated raw firm effect estimates $\hat{\theta}_j$ (scaled by 100 to express in percentage points) with firm characteristics. All columns include fixed effects for industry and firm size categories, where size is based on a firm's average number of employees per month.[31]

Column 1 highlights significant differences by industry. For example, compared to at-risk hires at services firms (the omitted category), hires at manufacturing and construction firms are about 2.4pp and 3.4pp more likely to have criminal records, respectively. For reference, recall that 56% of at-risk hires have a record. By contrast, hires in health care, education, and public administration and defense are about 2pp less likely to have a record. It is exactly in these three industries that many of the occupations requiring mandatory background checks at licensing or hiring are found. Among at-risk hires, larger firms are less likely to hire WCRs. Compared to firms with 1-10 employees, at-risk hires at firms with 101 to 250 employees and firms with 1001+ employees are 2.1pp and about 2.8pp less likely to have a record.

Firm heterogeneity in WCR hiring may in part reflect differences in explicit policy. One policy with clear implications for WCR hiring is how background checks are used in hiring. Firms vary in whether they conduct background checks for potential hires, whether they signal background checks in job ads, when in the hiring process they conduct background checks, and what they do

[31] Firm size categories are defined as 1-10, 11-25, 26-100, 101-250, 251-1000, 1001-2500, and 2501+ employees. We categorize firms based on their average size and modal industry across at-risk hires.

TABLE 8
FIRM WILLINGNESS TO HIRE WCRS AND FIRM CHARACTERISTICS

	(1)	(2)	(3)
% firms ever mentions background checks in ads		-1.295	
		(0.317)	
Operator has past record			1.642
			(0.171)
Operator has family with past record			1.436
			(0.217)
Operator has high exposure to co-workers with records			1.867
			(0.156)
Agriculture and resources	1.638	2.339	2.069
	(0.340)	(0.671)	(0.450)
Manufacturing and industry	2.354	2.681	1.759
	(0.168)	(0.321)	(0.218)
Construction	3.378	3.318	3.051
	(0.182)	(0.437)	(0.237)
Retail and wholesale	0.448	0.531	0.336
	(0.183)	(0.362)	(0.238)
Hotels and restaurants	1.642	1.887	1.653
	(0.180)	(0.357)	(0.239)
Education	-0.134	0.462	0.010
	(0.351)	(0.469)	(0.407)
Health care	-0.113	0.764	0.063
	(0.298)	(0.417)	(0.338)
Care and social services	0.407	0.200	0.553
	(0.320)	(0.639)	(0.427)
Public administration and defense	-1.258	-1.461	-2.558
	(0.851)	(0.978)	(0.802)
Services	0.000	0.000	0.000
	(.)	(.)	(.)
1-10	0.000	0.000	0.000
	(.)	(.)	(.)
11-25	-0.616	-0.397	-0.171
	(0.138)	(0.392)	(0.186)
26-100	-1.651	-1.219	-1.035
	(0.137)	(0.368)	(0.183)
101-250	-2.094	-1.485	-1.273
	(0.188)	(0.395)	(0.220)
251-1000	-2.759	-1.973	-1.794
	(0.217)	(0.394)	(0.223)
1001-2500	-2.730	-1.814	-2.031
	(0.325)	(0.454)	(0.291)
2501+	-2.810	-1.572	-2.842
	(0.302)	(0.476)	(0.311)
Observations	138,334	23,501	67,786

This table presents coefficient estimates from least squares regressions of estimated WCR hiring firm effects $\hat{\theta}_j$, described in section 5.7, on firm characteristics. Each observation is a private sector firm with at least one "at-risk" hire as defined in section 6 between 2005 and 2015.

when a candidate's background check is not completely clean. While we cannot measure every aspect of how a firm uses background checks, we can measure what they mention in job ads.[32] Column 2 adds an indicator for whether a firm mentions background checks in job ads. We limit the sample to firms that we can match to at least one job ad.[33] At-risk hires at firms that mention background checks in their ads are about 1.3pp less likely to have a record.

In column 3 we test whether WCR hiring varies with whether the firm operator has past exposure to people with criminal records.[34] Previous exposure could affect a manager's willingness to hire WCRs for several reasons, including by providing better information about their performance for certain jobs or decreasing prejudice towards these workers (Paluck et al., 2019; Lepage, 2024). We study three sources of exposure. First, we consider whether operators themselves have had a criminal record in the past. Second, we consider whether an operator was exposed to more or fewer coworkers with criminal records at previous establishments in which they worked (regardless of whether they managed those establishments or not).[35] Third, we consider whether an operator has a family member (parent, child, or sibling) with a criminal record.

For each exposure measure, we find that at-risk hires at firms with more exposed operators are 1.5pp to 2pp more likely to have criminal records.

7 Conclusion

In this paper, we address four questions concerning the labor market outcomes of workers with criminal records: (1) How do workers with and without criminal records differ in their labor market outcomes, including their earnings, employer, and occupation? (2) What is the causal effect of a criminal record on employment and earnings? (3) How does worker sorting across employers and

[32] Measuring such firm policies and linking them to real-world hiring outcomes (at a national level as opposed to a small survey or single firm RCT) is rare in the personnel economics literature in general, and with regards to WCRs especially (Hoffman and Stanton, 2024). Though job ads have been increasingly used to study questions related, for instance, to gender discrimination (e.g., Kuhn and Shen (2012)) or how firm demand for occupations and tasks has evolved over time (e.g., Atalay et al. (2020)), these data have rarely been linked to register data on firm outcomes. Two recent exceptions are Card et al. (2024), who study the effect of stated gender preferences in ads, and Audoly et al. (2024), who study the relationship between job ad content and actual employer attributes (pay versus amenity).

[33] See Appendix Table E.10 for firm level summary statistics characterizing job ad signaling behavior. Job ad characteristics substantially differ between firms that ever signal a criminal background check and those that do not. More than 20% of firms that signal checks (versus just 1% of firms that do not) also signal drug and alcohol testing. In other words, firms that signal checks have other observed (and likely unobserved) policies related to concerns about a safe work environment. Ads at firms that signal checks are for jobs that on average require more education and job skills and have five times more exposure to vulnerable populations (O*NET measures) and relatively more manager, professional and technician positions and fewer unskilled labor, plant and machine, and crafts and trades positions.

[34] The firm operator is a high-level manager at the firm that is identified by the tax authority.

[35] For each operator, we restrict to previous establishments with less than 100 workers to increase the likelihood that the two coworkers interacted in the workplace.

jobs mediate this effect? (4) To what extent, and why, do employers vary in their hiring of WCRs? We conclude by summarizing and critically discussing our answers to these questions.

We provide the first nationwide and register-based estimates for the prevalence of criminal records in the workforce and demonstrate that demographically similar adults with and without records have markedly different labor market outcomes. These gaps are seen at multiple margins: WCRs earn less (31%), work less (20% fewer months per year), have lower wages, are sorted into lower-paying firms with disproportionately more coworkers with criminal records, and are sorted out of occupations in which background checks are mandatory or records may be perceived as risky to a firm's customers, employees, or finances. These effect sizes indicate that WCRs are amongst the most disadvantaged populations in the Swedish labor market, with gaps larger than those observed, for instance, with respect to gender, education, and even immigrant status (Åslund, Bratu, Lombardi and Thoresson, 2021; Karimi and Palme, 2024).[36]

But are these unequal labor market outcomes caused by the record itself or are they attributable to selection on unobservables or simultaneity? Using our charged versus non-charged suspects research design, we find that a criminal record indeed has a negative causal effect on months employed and earnings, which persists for many years (even beyond when most offenses are expunged). The magnitudes of these estimates are 2% and 5%, respectively, for the first such charge but about twice as large for more serious or subsequent charges. These penalties exist even in Sweden, a society that historically emphasizes the rights of WCRs. Moreover, these effects are not small; the earnings estimates are similar (or larger) in size compared to the long-run effects of direct job displacement due to plant closure (e.g., 8% in Sweden (Athey et al., 2024) and 3% in Norway (Huttunen et al., 2011)) or recent estimates of the labor market costs to crime victims (Bindler and Ketel, 2022).

We find that a criminal record leads workers to sort away from more discriminatory employers (i.e., those with the lowest propensity to hire WCRs) and that these effects are only partially offset by an increase in employment at more WCR-friendly firms. Moreover, a record lowers WCR wages more broadly, even at "friendly" firms.

Finally, given our findings of substantial differences across firms in their propensity to hire WCRs and related firm polices (like background check job ad signals) and the mediating effects of firm heterogeneity, we asked why such employer variation exists. Our results highlight one mechanism:

[36]The extent of these disparities are especially sizable given that a record includes all non-traffic ticket offenses, and not just offenses serious enough to result in incarceration; recent estimates, for instance, of the earnings penalty (using an occupation based proxy of earnings) associated with incarceration in the US from 1880 to 1940 range from 5 to 15% (Ang et al., 2024).

managers. Managers with a past criminal record themselves, or with more exposure to individuals with records (through former coworkers or family members), are more likely to hire such workers. These results leave open the possibility that the proportion of firms that are WCR-friendly may increase as a result of policies targeting the employment of workers with records (e.g., intensive supervision with employment requirements, prison programs to place inmates with employers).

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A Data appendix

A.1 Criminal record expungement rules over time

This Appendix summarizes changes to the criminal record expungement rules that occurred in Sweden between 1990 and 2020. The age of criminal majority in Sweden is 15. So no crimes committed before age 15 appear on a criminal record.

All offenses, regardless of severity, are automatically expunged from one's criminal record. Once expunged, an offense disappears from a criminal record permanently. The precise timing of expungement is a function of four factors: (i) age at the time of the offense (under 18 versus 18 or older), (ii) the sentence received, (iii) whether or not one recidivates, and (iv) the regulations in place in a given year (new rules supersede old rules).

Between 1990 and 1999, the expungement rules were the same for all persons age 15 or older. Crimes that received no punishment, a ticket issued by the police (*ordningsbo*t), a fixed fee fine (*penningbot*), or an income related fine (*dagsböte*r), did not result in a criminal record. All other crimes that led to an in-court or out-of-court conviction generated a criminal record that was expunged after 10 years. For those receiving a prison sentence or institutional placement, their offense was automatically expunged 10 years after their release. New offenses generated an extension of a criminal record, such that an offense was not expunged until all offenses were expunged. Offenses that led to tickets or fines did not extend the expungement time.

Between 2000 and 2007, the expungement rules were still the same for all persons age 15 or older. If the main punishment was a fixed fee fine (*penningbot*) or an income related fine (*dagsböter*), then this offense now showed up on a criminal record and was expunged after 5 years. This also meant that these crimes could suddenly appeared on a person's criminal record extract in the year 2000. That is, this change to the expungement rules also affected those with fines received between 1996 and 1999, since these past offenses were also subject to the new expungement rules. As before, other crimes were expunged after 10 years, or 10 years after release from prison or institution. Committing a new offenses extended the expungement time until the last crime was expunged. This extension rule now included those who received an income related fine, but still excluded those who received a ticket or a fixed fee fine. However, starting in the year 2000, no offense was allowed to stay on a criminal record for more than 20 years (or 20 years after release from a prison or institution).

Starting in 2008, the expungement rules began to discriminate by age. Offenses that were

committed by someone under the age of 18 who admitted their guilt and was then given a decision of non-prosecution (AUL, *åtalsunderlåtelse*) were now expunged after 3 years. All other expungement rules remained the same.

In 2010, the expungement rules were changed once again in order to hasten the expungement of offenses committed before age 18. The automatic expungement time for non-prosecuted crimes remained 3 years, while most other crimes committed before age 18 were now expunged after 5 years. The exception to this rule was for crimes that led to an institutional placement (e.g. a locked youth facility). As before, these crime were still expunged 10 years after release. Furthermore, recidivism continued to extend expungement times of all previous offenses, even those crimes committed before age 18. These rules stayed in place until the end of 2020.

Appendix Tables A.1, A.2, and A.3 give a detailed description of the changes to Sweden's criminal record expungement laws over time.

Table A.1
Swedish law (1963:197) concerning expungement of criminal records (1980 - 2000)

Paragraph	(2) Jan 1980	(3) July 1981	(4) July 1983	(5) Jan 1989	(6) July 1997
7 §					
Accused acquitted of the act by the court of appeal	w.d	w.d	w.d	w.d	w.d
Accused found guilty but not sentenced by the court of appeal	w.d	w.d	w.d	w.d	w.d
(Retrial) Accused acquitted from the charged act	w.d	w.d	w.d	w.d	w.d
(Retrial) Accused found guilty but not sentenced	w.d	w.d	w.d	w.d	w.d
The registered person has died	w.d	w.d	w.d	w.d	w.d
When 80 years have passed from his year of birth	w.d	w.d	w.d	w.d	w.d
The Court of Appeal has overturned the District Court's decision on conversion punishment for fines	–	–	w.d	w.d	w.d
(Retrial) The Court of Appeal has overturned the District Court's decision on conversion punishment for fines	–	–	w.d	w.d	w.d
Penal order removed	–	–	–	–	w.d
10 §					
Conditional sentence (1)	10	10	10	10	10
Probation (1)	10	10	10	10	10
Imprisonment according to ch. 28, sec. 3 of the Penal Code (Skyddstillsyn) (1)	10	10	10	10	10
Handover to special care (1)	10	10	10	10	10
Stay of execution of conversion punishment (1)	10	10	–	–	–
Imprisonment in other cases than referred to in 1	10	10	10	10	10
Internment	10	–	–	–	–
Conversion punishment for fines	–	–	10	10	10
New sentence before expungement of older record	Keep old records	k.o.r.	k.o.r.	k.o.r.	k.o.r.
11 §					
Imprisonment for no more than 1 year	5	5	5	–	–
Conditional sentence	5	5	5	–	–
Probation	5	5	5	–	–
Imprisonment as sentenced according to chapter 28, section 3 of the Penal Code	5	5	5	–	–
Stay of execution of conversion punishment	5	5	–	–	–
Under 18: Nothing is released	Yes	Yes	Yes	No	No
Conversion punishment for fines	–	–	5	–	–
Other					
Twenty year ceiling	No	No	No	No	No
Restrictive access 9 §	Yes	Yes	Yes	No	No

Numbers in columns (2) - (6) refer to years until automatic expungement. The letters w.d. stand for expungement "without delay". Entries in red signal changes made in that year.

Table A.2
Swedish law (1998:620) concerning expungement of criminal records (2000-2024)

Paragraph	(2) Jan 2000	(3) Jan 04	(4) July 05	(5) Jan 07	(6) April 08	(7) Sept 10	(8) Oct 11	(9) June 15	(10) Jan 16	(11) Jan 21
16 §										
Acquitted by the court of appeal	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d
Acquitted (after reopening of the case)	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d
Judgment, decision, penalty order, or order of summary punishment has been revoked	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d
Appellate court has revoked conversion punishment for fines	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d
Prosecutor's decision not to prosecute has been recalled	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d
Prosecutor's decision on warning punishment has been recalled	–	–	–	–	–	–	–	w.d	w.d	w.d
Restraining order has been lifted	–	–	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d
European protection order has been lifted	–	–	–	–	–	–	–	–	w.d	w.d
Visitation ban has been lifted	w.d	w.d	w.d	w.d	w.d	–	–	–	–	–
Registered person has deceased	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d
Contact ban according to the law on European protection orders has been lifted	–	–	–	–	–	–	–	–	w.d	w.d
17 §										
Released from prison (alt. conversion punishment for fines)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)
Prison sentence enforced through earlier deprivation of liberty	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)
Liberated by decision of clemency	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)
Prison or conversion punishment for fines has been dropped	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)
Sentenced to probation	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (5)	10 (5)	10 (5)	10 (5)	10 (5)
Conditional sentence (years after the sentence)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (5)	10 (5)	10 (5)	10 (5)	10 (5)
Closed juvenile care has been enforced	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (5)
Juvenile care, after sentence or decision	–	–	–	10 (10)	10 (10)	10 (5)	10 (5)	10 (5)	10 (5)	10 (5)
Juvenile service, after sentence or decision	–	–	–	10 (10)	10 (10)	10 (5)	10 (5)	10 (5)	10 (5)	10 (5)
Juvenile supervision, after sentence or decision	–	–	–	–	–	–	–	–	–	10 (5)
Handover to care within the social services (years after decision)	10 (10)	10 (10)	10 (10)	–	–	–	–	–	–	–
Care according to the law on care of abusers (years after decision)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (5)	10 (5)	10 (5)	10 (5)	10 (5)
Handover to forensic psychiatric care (after discharge)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)
Fines	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)
Declared free from sanctions	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (5)	10 (5)	10 (5)	10 (5)	10 (5)
Prosecutor's decision not to prosecute for crime	10 (10)	10 (10)	10 (10)	10 (10)	10 (3)	10 (3)	10 (3)	10 (3)	10 (3)	10 (3)
Decision on restraining order	–	–	–	–	–	–	10 (10)	10 (10)	10 (10)	10 (10)
Ban according to the law on European protection orders (after the decision)	–	–	–	–	–	–	–	–	10 (10)	10 (10)
Decision on entry ban	–	–	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)
Decision on visitation ban	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)	–	–	–	–
Decision on extradition for crime	10 (10)	–	–	–	–	–	–	–	–	–

The table shows the time (in years) until expungement for individuals over and under 18 (under 18 in parenthesis). Changes are highlighted in red. For 16 §, expungement is always "without delay" (w.d). Otherwise expungement rules are stated as years after the prosecutor decision or court judgement, or years after release from prison or institution.

Table A.3
Continued ... Swedish law (1998:620) concerning expungement of criminal records (2000-2024)

Paragraph	(2) Jan 2000	(3) Jan 04	(4) July 05	(5) Jan 07	(6) April 08	(7) Sept 10	(8) Oct 11	(9) June 15	(10) Jan 16	(11) Jan 21
17a §										
Another state has notified expungement	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d	w.d
18 §										
New crime committed before the expiration of the time in section 17 (or 17a)[a]	k.o.r.	k.o.r.	k.o.r.	k.o.r.	k.o.r.	k.o.r.	k.o.r.	k.o.r.	k.o.r.	k.o.r.
Twenty-year ceiling	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The table shows the time until expungement for individuals over and under 18 (under 18 in parenthesis). For 16 §, expungement is always *without delay* (w.d). Otherwise expungement rules are years after the prosecutor decision or court judgement, or years after release form prison or institution. The letters k.o.r. stand for *keep old records*

[a] Does not apply if the new entry relates to a ticket (*ordningsbot*) or a fixed fee fine (*penningbot*).

A.2 O*NET data appendix

A.2.1 SOC to SSYK occupation code crosswalk

To merge O*NET occupational characteristics to Swedish employment registers, crosswalks are needed between the US and Swedish occupation codes. The O*Net data version we use contains the 2000 Standard Occupational Classification by the Bureau of Labor Statistics (referred to below as SOC2000) while the Swedish register data uses the Standard for Svensk Yrkesklassificering (the Standard for Swedish Occupation Classifications). The Swedish occupation codes were updated in 2012, such that there are two versions: SSYK96 and SSYK2012. To the best of our knowledge there is no official crosswalk between the SOC2000 codes and the SSYK codes (96 or 2012). But, given that both the US and Swedish standards are based on the International Standard Classification of Occupations (ISCO), we use the ISCO-88 occupation codes to create a crosswalk between SOC2000 and SSYK96 codes.

To create the SSYK96-SOC2000 crosswalk, we used (i) an SSYK96 to ISCO-88 crosswalk, obtained from Statistics Sweden and (ii) an ISCO-88 to SOC2000 crosswalk, obtained from the Bureau of Labor Statistics. Both crosswalks contain the ISCO-88 code and occupation name, as well as the corresponding SSYK or SOC codes and names. These files were merged using the ISCO-88 code, yielding a SSYK96 to SOC2000 crosswalk. The crosswalk from Statistics Sweden is, however, only semi-official and incomplete; thus, a research assistant manually completed the SSYK to ISCO crosswalk by using the SSYK and ISCO-88 look up functions.[37] In a handful of cases, too much guesswork was required to confidently assign corresponding ISCO and SOC codes to the SSYK code, and thus the crosswalk is missing for these SSYK codes. We can also merge SOC2000 data onto the SSYK2012 codes, given the existence of an official SSYK96 and SSYK2012 crosswalk from Statistics Sweden.

We highlight here that there are more than twice as many 6-digit US occupation codes as 4-digit Swedish codes. It is not surprising that there is not always a one-to-one mapping of US and Swedish codes in the crosswalk, but rather also many-to-one mappings of SSYK to SOC codes and one-to-many mapping of SSYK to SOC codes.

[37] In some cases, the link between occupation codes may not be obviously correct since there are multiple occupations included in the Swedish occupation categories. Using the look-up function, however, provides a list of all occupations included, and can clarify why the link made. https://www.h5.scb.se/yreg/ssyk.asp; https://ilostat.ilo.org/methods/concepts-and-definitions/classification-occupation/

A.2.2 O*NET variables

We obtained the data dictionary and raw data for version 14 of the Occupational Information Network (O*Net) data from the **O*NET® Database Releases Archive**.[38] For the purposes of our analyses, we used six raw data files: (i) *Occupation Data.txt*, from which we obtained occupation titles and SOC codes (at the 8-digit level), (ii) *Scales Reference.txt*, which indicates the scale of each survey question, (iii) Education, *Training, and Experience.txt*, from which we extracted the required level of education for each occupation (1-12 scale), (iv) *Job Zones.txt*, which provides a job zone measure of how much preparation is needed for each occupation (1-5 scale, where 5 is extensive and 1 is little or none), (v) *Work Context.txt*, which signals (one a 1-5 scale) the extent of customer interaction and exposure to poor work environment characteristics, and (vi) *Task Statements.txt*, which includes a detailed task description, in which we searched for key words to measure exposure to vulnerable populations and opportunities for theft and financial responsibility.

Our analyses use the average of all nine O*NET work environment conditions: exposure to contaminants; disease/infection; hazardous conditions; hazardous equipment; high places; minor burns, cuts, bites and stings; radiation; whole body vibration; and extremely bright or inadequate lighting. We proxy for exposure to any vulnerable populations by searching for whether the core occupation tasks include the following key words: child, youth, student, handicap, disable, disability, group home, elderly, geriatric, old age, addict, alcohol, mentally ill, mental ill, and substance abuse. We proxy for exposure to opportunities for theft or financial responsibility by averaging whether there are any tasks (i) with opportunity for theft (key words: cash, payment, money, sell, sales, valuable) and (ii) signaling financial responsibility (key words: financial, budget, accounting).

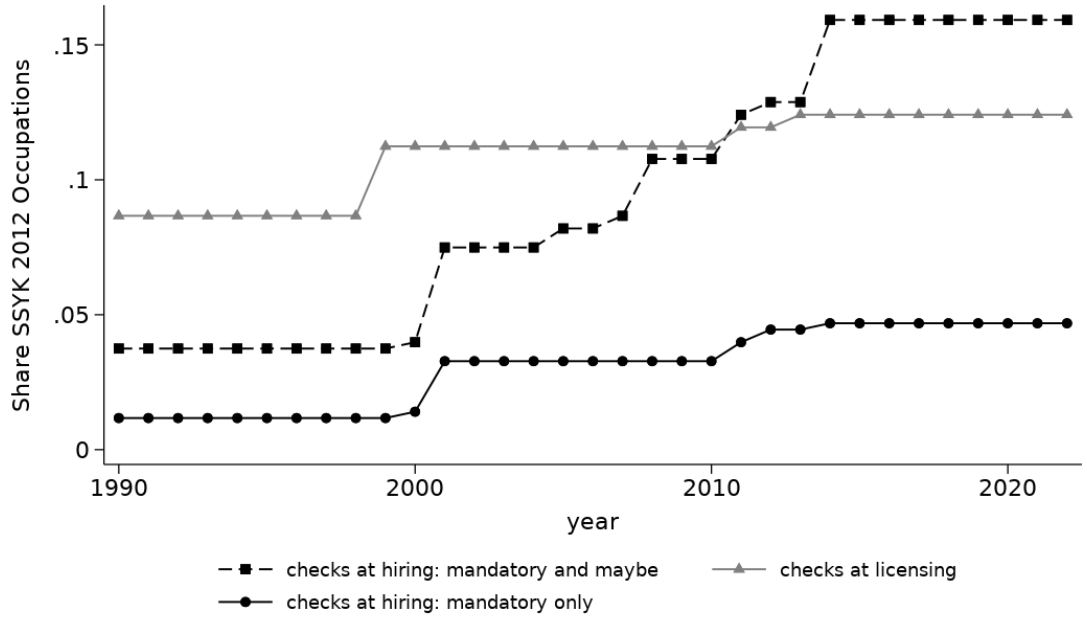
We restrict our data set to occupations with SOC codes of the form YY-ZZZZ.00, which allows us to use a 6-digit SOC code to use a many to one merge match to the Swedish SSYK 4-digit codes in the crosswalk. Since some SSYK codes correspond to more than one SOC code, we collapse the data to the SSYK96 (or SSYK2012, when appropriate) occupation code level and use the mean O*NET characteristic. The final data set has 342 SSYK96 occupation codes and corresponding occupational characteristics. Finally, we transform the poor work environment variable, such that 0 is a poor condition and 5 is a good condition.

[38] See https://www.onetcenter.org/db_releases.html.

A.3 Mandatory background check laws and reforms

As described in section 3.3, we characterize the types of jobs in which individuals work according to whether criminal background checks were required upon hiring or to obtain an occupational license. The latter are generally only conducted at the time the license is obtained, and not required retroactively upon reforms. Reforms have been rolled out that made background checks required for selected jobs and occupations. The table below lists the main reforms we used (as well as the date of implementation) to code whether background checks would be required in each 4-digit occupation code in each year. We classify occupation codes has having mandatory checks (for all possible jobs), maybe background checks (for either some jobs or optional), and no background check requirements. Figure A.1 depicts the share of 4-digit occupation categories impacted by these laws over time. We assign the reform year such that it is the year of implementation for reforms in January to September and the following year for reforms in October to December.

Figure A.1
Roll-Out of Background Check Laws at Hiring/Licensing by Occupation



Note: This figure demonstrates the roll-out of mandatory and optional background check laws upon hiring and for occupational licensing by plotting the share off SSYK 2012 4-digit occupation codes affected each year. As each SSYK code includes multiple jobs, which are sometimes even in different industries (e.g., a cook in a school versus a restaurant), some occupation codes are only partially affected. These are captured in the maybe category, as is laws that say a background check is optional. An occupation falls into the mandatory only category if a background check is mandatory in year t for all jobs under that occupation.

Table A.4

List of the main background check laws for hiring and occupational licensing

Year (Month)	Law and Description
Main Background Check Hiring Laws with Non-General Extracts from the Belastningsregister	
2001 (01)	Law (2000:873) on MANDATORY registry control of personnel in preschool activities, schools and after-school care
2007 (07)	Law (2007:171) on MANDATORY registry control of personnel at certain accommodations that receive children
2011 (01)	Law (2010:479) on MANDATORY registry control of personnel performing certain services for children with disabilities
2012 (08)	Education Act (2010:800) reinforces MANDATORY registry controls in list of different types of educational institutions
2013 (12)	Law (2013:852) on OPTIONAL background checks for persons working with children in other contexts
2018 (07)	Law (2018:1219) on MANDATORY registry controls for those working in insurance distribution
Main Occupational Licensing Laws	
1984 (07)	Law (1984:542) on the Eligibility to Practice Professions in Healthcare and Related Fields (included list of 10 occupations)
1999 (01)	Law (1998:531) on professional practice in the field of healthcare (expanded from 10 to 21 occupations in list)
2011 (01)	Patient Safety Act (2010:659) (minor changes, 22 occupations)
National Security and Ordinance Laws	
1969 (06)	Personnel Control Ordinance Law (1969:446) that gives 74 agencies the right do employee background checks. It also essentially makes it MANDATORY for the military to do background checks.
1981 (01)	Law (1980:578) that makes it MANDATORY to background checks for security guards.
1996 (07)	This Security Measures (1996:627) and Security Protection Ordinance (1996:633) replaces 1996:455, and expanded the list to 81 agencies.

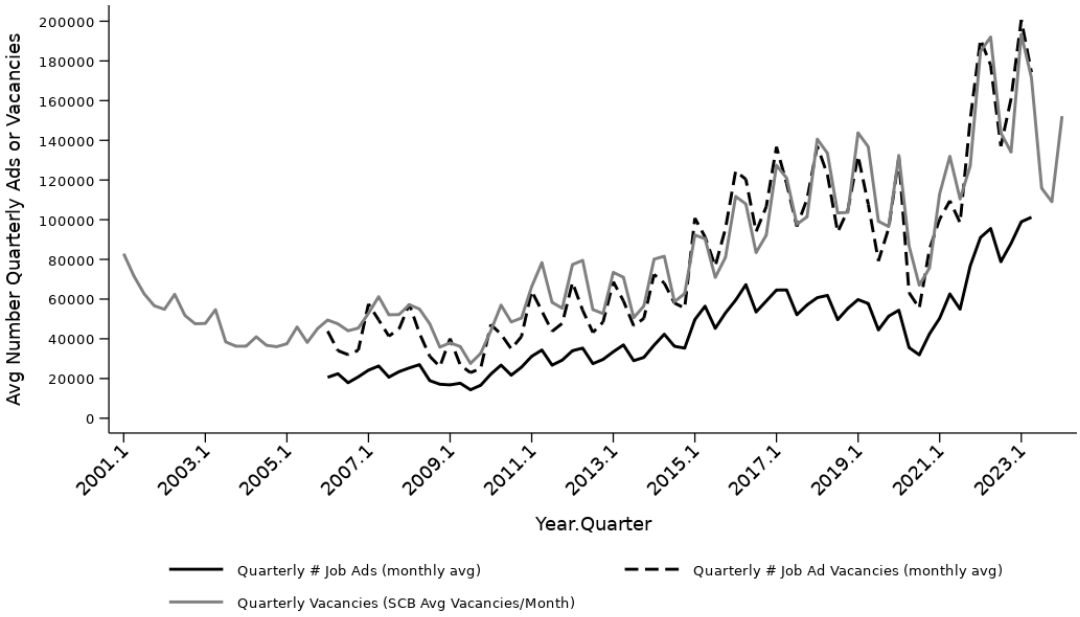
A.4 Job ad data appendix

We measure the extent to which Swedish firms signal that they care about the criminal records of workers using a data set of Swedish job advertisements from Platsbanken, the largest job board in Sweden. A team at Platsbanken maintains a historical database and has made it available online.[39] The dataset spans the 2006-2023 period and includes over 9 million job ads; a total of close to 17 million vacancies (due to multiple jobs per ad). Ads are grouped by the month and year they are first published and is stored in the jsonl format. After downloading the files and converting the files to the csv-format, we create a unique ID variable for each ad. The data is then separated into a two parts – one file for the main ad text and one file for the variables – to speed up further computations. Specifically, we analyze the text to capture whether the firm signals in the ad that a background check will be conducted during the hiring process. This section provides some key details about the data source, the cleaning and creation of the main variables, and the procedure via which we matched on the job ads to our employer-employee registers.

Platsbanken and the Job Ad Dataset: Platsbanken is maintained by the Swedish Public Employment Service (PES) and had an average of about 7.7 million visits in 2022-2023. Employers can post directly on the job board after registering an account or by special recruitment software using the job boards API. This job board is a central part of the Swedish labor market, given that unemployment insurance recipients have to register as unemployed at PES to receive benefits and that beneficiaries can be required to fulfill tasks, like active job search. Public sector jobs are required to post jobs on Platsbanken, while other vacancies were mandated prior to 2007. The number of ads on Platsbanken has significantly expanded over time, with both the expansion of the labor market but also potentially changes to the platform to include new ad recruitment technologies in 2013 and an employer 'self-service' component added in 2017. Ads from other private job boards, e.g., Blocket, Monster.se and LinkedIn, were added in 2021.

[39] https://data.jobtechdev.se/annonser/historiska/monthly/

Figure A.2
Number of Platsbanken job ads/vacancies vs. national vacancy estimates



Note: This figure compares estimates of the quarterly number of job vacancies in Sweden from Statistics Sweden with the quarterly number of job ads on Platsbanken, and the corresponding number of vacancies. All data series present quarterly average (across all months in the quarter) of the monthly number of ads or vacancies. The national vacancy data are sourced from: https://www.scb.se/hitta-statistik/statistik-efter-amne/arbetsmarknad/vakanser-och-arbetsloshet/konjunkturstatistik-over-vakanser-kv/

These background features strongly suggest that Platsbanken is a good measure of the Swedish labor market. To get a better sense of how representative Platsbanken is of the market, we compare in Appendix Figure A.2 the number of vacancies in Platsbanken to those reported in Statistic Sweden's monthly survey of firms asking for the number of vacancies (lediga jobb, which refers to job vacancies for which the firm has started external recruitment). As Statistics Sweden reports the average number of monthly vacancies per quarter, we collapse the job ad data down to the quarterly level as well and report the average number of monthly ads and average number of monthly vacancies. Two phenomena stand out. First, the trends in the these two time series are very similar, suggesting the Platsbanken captures business cycle variations over time in the labor market. Second, these two time series are very close together.

Key Variables: A key step of our analysis is to identify employers who signal - either implicitly or explicitly - that they will require a background check. We do this by searching the text for the following key words and creating a dummy for each hit: "belastningsregist", "registerkontroll",

"bakgrundskontroll". We drew random samples of ads and manually looked at the text to confirm that these hits were indeed capturing background checks. We flag the ad as signalling a background check if any one of these variables is equal to one. We have created a number of other naive dummy variables, i.e., indicators if the ad includes other keywords, related to drug and alcohol free work environments, required skills (svenska or swedish, körkort or driving license), personal character traits, personal cognitive traits, personal traits related to customer service, personal traits related to management ability, and personal social traits. The data set includes a large number of other variables, many of which were tagged (though the coverage of these variables is far from complete in the earlier sample years). These include occupation codes, dates of ad posting, number of vacancies, position type (e.g., regular versus summer), position length, salary type (e.g., fixed versus flexible), and job location (of which municipality is the most complete). The main occupation code variable is one used internally by the team that maintains the ads database. This variable was once connected to an official ssyk96 or ssyk12 codes; but as that connection was lost at a prior date, the team at Arbetsförmedlingen was able to recreate these mappings by combining different data sources at their disposal and by letting experts at Arbetsförmedlingen map the codes manually.[40] This translation key was then joined to the ads database. Finally, all ads include a firm name (of various cleanness), which we use to code the employer type. We classify jobs as 'public' if the employer name contains 'municipality', 'region', 'county', or 'city'.

Firm Organization Numbers and Matching to SCB Registers: We thus have a large data set of job ads and variables capturing job characteristics, including whether a background check will be conducted. The final step is to match these data to the firm's in the employer-employee register, for whom we have a pseudonymized firm id. In order to do this match, we needed to provide our job ad data set to Statistics Sweden, so that they could replace the firm organization number in the job ad data set with the corresponding pseudonymized id. This is straight forward for the 2021-2023 job ads since almost all of these ads included in the firm organization number as a variable. But firm names were only included in earlier sample periods. We therefore took a number of steps to assign organization numbers to the ads for which this was missing in earlier periods. First, a *within* crosswalk is created from the existing ids and mapped onto the firm names in the earlier years. The next step was to attempt to scrape the firm ids for the remaining firms. We chose to only use firm names with 10 or more ads in the 2006-2023 period to make this manageable. The first round of scraping is done on proff.se, a website that lists firm information such as revenue, phone

[40] https://gitlab.com/davidnoirman/legacy-id-to-ssyk

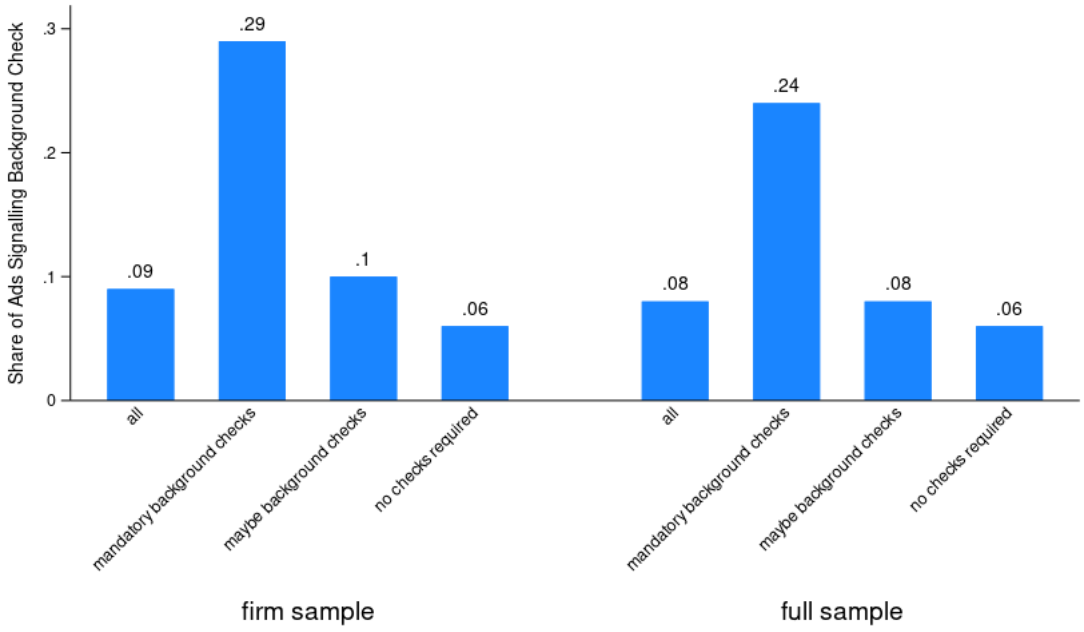
number address and, of course, firm ids. We scrape both the firm id and the firm name so that we can compare the scraped name to the name in the data frame. The second and third round use the search engine duckduckgo.com to retrieve even more firm ids. The result is a data frame that contain the first two search hits[41]. Because a search engine was used, these results are not as clean as round 1. The firm id needs to be extracted (10 digits) and the firm name will contain more information than we want (e.g. the name of the website). For each firm id, we thus create an indicator of how confident we are that it corresponds to the correct firm; we label the id 'robust' if (i) the source is the original id or from the within dataset crosswalk, (ii) the source was manually inspected by a research assistant, (iii) the scraped name is exactly the same as the firm name in the ads data set, and (iv) the first three or two words in the firm name are also in the scraped firm name.

Sample and Selected Summary Statistics: Our final data set includes 9,124,783 job ads; for 6,517,523 job ads, we have a robust firm identification number that could be matched by Statistics Sweden to our employer-employee registers. This includes 54,370 firms. For each firm, we calculate the share of job ads that signal a background check and whether the firm ever signalled a background check.

Figure A.3 demonstrates that the firm sample is fairly representative of the full sample of job ads in terms of background check signals: 9% of the firm sample and 8% of the full sample signal background checks. Given that the firm sample is conditioned firms that post more ads, i.e., firm size, and survey evidence that larger firms conduct more background checks, these statistics make sense. Moreover, as one would expect, we see that firms are more likely to signal background checks for 4-digit occupation codes that have mandatory checks (29%) than those that only maybe have checks (10%) or do not require checks (6%).

[41] Duckduckgo has an option to restrict results to a named list of urls. We used duckduckgo twice; The first round use the search formula "[firm-name] organisationsnummer inurl:bolag inurl:hitta inurl:118100 inurl:ratsit inurl:merinfo"; The second round only used "[firm-name] organisationsnummer".

FIGURE A.3
SHARE OF JOB ADS SIGNALING BACKGROUND CHECKS BY TYPE OF OCCUPATION



Note: This figure presents the share of job ads signalling background checks in the full sample as well as in the sample of ads matched to firm ids in the employer-employee register. It also reports the share of ads signalling checks for three categories of occupations: those that require mandatory background checks, those that may require checks, and those do not require checks.

B Estimating firm pay premiums

(To be added.)

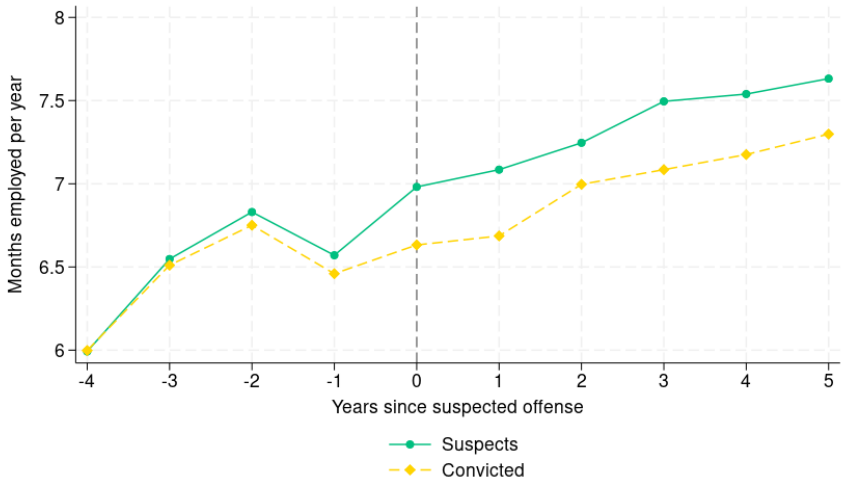
C Subsequent offenses

We construct our estimation sample and weights in the same manner as above, except we limit to suspected offenses where the suspect has been charged exactly once in the past, and in the past five years. Again we restrict our analysis to cells that contain both charged and non-charged suspects and weight non-charged suspects to match the distribution of charged suspects. The number of events meeting our sample criteria is smaller and hence it is more difficult to find matches. Cells containing both types of suspects account for 28% of charged suspects. Appendix Table E.8 shows the characteristics of events. Our final example includes 14,233 events in the treatment group and 15,246 events in the comparison group.

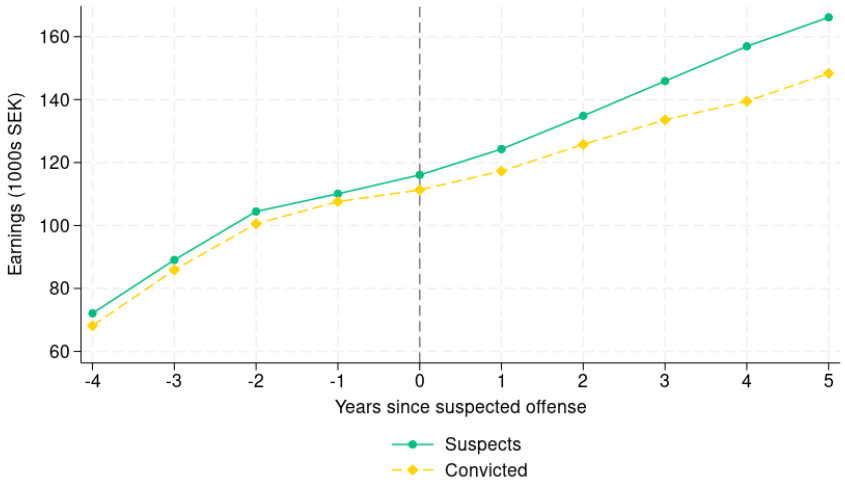
Figure C.4 plots months employed in panel A and earnings in panel B for charged suspects and (weighted) non-charged suspects. Months employed are generally increasing for non-charged suspects, except for a dip in the year before the focal event. A gap of about 0.4 months between charged and non-charged suspects emerges in the event year and the following year. The earnings gap emerges more slowly, with a difference of about 8,000 SEK (7% of mean among non-charged suspects) one year post-event and 16,000 SEK (10%) two years post-event.

Figure C.4
Subsequent charges also reduce employment and earnings

(a) Months employed



(b) Earnings



Note: This figure plots months employed (panel A) and earnings (panel B) before and after suspected offenses for the sample of charged and matched non-charged suspects described in section 5.6. We limit events to person-years with at least one associated suspected offense where the person (1) does not have a prior charge; (2) is between ages 22 and 40 at the time of suspicion; (3) is present in Sweden at least 4 years before and 5 years after the suspected offense. Outcomes are plotted separately for non-charged (green solid line) and charged (orange dashed line) suspects.

D Empirical Bayes estimation

We use an empirical Bayes approach to estimate firm effects for WCR hiring. Our goal is to measure firm-level tendencies to hire WCRs conditional on their hires' risk of having a criminal record, defined as

$$\theta_j = E_[\Delta_{it}|J(i,t)=j] = E_[\text{RECORD}_{it} - P(\text{RECORD})_{it}|J(i,t)=j; P(\text{RECORD})_{it} > 0]. \quad \text{(D.1)}$$

where average is taken over workers hired by firm J. We often observe few at-risk hires for a given firm, so the sample mean of Δ_{it} for a firm's observed hires is often a noisy estimate for θ_j. We take an empirical Bayes to appropriately shrink our θ_j estimates and to make statements about the distribution θ_j across firms, accounting for estimation noise.

Our approach closely follows the "recipe" described in Walters (2024). The first step is to construct estimates of θ_j for each firm, $\hat{\theta}_j$. Our estimate $\hat{\theta}_j$ is the mean Δ_{it} for all (i,t) such that $J(i,t)=j$. The standard error of this mean is s_j. We also observe firm characteristics Z_j (industry, size, proportion of employees with criminal records). We assume the $\hat{\theta}_j$ estimates are unbiased, normally distributed, and mutually independent, with sampling variances equal to their squared standard errors:

$$\hat{\theta}_j|\theta_j, s_j, Z_j \sim \mathcal{N}(\theta_j, s_j^2). \quad \text{(D.2)}$$

We assume that θ_j follows a normal mixing distribution where the mean depends on characteristics Z_j such that

$$\theta_j|s_j \sim \mathcal{N}(\mu(Z_j'), \sigma_r^2) \quad \text{(D.3)}$$

We estimate the function $\mu(\cdot)$ using a random forest. We train the model five features: 1-digit industry, 2-digit industry, number of employees, number of at-risk hires, and the proportion of their employees with criminal records. We use the R function `ranger`.

We estimate the hyperparameter σ_r^2 with the estimator:

$$\hat{\sigma}_r^2 = \frac{1}{K}\sum_{j=1}^{K}\left[(\hat{\theta}_j - \hat{\mu}(Z_j)^2 - s_j^2\right]. \quad \text{(D.4)}$$

In estimating $\hat{\sigma}_r^2$ we account for the statistical noise associated with our θ_j estimates by subtracting away s_j^2.

Finally we combine our noisy estimates $\hat{\theta}_j$ and our estimates of μ_θ and σ_θ^2 to form posteriors for each θ_j.

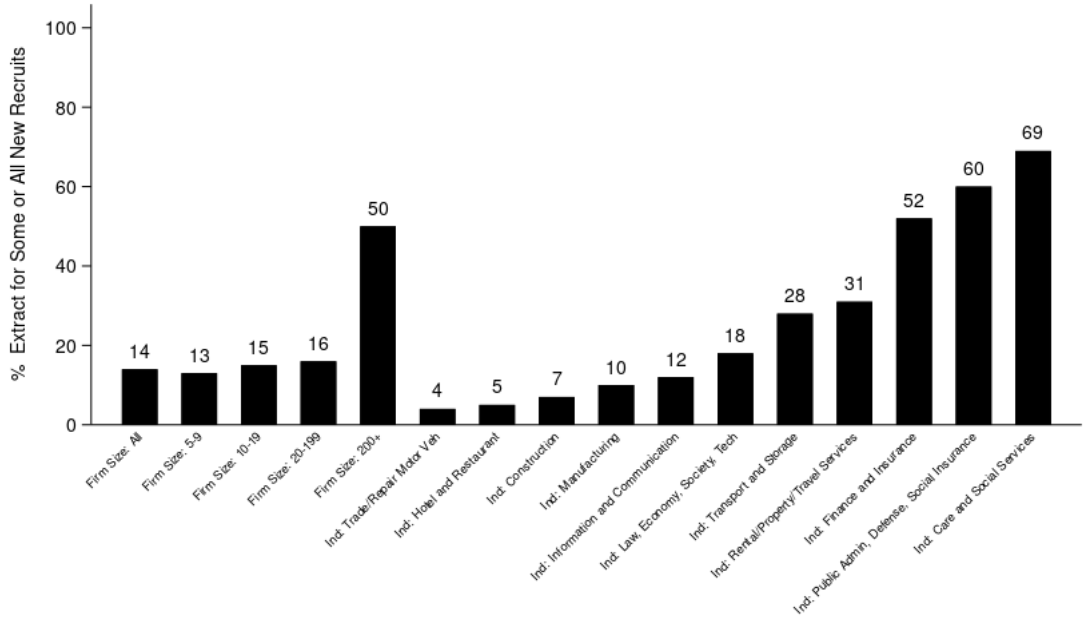
Our empirical Bayes (EB) shrinkage estimate is given by

$$\hat{\theta}_j^{EB} = \left(\frac{\hat{\sigma_\theta^2}}{\hat{\sigma_\theta^2} + s_j^2} \right) \hat{\theta}_j + \left(\frac{s_j^2}{\hat{\sigma_\theta^2} + s_j^2} \right) \hat{\mu}_\theta. \tag{D.5}$$

The EB estimate shrinks the unbiased estimate $\hat{\theta}_j$ for firm j towards the mean for all firms with similar characteristics.

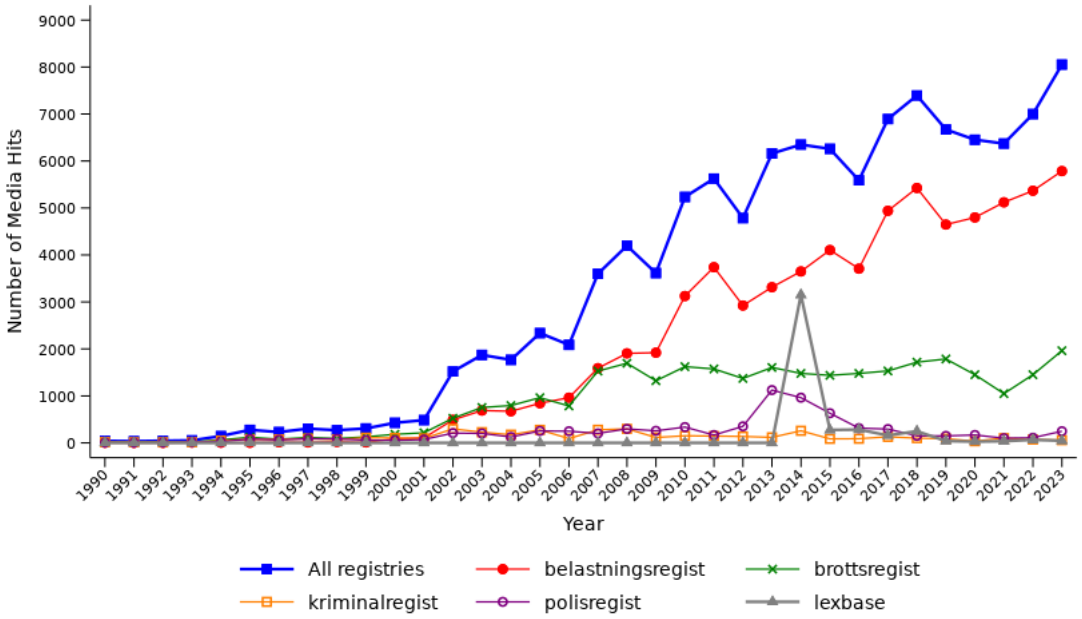
E Additional Exhibits

FIGURE E.5
GOVERNMENT SURVEY OF FIRMS ABOUT BACKGROUND CHECKS



Note: This figures presents selected statistics from a 2014 government investigation into the prevalence of background checks, in which more than 1600 firms were surveyed. See SOU 2014:48, Registerutdrag i arbetslivet, Stockholm, 2014.

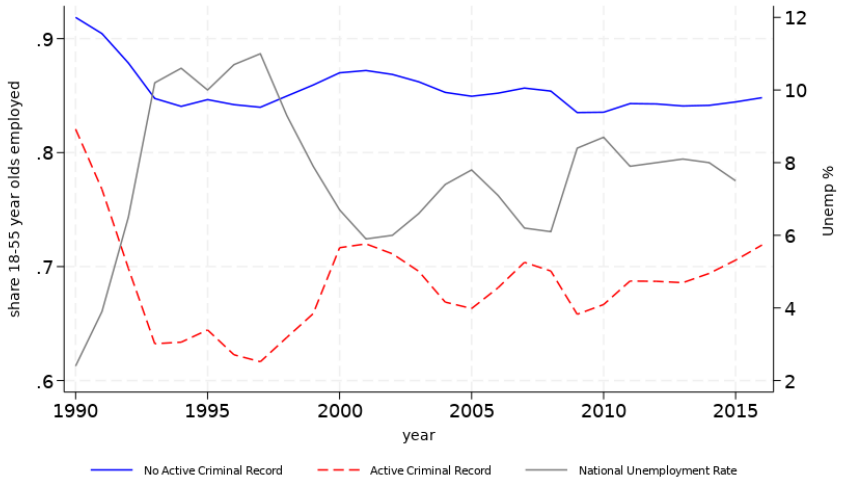
FIGURE E.6
MEDIA COVERAGE OF CRIME REGISTERS AND LEXBASE



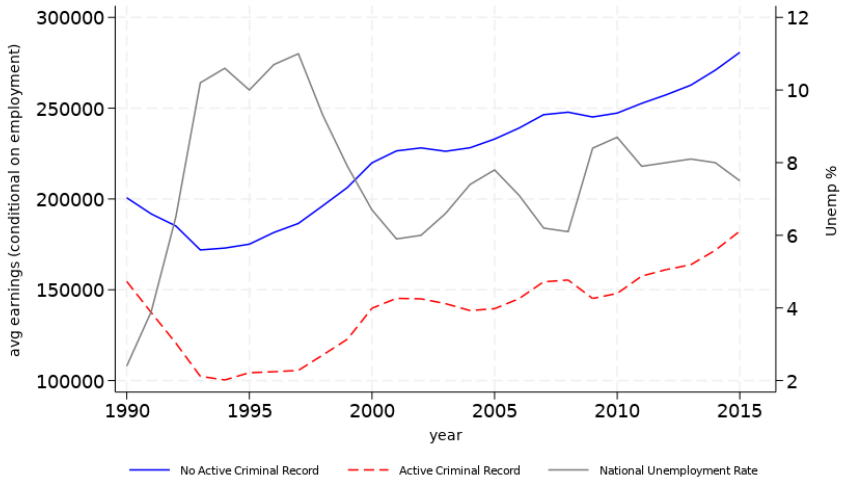
Note: This figures presents the number of hits per year in a Swedish media archive (newspapers, TV, and radio) for the following keyword searches in *Retriever*: belastningsregist, brottsregist, kriminalregist, polisregist. The latter two capture the two registries that existed prior to 2000: Kriminalregistret and Polisregistret, while the Brottsregistret is a commonly used synonym. The figure also displays the number of hits for lexbase.

Figure E.7
Raw employment and earnings gaps over time

(a) Employment



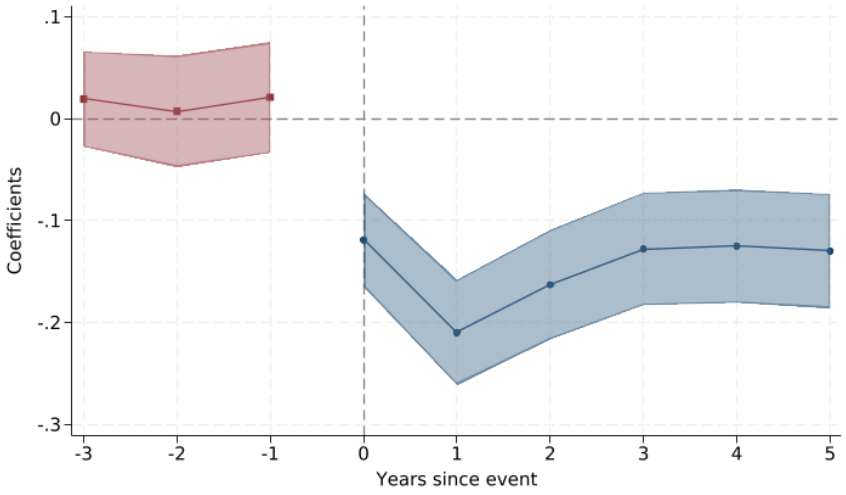
(b) Earnings



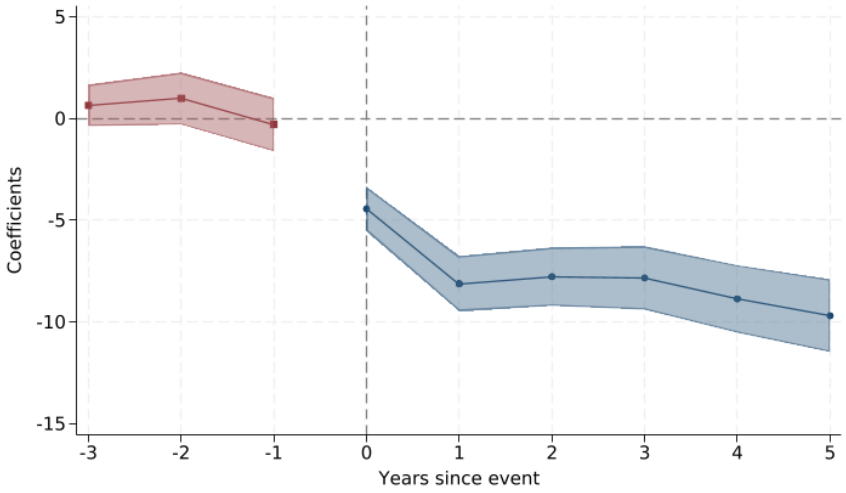
Note: This figure demonstrates how the employment and earnings gaps beteen workers with and without active records vary over time and with the national unemployment rate, which is plotted on the right axis.

Figure E.8
Event study estimates for employment and earnings, imputation-based method

(a) Months employed



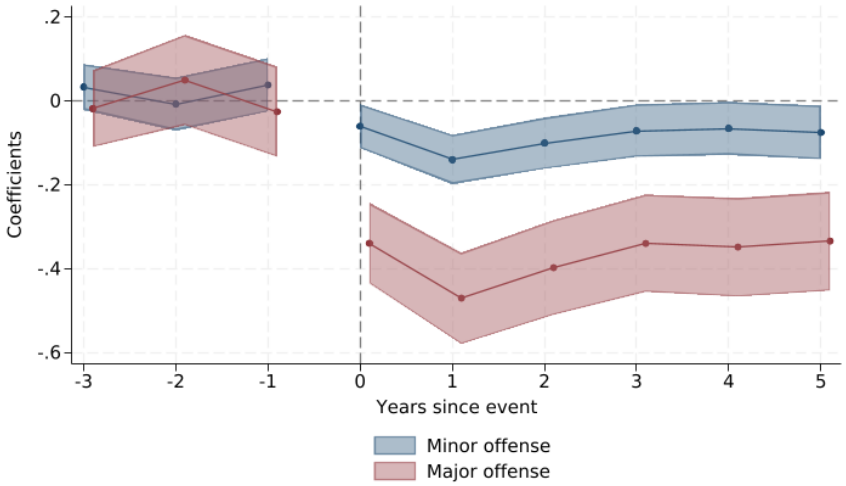
(b) Earnings



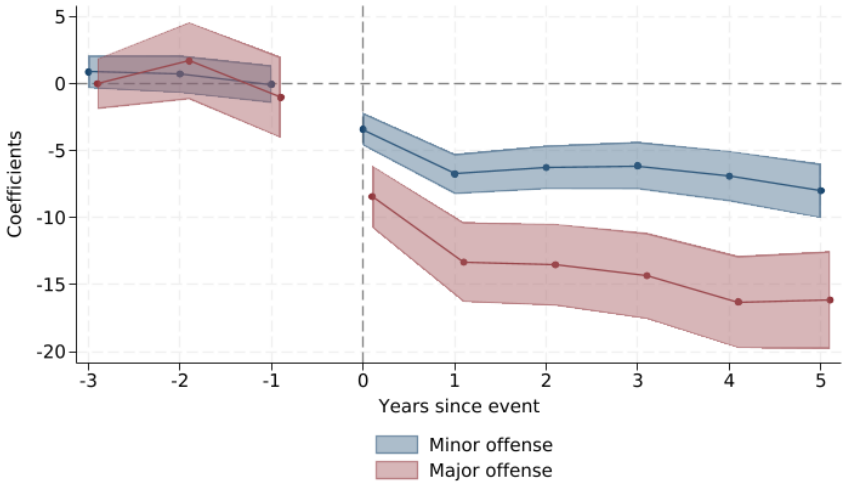
Note: This figure plots the event time coefficients using the imputation-based event study methodology of Borusyak et al. (2024). In panel A the outcome is months employed. In panel B the outcome is earnings.

Figure E.9
Employment and earnings effects by offense severity, imputation-based method

(a) Months employed



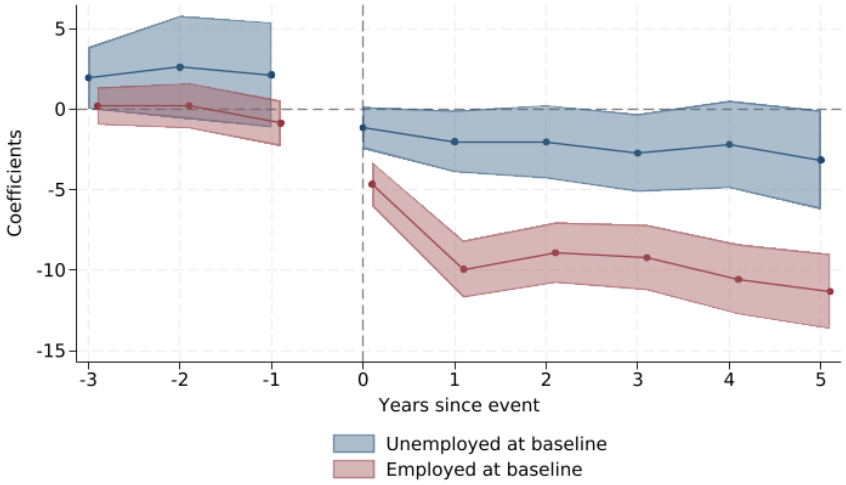
(b) Earnings



Note: This figure plots the event time coefficients using the imputation-based event study methodology of Borusyak et al. (2024), where the specification is estimated separately for events corresponding to minor and major offenses. A event includes a major offense if any specific suspected offense code falls in the top quartile of expected prison sentence length, conditional on a charge. Remaining events are denoted as minor offenses. In panel A the outcome is months employed. In panel B the outcome is earnings.

Figure E.10

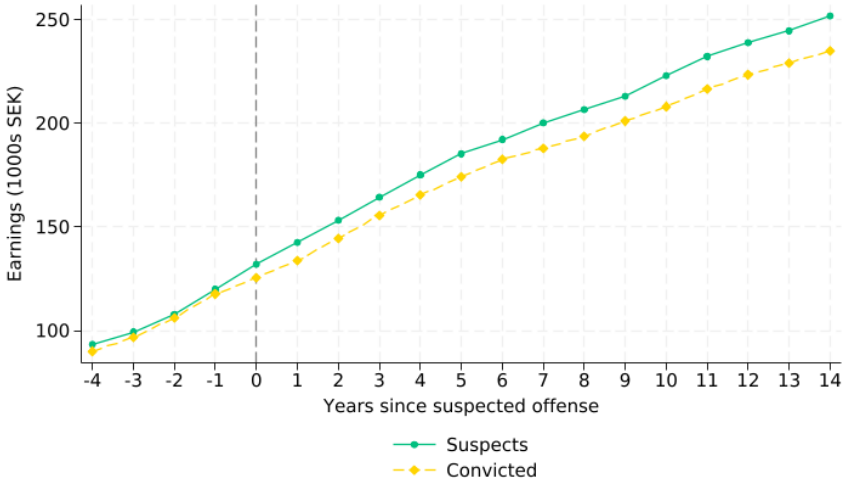
Earnings effects by baseline employment status, imputation-based method



Note: This figure plots the event time coefficients using the imputation-based event study methodology of Borusyak et al. (2024), where the specification is estimated separately for events where the suspect is working in the month of the suspected offense and events where the suspect is not. In panel A the outcome is months employed. In panel B the outcome is earnings.

Figure E.11

Acquiring a criminal record reduces earnings for over an decade

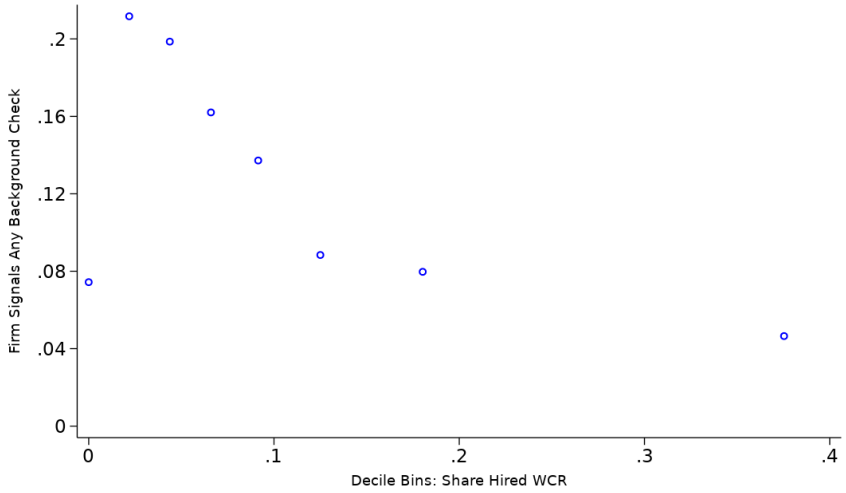


Note: This figure plots earnings before and after suspected offenses for the sample of charged and matched non-charged suspects described in section 5.2, extending the time window to 14 years post-event. We limit events to person-years with at least one associated suspected offense where the person (1) does not have a prior charge; (2) is between ages 22 and 40 at the time of suspicion; (3) is present in Sweden at least 4 years before and 14 years after the suspected offense. Outcomes are plotted separately for non-charged (green solid line) and charged (orange dashed line) suspects.

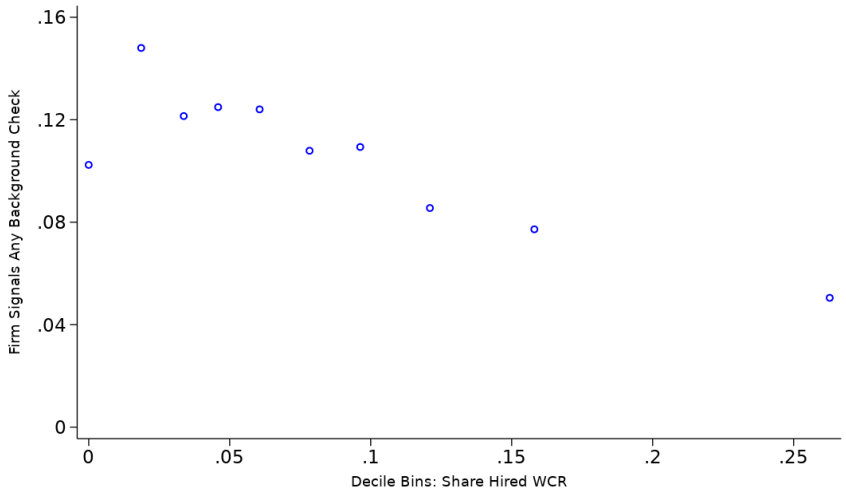
Figure E.12

Bin scatter plots: background check job ad signals versus share of hires with criminal record

(a) All Firms



(b) Trimmed Sample of Firms



Note: This figure demonstrates that there is a negative relationship between the share of workers with a criminal record hired at a firm and whether firms signal any criminal background checks in the job ad data. Panel A includes all firms, while Panel B trims the sample of firms to exclude those with less than 20 hires or more than 346 job ads (which corresponds to the top 5% of firms, and disproportionately includes recruiting firms and public employers).

TABLE E.5
EARNINGS BY WCR STATUS WITH EXAM SCORES, 2015

	Earnings			Months Worked			Log Monthly Earnings				
	Raw	+Demo.	+Test Scores	Raw	+Demo.	+Test Scores	Raw	+Demo.	+Test Scores	+Industry	+Firm
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Criminal record	-113.53	-78.82	-75.47	-2.43	-2.19	-2.18	-0.36	-0.25	-0.24	-0.21	-0.13
	(0.15)	(0.14)	(0.14)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Demographics		✓	✓		✓	✓		✓	✓		
Scores × Demo			✓			✓			✓		
Industry FE										✓	
Firm FE											✓
Observations			31,324,035						27,740,240		

Table E.6
Top/bottom 20 occupations: prevalence of WCRs in 2015

SSYK12 code	*English Name*	*N*	*shrecord*	*MH*	*ML*
2134	Agricultural professionals	616	.002		
2146	Engineering prof: mining, metallurgy...	571	.002		
2242	Psychotherapists	415	.002		+
2232	Nurses - children	2577	.003		+
1351	Real estate and Head of Admin	344	.003		
1540	Religious body manager/leader	340	.003		
2672	Deacons	622	.003		
1111	Legislators	301	.003		
1531	Dept manager elderly care	586	.003		+
2623	Archaelologist and related	827	.004		
1422	Pre-school managers, level 2	2152	.004	X	
2612	Judges	1333	.004	X	
2111	Physicists and astronomers	1542	.004		+
2613	Prosecutors	761	.004		+
2234	Company nurses	494	.004		+
2415	Economists and macro analyst	1118	.004		
2250	Veterinarians	1702	.005		
2283	Audiologists and speech therapists	1859	.005		+
2113	Chemists	2265	.005		
2224	District nurses	4501	.005		+
8321	Taxi, car, and van drivers	6768	.12		+
7212	Welders and flame cutters	9552	.121		
5242	Telemarketers	7147	.122		
9629	Other unclassified service workers	15086	.122		
7132	Painters and industrial painters	3712	.123		
7123	Insulation workers	1238	.123		
7122	Floor layers	2870	.126		
9120	Car reconditioning, window/hand cleaners	3715	.131		
7113	Concrete placers, finishers, related	6389	.134		
9520	Street and market vendors	666	.135		
8113	Well drillers, borers, and related	368	.136		
9332	Ground personnel, movers and stockers	3952	.137		
7215	Steel structure erectors and heavy plate workers	1268	.139		
7119	Unclassified building frame and related	13710	.144		
6222	Fishermen	481	.152		
7121	Roofers	2644	.155		
7221	Blacksmiths, hammersmiths, forging press	2088	.157		
7134	Building structure cleaners and related	2931	.172		
9310	Construction labourers	4502	.189		
7116	Scaffold builders	2358	.263		

For the sample 18 to 55 year old employees with occupation codes in 2015 we list the top and bottom 20 occupations in terms of the prevalence of workers with non-traffic ticket criminal records. X indicates if there are mandatory checks for hiring (ML) and + for occupational licenses (ML). We exclude the bottom 5 percent of occupations in terms of number of employees.

TABLE E.7

HETEROGENEITY IN THE EARNINGS EFFECT OF A CHARGED OFFENSE

	By offense severity		By baseline status		By offense type				By age		By time period	
	Minor	Major	Unemployed	Employed	Violent	Property	Narcotics	Traffic	22–29	30–40	'95-'03	'04-'10
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
θ_{-4}	0.03	1.01	-2.14	0.87	1.24	-0.70	3.86	-2.09	0.31	0.26	0.26	0.32
	(0.71)	(1.54)	(1.65)	(0.72)	(0.88)	(1.28)	(1.90)	(1.60)	(0.61)	(1.21)	(0.70)	(1.12)
θ_{-3}	0.91	1.01	-0.18	1.06	1.14	0.98	3.45	-1.21	0.68	1.22	0.57	1.31
	(0.63)	(1.18)	(1.06)	(0.73)	(0.87)	(0.88)	(2.04)	(1.90)	(0.63)	(0.95)	(0.70)	(0.87)
θ_{-2}	0.77	2.73	0.48	1.09	1.03	1.65	3.08	0.77	0.96	1.62	1.61	0.95
	(0.50)	(0.91)	(0.60)	(0.59)	(0.70)	(0.70)	(1.73)	(1.33)	(0.54)	(0.70)	(0.59)	(0.64)
θ_{-1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
θ_0	-3.14	-7.16	-1.96	-3.95	-3.44	-4.52	-7.99	-5.44	-4.04	-4.34	-3.32	-5.05
	(0.53)	(1.17)	(0.47)	(0.60)	(0.74)	(0.85)	(1.92)	(1.38)	(0.59)	(0.80)	(0.62)	(0.77)
θ_1	-5.91	-12.17	-2.99	-8.35	-6.03	-6.85	-14.91	-11.22	-7.17	-7.95	-5.60	-9.50
	(0.70)	(1.58)	(0.76)	(0.86)	(0.98)	(1.15)	(2.52)	(1.88)	(0.78)	(1.08)	(0.88)	(0.99)
θ_2	-6.05	-12.03	-3.00	-8.59	-7.34	-6.65	-19.92	-6.80	-8.07	-7.12	-5.89	-9.34
	(0.79)	(1.59)	(1.02)	(0.93)	(1.12)	(1.19)	(2.90)	(2.09)	(0.89)	(1.14)	(0.92)	(1.11)
θ_3	-6.38	-12.64	-3.76	-9.24	-7.97	-7.36	-20.97	-5.94	-8.21	-7.80	-6.07	-9.97
	(0.88)	(1.67)	(1.23)	(1.01)	(1.23)	(1.28)	(3.11)	(2.30)	(0.97)	(1.25)	(1.02)	(1.19)
θ_4	-6.93	-14.89	-3.52	-10.46	-7.66	-8.83	-23.18	-8.58	-9.55	-8.43	-7.92	-10.10
	(0.94)	(1.78)	(1.33)	(1.08)	(1.32)	(1.34)	(3.38)	(2.51)	(1.04)	(1.33)	(1.12)	(1.25)
θ_5	-7.83	-14.31	-4.00	-10.90	-8.85	-7.64	-24.88	-9.23	-9.96	-9.06	-8.77	-10.29
	(1.01)	(1.88)	(1.43)	(1.16)	(1.40)	(1.44)	(3.62)	(2.67)	(1.11)	(1.42)	(1.20)	(1.32)
Non-charged outcome mean	...	...	...	...	203.3631	170.3827	188.3137	243.666	194.6622	211.8024	186.7118	220.5373
Observations	1165480	420220	449150	1063670	597120	579170	71550	217680	801610	784090	773550	812150

This table shows event time coefficients (λ_j) from the event study specification (3), where the specification is estimated separately for various subsamples of events. Columns 1 through 4 split the sample by the type of offense (violent, property, narcotics, traffic). Events that includes multiple types of suspected offenses will be included in multiple samples. Columns 5 and 6 split the sample in half by suspect age: 22–29 in column 5 and 30–40 in column 6. Columns 7 and 8 split the sample period in half: 1995–2003 in column 7 and 2004–2010 in column 8.

Table E.8
Characteristics for suspects and suspected offenses, second offense

	All		Matched and Weighted	
	Suspects	Convicted	Suspects	Convicted
Age at time of suspected offense	29.02	28.09	26.79	26.79
	(5.697)	(5.541)	(5.294)	(5.294)
Year of suspected offense	2004.6	2004.2	2004.4	2004.4
	(4.015)	(4.107)	(4.202)	(4.202)
Order of offense	2.414	2.376	2.155	2.155
	(0.711)	(0.677)	(0.410)	(0.410)
Violent (%)	48.54	28.60	30.50	30.50
Property (%)	34.62	41.16	39.28	39.28
Traffic (%)	6.133	29.99	13.31	13.31
Narcotics (%)	10.94	27.58	17.44	17.44
Sex (%)	4.217	2.073	0.510	0.510
Other (%)	12.13	14.45	3.392	3.392
Any major offense (%)	42.9	31.3	19.8	19.8
Fine or less (%)	0	59.95	0	57.97
Probation and other (%)	0	27.25	0	31.45
Prison (%)	0	12.80	0	10.58
Male (%)	76.13	74.97	79.39	79.39
Swedish born (%)	62.86	66.23	68.53	68.73
Age	28.55	27.61	26.30	26.25
	(5.752)	(5.578)	(5.366)	(5.335)
Years of education	11.07	10.93	11.06	11.01
	(1.944)	(1.887)	(1.804)	(1.835)
Earnings (1000s SEK)	133.1	115.1	123.3	118.2
	(151.3)	(121.8)	(128.7)	(121.8)
Months employed year	6.924	6.544	6.570	6.460
	(5.457)	(5.467)	(5.528)	(5.528)
Workplace size	263.8	269.8	240.5	272.6
	(869.6)	(890.0)	(824.9)	(871.5)
Firm size	4136.2	3832.3	3366.5	3726.0
	(10891.7)	(10385.7)	(9722.2)	(10438.6)
Average coworker earnings (1000s SEK)	197.0	194.4	204.4	205.0
	(105.6)	(95.74)	(98.93)	(93.10)
% of coworkers with active records	11.30	11.73	11.11	11.14
	(14.44)	(14.84)	(13.91)	(13.70)
Firm pay premium at main job	0.144	0.145	0.193	0.244
	(0.830)	(0.822)	(0.809)	(0.755)
Agriculture and resources	3.274	3.577	3.888	3.517
Care and social services	10.00	10.25	7.384	8.034
Construction	9.128	9.461	10.70	12.43
Education	4.044	3.844	3.444	3.557
Health care	2.580	2.488	1.914	1.958
Hotels and restaurants	8.723	9.012	7.621	7.514
Manufacturing and industry	19.32	19.54	20.56	21.58
Public administration and defense	2.080	1.431	1.533	1.199
Retail and wholesale	12.96	13.65	15.17	14.79
Services	25.28	23.93	25.45	23.26
Unknown	2.580	2.787	2.338	2.158
Missing	0.0193	0.0320	0	0
Observations	29479			

...

TABLE E.9
FIRM DESCRIPTIVE STATISTICS FOR TABLE 8

	Baseline	Matched to job ads	With exposure measures
Male (%)	63.01	57.33	63.78
	(27.71)	(27.07)	(27.63)
Swedish born (%)	79.99	79.17	80.98
	(24.53)	(22.95)	(24.03)
Avg. age	30.42	30.58	30.17
	(4.981)	(4.544)	(4.717)
Avg. years of education	11.68	11.94	11.68
	(0.970)	(0.999)	(0.975)
Monthly wage (1000s SEK)	10.76	12.26	11.29
	(8.197)	(7.653)	(7.644)
Log monthly wage	1.492	1.718	1.591
	(1.114)	(0.962)	(1.024)
Avg. earnings rank	53.04	53.63	53.58
	(11.26)	(10.49)	(11.10)
Criminal record (%)	13.13	10.43	12.73
	(10.64)	(8.512)	(10.26)
Suspect without record (%)	7.557	6.762	7.194
	(6.571)	(5.563)	(6.252)
Workplace size	114.4	131.3	107.8
	(209.1)	(223.1)	(188.1)
Firm size	1461.7	1627.2	1364.1
	(2047.2)	(2100.0)	(1848.3)
Firm effect for WCR hiring (θ) $\times$ 100	0.629	-0.0246	0.572
	(22.28)	(19.43)	(21.85)
Avg. criminal propensity of hires X 100	10.33	8.702	9.933
	(8.111)	(6.958)	(7.773)
Firm pay premium	-0.257	-0.00557	-0.107
	(1.084)	(0.872)	(0.941)
Log value added per worker	11.27	11.65	11.46
	(1.384)	(1.236)	(1.247)
% firms ever mentions background checks in ads	11.10	11.10	11.40
	(31.42)	(31.42)	(31.78)
operator has past record	0.233	0.201	0.234
	(0.405)	(0.375)	(0.405)
operator has family with past record	0.142	0.135	0.142
	(0.312)	(0.294)	(0.312)
operator has high exposure to co-workers with records	0.269	0.168	0.269
	(0.425)	(0.338)	(0.424)
Agriculture and resources	3.917	3.149	4.094
	(12.98)	(11.64)	(13.29)
Care and social services	5.101	6.867	4.777
	(11.63)	(15.29)	(11.07)
Construction	12.74	7.718	13.69
	(25.85)	(20.13)	(26.81)
Education	4.225	6.621	4.154
	(10.26)	(15.26)	(10.36)
Health care	1.502	2.080	1.354
	(7.032)	(9.280)	(6.518)
Hotels and restaurants	12.65	12.92	11.67
	(24.81)	(25.34)	(23.97)
Manufacturing and industry	14.98	14.51	15.37
	(25.77)	(25.73)	(26.06)
Public administration and defense	1.129	1.088	1.011
	(3.263)	(2.743)	(2.669)
Retail and wholesale	15.05	14.83	15.57
	(23.69)	(23.40)	(24.24)
Services	27.63	29.45	27.33
	(28.86)	(29.96)	(29.08)
Unknown	1.066	0.768	0.969
	(3.876)	(1.896)	(3.606)

TABLE E.10
FIRM LEVEL SUMMARY STATISTICS IN THE JOB ADVERTISEMENT DATA

	(1) All Firms		(2) All: Signal=1		(3) All: Signal = 0		(4) Private: Signal=1		(5) Private: Signal=0	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
any_ads_crimrec	0.09	0.28	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
any_ads_drugalc	0.03	0.17	0.21	0.41	0.01	0.11	0.17	0.38	0.01	0.11
onet_avg_educ	3.35	1.35	3.82	1.20	3.30	1.36	3.77	1.23	3.30	1.36
onet_jobzone	2.48	0.79	2.71	0.73	2.46	0.80	2.68	0.75	2.46	0.80
onet_customers	3.42	0.58	3.42	0.48	3.42	0.59	3.41	0.49	3.42	0.59
onet_vulnerable_pop	0.10	0.24	0.35	0.37	0.07	0.21	0.33	0.38	0.07	0.21
onet_theft_fin_opp	0.19	0.19	0.15	0.15	0.20	0.19	0.16	0.15	0.20	0.19
onet_work_conditions	3.14	0.46	3.27	0.31	3.13	0.47	3.26	0.32	3.13	0.47
share_military	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
share_manager	0.03	0.10	0.05	0.08	0.03	0.10	0.04	0.08	0.03	0.10
share_professionals	0.13	0.27	0.20	0.26	0.12	0.27	0.18	0.26	0.12	0.26
share_technicians	0.18	0.28	0.26	0.26	0.18	0.28	0.27	0.26	0.18	0.28
share_clerks	0.07	0.18	0.05	0.12	0.07	0.18	0.06	0.13	0.07	0.18
share_service_shop_sales	0.22	0.34	0.24	0.32	0.22	0.35	0.25	0.33	0.22	0.35
share_agric_fishery	0.02	0.11	0.01	0.05	0.02	0.12	0.01	0.05	0.02	0.12
share_craft_trades	0.15	0.30	0.07	0.17	0.16	0.31	0.07	0.18	0.16	0.31
share_plant_machine	0.08	0.22	0.06	0.18	0.08	0.23	0.06	0.19	0.08	0.23
share_elem_unskilled	0.11	0.25	0.06	0.19	0.12	0.26	0.07	0.19	0.12	0.26
sh_mancheck_hire	0.05	0.17	0.23	0.33	0.03	0.14	0.22	0.34	0.03	0.14
sh_mancheck_license	0.09	0.25	0.17	0.27	0.09	0.24	0.17	0.27	0.09	0.24
recruiting_firm	0.01	0.09	0.04	0.19	0.01	0.07	0.04	0.20	0.01	0.07
likely_public_sector	0.01	0.10	0.07	0.26	0.00	0.06	0.00	0.00	0.00	0.00
avg number vacancies	1.64	5.68	1.92	4.16	1.61	5.81	1.91	4.32	1.62	5.82
number of ads	119.87	1214.99	929.76	3839.44	41.83	358.92	774.89	3735.95	41.90	359.56
share_shortterm_job	0.12	0.22	0.12	0.16	0.12	0.22	0.12	0.16	0.12	0.22
share_regular_emp	0.86	0.28	0.86	0.23	0.86	0.28	0.85	0.24	0.86	0.28
share_fixed_salary	0.92	0.23	0.95	0.16	0.92	0.23	0.95	0.17	0.92	0.23
share_fulltime	0.81	0.29	0.75	0.28	0.82	0.29	0.75	0.29	0.82	0.29
share_license_req	0.19	0.30	0.27	0.29	0.18	0.30	0.27	0.30	0.18	0.30
adtext_result_detail	0.02	0.08	0.02	0.06	0.02	0.09	0.02	0.06	0.02	0.09
adtext_independent	0.18	0.27	0.25	0.24	0.17	0.28	0.24	0.25	0.17	0.28
adtext_adaptable	0.13	0.26	0.14	0.19	0.13	0.26	0.14	0.20	0.13	0.26
adtext_responsible	0.07	0.19	0.10	0.18	0.07	0.19	0.11	0.18	0.07	0.19
N	54370		4779		49591		4426		49412	

This table presents firm level summary statistics for all firms with known id numbers in the job ads data. Column (1) includes all firms, while column (2) and (3) separate the firms according to whether they ever signal background checks. Columns (4) and (5) present the same splits for firms that are likely non-public.