Prison Rehabilitation Programs, Recidivism, and Labor Market Outcomes*

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Abstract

This paper examines the impact of the Rehabilitation & Reintegration initiative, a prison-based job training and skills development program, on recidivism, labor market, and social outcomes. I use a difference-in-differences strategy to assess the causal impact of the program, introduced in the Netherlands in 2007. Drawing on rich administrative data from Statistics Netherlands and the Dutch Ministry of Justice and Security, I find that prisoners eligible in the program are 4.5 percentage points (14%) less likely to reoffend over a period of three years. The program also increases earnings, though only for native and older prisoners, and enhances stable housing and personal relationships. My results highlight the potential of rehabilitation programs in facilitating the successful reintegration of former prisoners into society.

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1 Introduction

Former prisoners face significant challenges when re-entering society: they often encounter discrimination in the labor market, difficulties in securing stable housing, and limited social support. Without adequate help, the risk of recidivism is high, with nearly 50% of ex-prisoners in most countries committing another crime within two years after release (Yukhnenko et al., 2019).

Prison rehabilitation programs, typically including a combination of vocational training, educational courses, and behavioral interventions, offer a potential pathway for reintegration. However, the efficacy of these programs remains largely unexplored. While some studies provide evidence that rehabilitative programs can effectively reduce recidivism (e.g., Arbour (2021); Arbour et al. (2024); Alsan et al. (2024)), others report no or diminishing effects over time (e.g., Huttunen et al. (2014); Lee (2019)). Even when positive outcomes are observed, the mechanisms behind these results remain unclear. Whether the reductions in reoffending are due to improved labor market opportunities, stronger social networks, or other factors is not well understood, as existing studies lack causal evidence on the channels through which these programs achieve their impact. Understanding whether and how prison rehabilitation programs facilitate successful reintegration is critical, as effective interventions could change the life trajectories of former prisoners while benefiting communities by enhancing public safety and reducing criminal justice costs.

I evaluate a prison rehabilitation program within the context of Dutch prisons. The Netherlands provides a compelling setting for this analysis due to its focus on rehabilitation over punishment, the standardized rehabilitation programs offered, and the availability of comprehensive administrative data that facilitate in-depth analysis of recidivism, labor market outcomes, and various social outcomes. In particular, I examine the Rehabilitation & Reintegration program (R&R program, henceforth), a prison-based job training and skills development initiative uniformly implemented across all penitentiary institutions in the Netherlands at the end of 2007. The program includes six behavioral interventions and consists of weekly group sessions lasting two to four months. Eligible prisoners are identified and assigned to a program counselor, who collaborates with the inmate to develop a personalized reintegration plan tailored to their specific needs and circumstances, such as enhancing cognitive abilities, job skills, or managing addiction and aggression.

To evaluate the causal impact of the program, I exploit the timing of the introduction of the R&R program within a difference-in-differences framework, leveraging exogenous variation in the eligibility criteria for program participation. Detainees with prison sentences

lasting a minimum of four months are eligible for the R&R program.[1] The rationale behind this threshold is to ensure that inmates have sufficient time to engage meaningfully with the program components. A minimum sentence of four months provides a feasible window for inmates to draw up a comprehensive reintegration plan in collaboration with their program counselor and allows for the scheduling and attendance of the group sessions. Hence, I compare the reoffending behaviors, labor market outcomes and social outcomes of eligible prisoners (those with a prison sentence longer than four months) and non-eligible prisoners (those with a prison sentence shorter than four months) over time.

My analysis relies on the following assumptions and considerations. First, the validity of the difference-in-differences identification strategy is based on the parallel trends assumption. The test results corroborate the absence of systematic differences between eligible and non-eligible offenders prior to the introduction of the program. Second, judges may have adjusted their sentencing behavior in response to the reform. To address this, I examine changes in sentence lengths around the time of the reform and find no evidence of manipulation, suggesting that judges did not alter their sentencing practices in response to the R&R program's implementation. Third, I investigate whether there were any compositional changes in the types of crimes or the characteristics of inmates during the reform period. My findings show no significant changes.

I evalute the effectiveness of the R&R program combining comprehensive administrative data from various sources, which allow me to track all the individuals who come into contact with the Dutch judicial system. I collect detailed prison register data from the Research and Policy Database for Judicial Documentation (OBJD) of the Dutch Ministry of Justice and Security, including information on inflow and outflow dates, types of crimes committed, criminal histories, and reoffending behavior. I link these records to court case information, providing a complete view of the judicial process from conviction to sentencing. Finally, I merge these data with administrative records from Statistics Netherlands, which include demographic (e.g., sex, age, country of origin) and socioeconomic (e.g., education, earnings, employment) variables. The resulting comprehensive data set enables me to assess the effects of prison rehabilitation programs not only on recidivism but also on labor market outcomes and broader social outcomes, such as stable housing and personal relationships.

My main findings can be summarized as follows. The R&R program reduces reoffending by 4.5 percentage points over a three-year period post-release, representing a 14% reduction in recidivism relative to the mean rate among non-eligible prisoners. The results should be interpreted as an intention-to-treat estimate, as the analysis is based on eligibility rather

[1]Exceptions include life sentence prisoners, those under forensic psychiatric care, criminal aliens, and individuals without sufficient Dutch proficiency.

than actual participation data. Approximately 40% of eligible offenders participate in the R&R program, resulting in an overall recidivism reduction of roughly 35%. To further assess the program's effectiveness across different prisoner profiles, I conduct a heterogeneity analysis by crime type. Prisoners are assigned to specific rehabilitation modules based on their criminogenic needs, which I infer from the type of crime committed. The results indicate stronger effects for prisoners convicted of violent and property crimes, suggesting these modules may be particularly effective in reducing recidivism risk among these groups. However, due to the non-random assignment of prisoners to modules, these findings should be viewed as suggestive rather than causal.

I further explore mechanisms that may explain the reduction in recidivism. Securing stable housing, employment, and personal relationships are widely considered crucial for successful reintegration and reducing recidivism (Jacobs & Gottlieb, 2020; Valentine & Redcross, 2015; Bersani et al., 2017). I find that eligibility in the program improves social outcomes, increasing the likelihood of having a partner by 1.5 percentage points, equivalent to a 15% rise compared to non-eligible prisoners. It also leads to a 1.2 percentage point (1.5%) increase in housing registration, suggesting enhanced housing stability among eligible prisoners. These factors likely contributed to their successful re-integration and reduced likelihood of returning to prison.

The R&R program also increases earnings but has a negligible effect on employment rates. Native and older offenders benefit the most from the program, with their average earnings increasing by approximately 9% and 12%, respectively, three years after release. The literature documents significant barriers to employment for individuals with criminal records (Pager, 2003; Rose & Shem-Tov, 2021; Humphries et al., 2023), raising questions about the efficacy of rehabilitation programs in this context. Nonetheless, my results suggest that for those who do find employment, participation in the R&R program may enhance productivity and job quality, thereby leading to higher earnings. To identify the source of the earnings gains, I investigate whether they stem from increased hours worked but find no evidence of such an effect. This suggests that the earnings improvements are more likely due to higher wages or improved job matches, possibly driven by mechanisms such as skill development, behavioral changes, or the signaling value associated with participation in rehabilitation programs. Additionally, the R&R program may help alleviate the self-stigma attached to having a criminal record. Ex-prisoners frequently sort into lower-paying jobs, potentially due to reduced expectations of their prospects in the labor market. By enhancing both confidence and employability, the program may encourage individuals to pursue better job opportunities that they might otherwise have overlooked.

My paper contributes to the existing literature by examining the factors that influence

reoffending behaviors and evaluating the effectiveness of prison rehabilitation programs. To explore the causes of reoffending and potential prevention measures, researchers have studied various factors, ranging from prison conditions to the duration of punishment (for an extensive literature review, see Doleac (2023)). Preventive interventions targeting high-risk individuals before incarceration have shown promise. For instance, job placement programs that integrate cognitive-behavioral therapy (CBT) for at-risk individuals have demonstrated reductions in rearrest rates and gun violence. When paired with cash transfers, CBT has shown additional reductions in recidivism, underscoring the preventive role of financial support alongside behavioral interventions (Barnes et al., 2017; Blattman et al., 2017, 2023; Bhatt et al., 2024).[2] However, despite the promise of preventive programs, it is not always feasible to avert criminal behavior entirely. For individuals already in the criminal justice system, prisons present a critical opportunity to implement reintegration programs that reduce recidivism and support reentry into society. In a controlled environment, rehabilitation efforts can offer structured interventions designed to address the underlying factors contributing to criminal behavior. As I mentioned earlier, prison rehabilitation and restorative justice programs generally show positive effects, but largely focus on reoffending rates alone (Huttunen et al., 2014; Lee, 2019; Arbour, 2021; Arbour et al., 2024; Shem-Tov et al., 2024; Alsan et al., 2024). This paper provides causal evidence on the impact of prison rehabilitation programs not only on recidivism but also on labor market and social outcomes, such as personal relationships and housing stability—key areas for social reintegration that have been largely overlooked in prior research.

My paper also relates to the broader literature on the effects of incarceration on recidivism and labor market outcomes. The overall impact of incarceration is mixed. While some studies find that it can lead to long-term criminogenic effects and adverse labor market outcomes (Stevenson et al., 2023; Mueller-Smith, 2015), others highlight conditions under which it can support social reintegration, particularly when prisoners are given greater freedoms (Mastrobuoni & Terlizzese, 2022; Tobón, 2022). Bhuller et al. (2020) highlights that incarceration may be more effective when focused on rehabilitation, as demonstrated by Norway's criminal justice system. A rehabilitative approach appears to reduce criminal behavior and improve employment prospects, particularly among individuals who were unemployed prior to incarceration. The economic effects of incarceration are similarly varied. Some studies report minimal negative impacts on employment in certain contexts (Kling, 2006), while others identify short-term economic declines (Garin et al., 2024). These findings underscore the

[2]Similar programs for youths have also been studied. For instance, the Pathways to Education program, which provides comprehensive support to disadvantaged youth, has been shown to reduce criminal charges (Lavecchia et al., 2024).

complexity and heterogeneity of incarceration's impacts. My study aims to clarify the conditions under which incarceration can effectively support rehabilitation and promote lasting social reintegration.

The rest of the paper is organized as follows. Section 2 describes the institutional setting and provides details on the R&R program. Section 3 presents the data and the sample selected. Section 4 introduces the empirical strategy and main results based on event study and difference-in-differences estimates. Additionally, Section 4 discusses potential mechanisms driving the results. Section 5 provides alternative approaches to identification and estimation. Section 6 presents a discussion on the cost-benefit analysis of the R&R program. Section 7 integrates all the findings and concludes.

2 Institutional Background

2.1 Dutch Criminal Justice System

The Dutch prison system comprises today 48 establishments, including 30 prisons for adults, 5 institutions for juveniles, 2 for illegal aliens, and 11 clinics for individuals subject to forensic psychiatric care.

Dutch prisons are designed to accommodate different needs and security levels. There are specific centers where adults awaiting trial are held, separate from regular prisons where those who have been convicted serve their sentences. For prisoners with specific needs, due to the nature of their offenses or mental health issues, there are specialized units such as extra care units and psychiatric facilities. Persistent offenders have their own specialized units as well. Prisons also differ in security levels: high-security units are designated for dangerous individuals, while minimum-security units offer more freedom. Typically, prisons feature libraries, sports facilities, and worship spaces that accommodate various religions. Prisoners are entitled to at least one hour of outdoor time daily.[3] Additionally, every prison has a health care unit that provides free physical and mental health care.

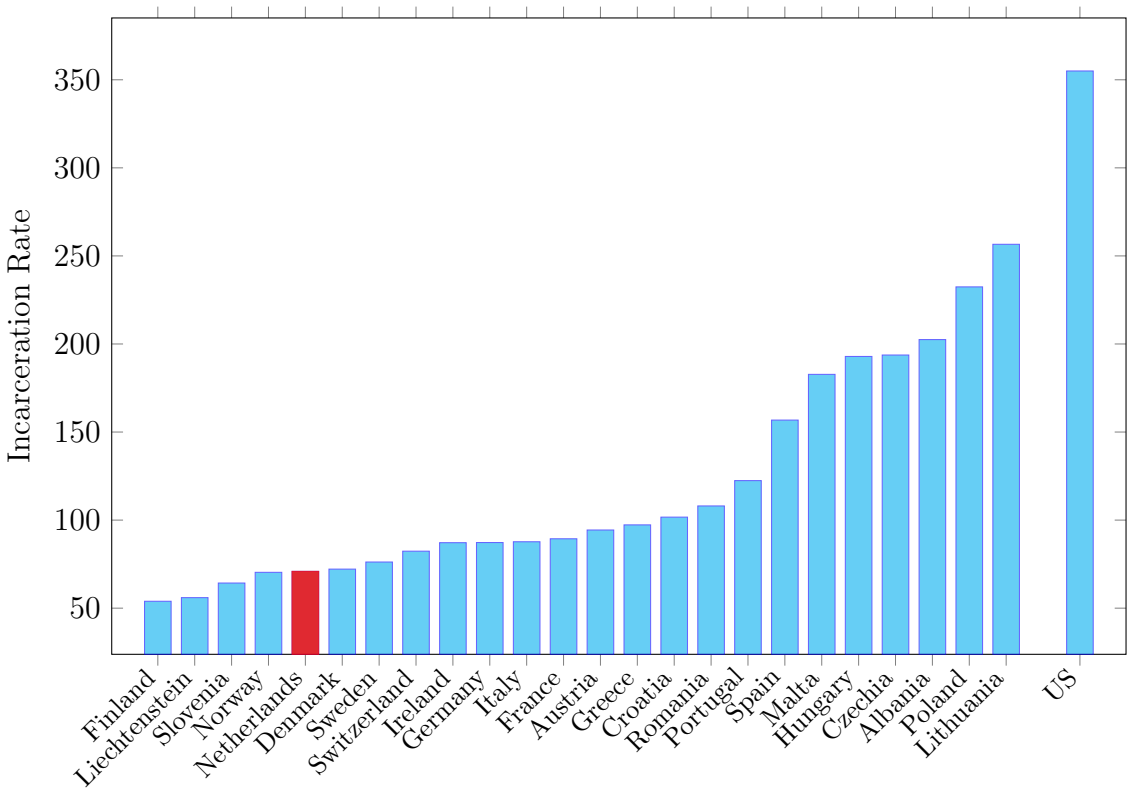
Comparison Prison Systems To interpret the findings on the impact of the R&R program, it is useful to compare the Dutch prison system with those of other countries, especially the United States and Scandinavian countires, where most of the existing evidence on incarceration originates. Unlike the United States, but more in line with Scandinavian countries,

[3]The right to access activities and spend time outdoors is guaranteed by Article 49, paragraph 1 of the Penitentiary Principles Act.

the Netherlands is known for its relatively lenient approach to incarceration, prioritizing rehabilitation and reintegration over punitive measures (Tak, 2008).

Figure 1 illustrates the incarceration rates across European countries and the United States. The Netherlands, with approximately 65 prisoners per 100,000 inhabitants, has one of the lowest incarceration rates in Europe—significantly below the European average of 106 in 2021 (Eurostat, 2021). This contrasts sharply with the United States, where the incarceration rate exceeds 350 per 100,000 inhabitants. Despite the relatively low number of inmates, the recidivism rate in the Netherlands remains high, with 50% of ex-detainees reoffending within two years of release (Verweij et al., 2021).

Figure 1: Incarceration Rate per 100,000 Inhabitants



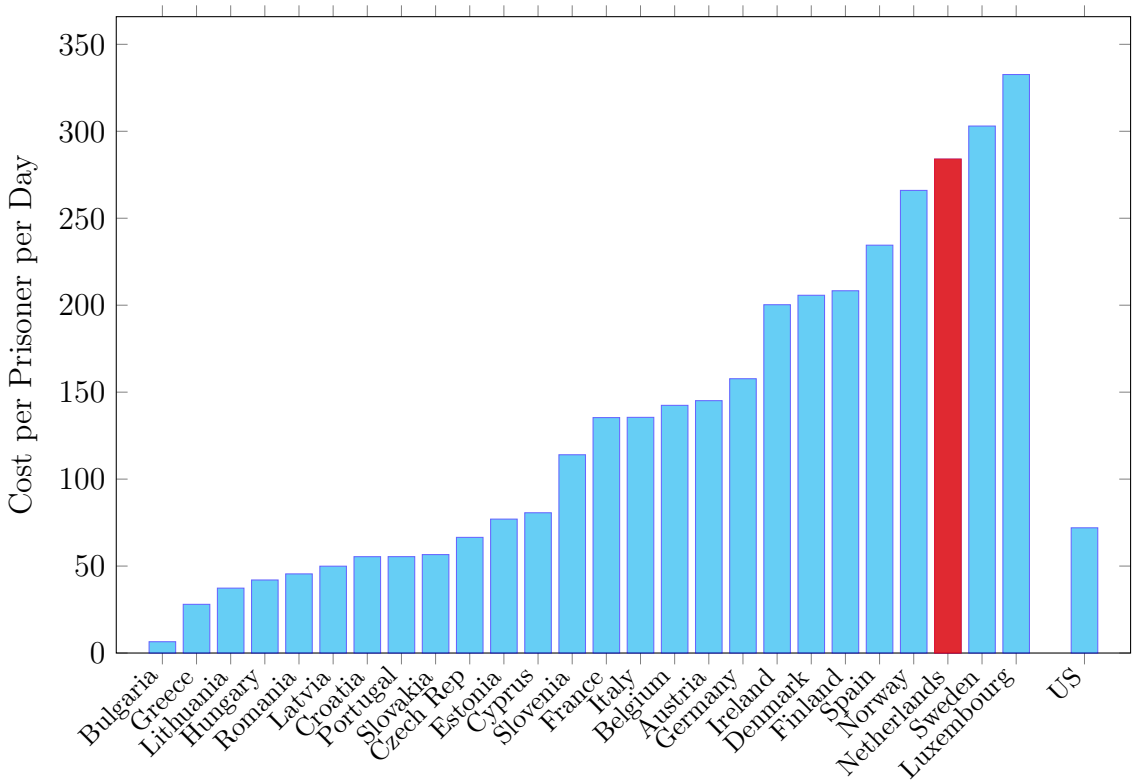
Notes: This figure shows incarceration rates across the main European countries and the United States. The incarceration rate is calculated as the number of individuals in prison per hundred thousand inhabitants. European incarceration rates are retrieved from (Eurostat, 2021), while United States incarceration rates are taken from Bureau of Justice Statistics (2023).

The cost of incarcerating prisoners varies significantly between the United States and European countries, particularly those in Scandinavia. In the U.S., the average daily cost per prisoner is approximately €66 (World Population Review, 2024).[4] In contrast, European

[4]Though this can vary widely, with average yearly costs ranging from €45 to over €759 depending on

countries allocate more substantial resources to their prison systems. The Netherlands spends around €284 per prisoner daily. Scandinavian countries allocate similar amounts. Norway, for instance, invests approximately €266 per prisoner daily, and Sweden allocates about €300 daily per prisoner. These figures reflect not only higher labor costs but also higher living standards and comprehensive rehabilitation programs in these countries (Council of the European Union, 2022). Figure 2 summarizes the daily cost per prisoner between European countries and the United States.

Figure 2: Cost per Prisoner per Day in Euros



Notes: This figure shows the daily cost per prisoner among various countries. The data is sourced from the respective governmental reports and international datasets. Council of the European Union (2022) and World Population Review (2024). In the U.S. it varies from €45 to over €759 depending on the state.

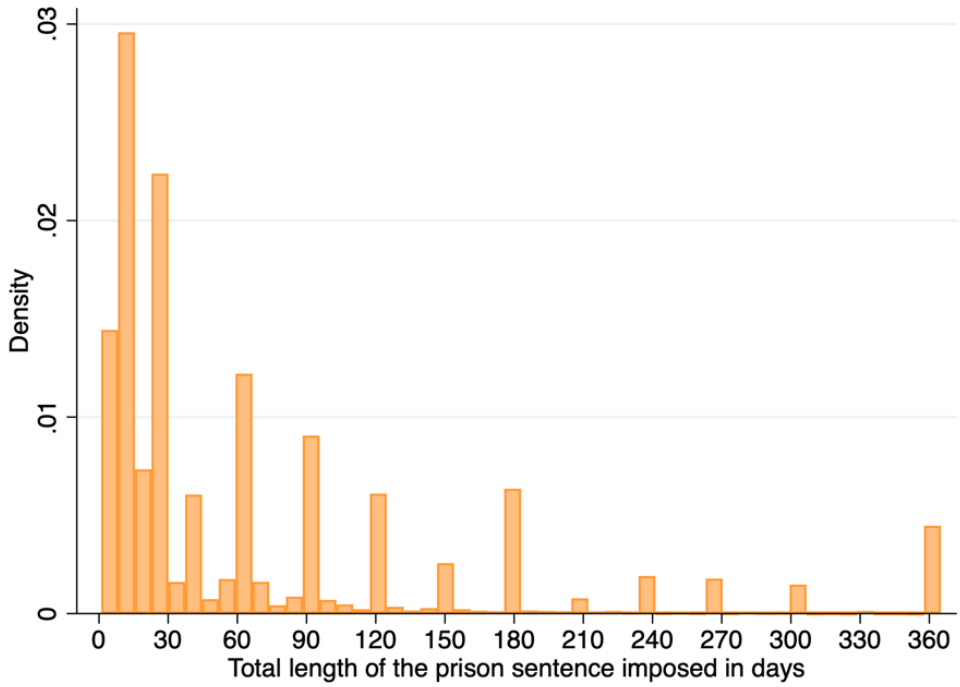
Concerning the prison sentence length, there are significant variations between countries, which reflect distinct criminal justice approaches. The U.S. imposes longer prison sentences compared to most European countries. In 2023, the average length of imprisonment in Europe was 11.8 months (Aebi & Cocco, 2024). In the same year, in the United States, the average sentence imposed was 52 months (United States Sentencing Commission, 2023).

the State.

In the Netherlands, the majority of prison sentences are relatively short, with an average sentence length of 3.5 months (Aebi & Tiago, 2018).[5]

Figure 3 presents the distribution of sentence lengths in the Netherlands, revealing a significant concentration of sentences at shorter durations. The data indicate distinct spikes at specific intervals that reflect sentencing practices associated with particular sentence lengths. These spikes are particularly evident at rounded month increments, suggesting systematic patterns in the assignment of sentences that are commonly observed in other jurisdictions as well.

Figure 3: Distribution Sentence Length in the Netherlands



Notes: This graph displays the density distribution of prison sentence lengths (in days) for convicted individuals in the Netherlands. The x-axis represents the total length of the prison sentence imposed, ranging from 0 to 360 days, while the y-axis shows the density. The source of the data used to create this figure is derived from Statistics Netherlands.

2.2 Prevention of Recidivism Program

The Rehabilitation & Reintegration Program was introduced in the Netherlands on December 31, 2007. The program was established by the Prison Sector Director in conjunction with the directors of the three Probation Organizations (3RO) in the Netherlands. This policy

[5]In the Netherlands, prisoners are usually released if they have served two thirds of their sentence.

reform uniformly affected all penitentiary institutions. The reform involves a prison-based program focused on the active participation of prisoners in skills and training programs. These programs aim to reduce reoffending rates among participants and facilitate their reintegration into society after release by helping them acquire skills useful for every day life and the labor market. Before the implementation of this policy, there was no structured approach to rehabilitation or program offerings.

Rehabilitation & Reintegration The primary objective of the R&R program is to decrease recidivism rates among former prisoners and help their reintegration into society. To achieve this, the program employs diagnostic tools, such as the Risk Assessment Scales (RISc), to develop individualized reintegration plans. The RISc is a validated tool designed to evaluate an offender's risk of recidivism and identify their criminogenic needs (Van der Knaap et al., 2007).

Facilitated by the Trajectory Information System (TRIS) application, prisoners are identified as eligible for the program by the Correctional Behavioral Treatment and Research (CBTR) following the court judgment. The Selection and Detention Phasing Office (BSD) is notified by the CBTR within five working days, initiating the screening process for identified candidates early in their detention. Eligible prisoners are automatically enrolled, and those who do not wish to participate must actively opt out. The R&R program targets prisoners sentenced to a prison term with a net remaining sentence of at least four months following the judge's decision.[6] The rationale behind this decision is to provide prisoners with sufficient time to participate in the program. Excluded from the program are individuals serving life sentences, individuals under prison forensic care, illegal aliens in detention, and individuals with insufficient Dutch speaking skills.[7]

The screening process begins by assigning eligible prisoners to a program counselor, who evaluates the risk of recidivism using the RISc. This assessment examines criminogenic factors and responsiveness (motivation, learning style, and personality) to guide the selection of behavioral interventions aimed at reducing the risk of reoffending. It comprehensively assesses twelve subdomains, each essential in preventing reoffending behavior: offending history, current offense and patterns of offenses, accommodation, education, work, and training, financial management and income, relationships with partners and relatives, relationships with friends, drug misuse, alcohol misuse, emotional well-being, thinking and behavior, and attitudes and orientation. By evaluating these different areas, the RISc provides a holistic

[6] "Net remaining sentence" denotes the portion of the sentence that remains after deducting any time already served during pre-trial detention.

[7] "llegal aliens" refers to individuals who do not possess a valid residence permit.

view of the factors contributing to an individual's likelihood of reoffending. The insights offered by the RISc enable program counselors to develop comprehensive rehabilitation plans that address the root causes of criminal behavior, possibly enhancing the effectiveness of rehabilitation programs. Counselors are responsible for creating and monitoring individualized reintegration plans, making adjustments as needed to ensure the best outcomes for each prisoner.

Behavioral Interventions The R&R program integrates six behavioral interventions, each rooted in evidence-based practices aimed at addressing the criminogenic needs of detainees. These interventions are structured to address cognitive, emotional, and behavioral deficits often observed among incarcerated individuals. The interventions included in the R&R program are:

1. **Cognitive Skills Training**: This module focuses on improving prisoners' cognitive abilities, particularly in areas such as problem-solving, decision-making, and critical thinking. By engaging participants in structured activities and educational exercises, this program seeks to enhance cognitive flexibility and reasoning. It helps prisoners develop better self-control, improve their understanding of social situations, and make more rational decisions, which can be critical in reducing impulsive or criminal behaviors post-release.
2. **Cognitive Skills Plus Training**: Specifically tailored for prisoners with reduced mental capacities, this variant of Cognitive Skills Training incorporates additional support mechanisms to accommodate cognitive impairments or learning disabilities. The program is designed to be more accessible to individuals who may struggle with standard interventions, offering them the opportunity to benefit from cognitive skill enhancement while addressing their specific needs.
3. **Lifestyle Training for Addicted Offenders**: Recognizing the high prevalence of substance abuse among offenders, this module addresses alcohol and drug addiction by providing prisoners with strategies for overcoming addiction. The program aims to reshape their approach to high-risk situations by helping them understand the triggers of their substance use, promoting healthier coping mechanisms, and teaching skills for maintaining sobriety.
4. **Job Skills Training**: Preparing prisoners for reintegration into society, this intervention equips participants with essential job-related skills that will help them secure employment upon release. The program focuses on practical skills development, such as resume building, interview preparation, and work-related competencies that can

improve their prospects in the labor market. By providing them with tools for employability, the program seeks to reduce recidivism by fostering economic stability.

5. **Aggression Regulation Training**: Targeted at offenders who struggle with anger management or violent tendencies, this intervention teaches individuals how to regulate their emotions and control aggressive impulses. Participants engage in techniques for managing stress, resolving conflicts non-violently, and understanding the underlying causes of their aggression. This training aims to reduce the likelihood of violent behavior both during and after incarceration.
6. **Relapse Prevention Resources**: This intervention builds awareness around the potential negative consequences of substance use and focuses on altering prisoners' behaviors concerning misuse. Participants learn to recognize early warning signs of relapse, develop strategies for avoiding high-risk situations, and build a support system to sustain their recovery. The emphasis is on long-term behavioral change, ensuring that prisoners can maintain sobriety post-release.

Each of these interventions is conducted in group settings, with groups of approximately 10 to 12 participants. The interventions are delivered over a span of 2 to 4 months, consisting of 15 to 21 group sessions, depending on the specific program. Group sessions provide an interactive learning environment where participants can share experiences, support each other, and practice new skills in a controlled setting. This group dynamic not only enhances engagement but also encourages the development of social skills, which are critical for successful reintegration into the community. Overall, the R&R program aims to provide detainees with the tools and skills necessary to make positive changes in their lives.

While I do not have access to individual data on participation in each intervention, I possess aggregate information indicating that *Cognitive Skills Training* is the most recommended, accounting for over a quarter of all cases. This is followed by *Lifestyle Training for Addicted Offenders* and *Job Skills Training*, both of which are also highly prioritized. Overall, participation and completion of these behavioral interventions cover about 40% of eligible prisoners.

3 Data

3.1 Data and Sample Selection

I use rich administrative data from multiple sources. The Research and Policy Database for Judicial Documentation (Onderzoek- en Beleidsdatabase Justitiële Documentatie, OBJD)

contains information on individuals who have come into contact with the judicial system. This database includes details such as inflow and outflow dates, the type of crime committed, the offender's criminal history, and registered reoffending behaviors at any given point in time. These data are made available by the Research and Documentation Centre (WODC) of the Dutch Ministry of Justice and Security for the period from 2005 to 2022.

Additionally, I link the prison register data to a dataset containing all cases that proceed to the court of justice.[8] This dataset includes criminal court cases adjudicated by judges, the characteristics of the case (such as the nature and content of the judgment and the date of the final decision), the characteristics of the suspect (including the case number and the type of suspect), and the characteristics of the crime (such as the date of commission and the nature of the crime).

Further, I link these data via unique identifier numbers to administrative data from Statistics Netherlands, which provide individual demographic information (including sex, age, and country of origin) and socioeconomic data (such as years of education, earnings, and employment).[9]

To construct my main sample, I first exclude legal entities. I then further restrict my baseline sample to individuals aged 18-65 who committed a crime and received a prison sentence of up to 12 months. The age restriction is implemented to focus on adult prisoners and to ensure the inclusion of individuals who could potentially still be part of the labor force. The sentence length restriction allows for comparability between my treatment group (those with a prison sentence longer than four months) and my control group (those with a prison sentence shorter than four months). As part of the robustness checks in Section 5, I conduct additional analyses using narrower bandwidths to assess the validity of the results. I also limit the period of analysis from 2005, the earliest year for which prison register data are available, to 2013. This restriction is necessary because, as of March, 2014, the R&R program was extended to require that prisoners exhibit "good behavior" for at least six weeks to be eligible for participation. This new requirement introduces other sources of endogeneity and potential bias in participation. Hence, I have decided to exclude the years in which the new participation requirement was implemented.

Finally, I include only individuals who are sentenced to prison for the first time in my analysis. This approach is necessary because the probability of reincarceration and the

[8]Note that there is imperfect matching between the inflow and outflow datasets for prisoners. I match inflow and outflow data by pre-arrest date and the unique personal identifying code, excluding prison transfers and immigration detainees, and focusing on criminal detainees. For imperfect matches between prisoner and sentencing datasets, I match records based on the closest judge decision date.

[9]Given the nature of my study population, not all individuals who committed a crime have corresponding records in the Municipal Personal Records Database (GBA) in Statistics Netherlands. Therefore, demographic and socioeconomic data are unavailable for some individuals.

severity of subsequent crimes may be influenced by prior participation in the R&R Program. Consequently, the likelihood of receiving the "treatment" a second time could be affected by previous treatment exposure. By focusing solely on first-time prisoners, I employ a conservative approach to estimate the effects.

3.2 Outcome Variables

I evaluate the R&R program by examining key measures of effective reintegration into society, including recidivism, labor market outcomes, and social outcomes such as personal relationships and housing stability. Below, I describe how I constructed the main outcome variables.

Recidivism is measured using a dummy variable that takes the value of 1 if an individual has reoffended within three years following their release from incarceration. Additionally, I analyze the nature of reoffending by categorizing the offenses into violent crimes, property crimes, drug offenses, and other types of crimes.

Employment outcomes are assessed by examining whether inmates have secured a job three years after their release. Given the lack of a single variable indicating employment status and considering the nature of my sample, I define employment using a dummy variable that equals 1 if the individual has earned at least the minimum wage for a minimum of three months within a year. This approach ensures that I capture meaningful employment activity, distinguishing between those with sporadic or informal work and those who have sustained employment at a recognized wage level. This method aims to provide a clearer picture of economic stability and job retention, reflecting a more reliable measure of successful reintegration into the labor market.

Earnings are measured based on reported earnings from employers, indicating formal employment with a contract.[10] I have detailed monthly earnings and hours worked for each individual, which I aggregate to calculate yearly earnings, adjusted for inflation. Similarly, I compute the total number of *hours worked* in a year.

Additionally, I assess social outcomes by computing variables for social benefits, stable relationships, and stable housing. *Social benefits* are measured as a dummy variable indicating whether the individual has received any form of social assistance. A *stable relationship* is defined as being in a marriage or a registered partnership for at least one year. However, this measure is likely a lower bound, as it may not capture all forms of stable relationships. *Stable housing* is defined as being registered at an address for at least one year. These vari-

[10]This excludes self-employed individuals; however, in my sample, their share is very low and, therefore, negligible.

ables help to capture the broader aspects of social integration and stability, contributing to a more comprehensive evaluation of the R&R program's impact.

3.3 Descriptive Statistics

Table 1 summarizes the characteristics of the sample under consideration. The table presents the descriptive statistics of prisoners categorized by their eligibility for the R&R program, which is determined by the length of their prison sentences. The period considered spans from 2005 to 2013.

Panel A presents prisoners' characteristics and baseline outcomes. Non-eligible prisoners, who received prison sentences shorter than 4 months, are compared with eligible prisoners, who received sentences between 4 and 12 months. The data reveals that a higher proportion of eligible prisoners are male (94.8% vs. 91.7%) and slightly younger (33 years vs. 34 years) compared to non-eligible prisoners. Educational attainment is similar across both groups, with a slight increase in those having more than a high school degree among eligible prisoners. The baseline earnings and employment status are comparable between the two groups, though both show low levels of employment and earnings in the year before trial. Additionally, the proportion of offenders with a partner, stable housing, and receiving social benefits are relatively consistent between the two groups.

Panel B shows the distribution of crime types among prisoners. Eligible prisoners are more likely to have committed drug crimes (19.8% vs. 7.6%) and less likely to have committed property or other crimes compared to non-eligible prisoners. This suggests a potential difference in the types of offenses associated with the two groups, which is consistent with expectations based on their differing sentence lengths.

4 Evaluation of the R&R Program

This section presents the estimates of the effect of participation in rehabilitation programs on offenders' criminal recidivism, labor market outcomes and social outcomes. To evaluate the causal impact of the R&R program, I use a difference-in-differences (DiD) framework, complemented with an event study approach. The DiD model provides an overall average treatment effect by comparing eligible prisoners (those with a prison sentence length between four and twelve months) with non-eligible prisoners (those with a prison sentence length shorter than four months) before and after the program's implementation. Meanwhile, the event study approach examines how the effects of access to the R&R program on reincarceration probabilities, labor market outcomes, and social outcomes evolve over time

Table 1: Descriptive Statistics of the Prisoners

	Non-Eligible Prisoner (Prison sentence: 0-4 months)	Eligible Prisoner (Prison sentence: 4-12 months)
Panel A: Prisoner Characteristics and Pre-Trial Outcomes		
Male	0.916	0.948
	[0.277]	[0.222]
Native born	0.473	0.436
	[0.499]	[0.496]
Age at trial	34.075	33.213
	[10.301]	[10.424]
Less than high school degree	0.319	0.323
	[0.466]	[0.468]
High school degree	0.668	0.660
	[0.471]	[0.474]
More than high school degree	0.013	0.016
	[0.111]	[0.127]
Earnings in year before trial	3,562.87	3,506.38
	[8,154.04]	[8,517.23]
Employment in year before trial	0.214	0.208
	[0.410]	[0.406]
Having a partner in year before trial	0.096	0.098
	[0.294]	[0.297]
Housing in year before trial	0.784	0.774
	[0.411]	[0.418]
Social benefits in year before trial	0.335	0.311
	[0.472]	[0.463]
Panel B: Type of Crime		
Property crime	0.385	0.331
	[0.487]	[0.470]
Violent crime	0.220	0.265
	[0.414]	[0.442]
Drug crime	0.076	0.198
	[0.265]	[0.399]
Other crime	0.319	0.206
	[0.466]	[0.404]
Observations	46,243	11,790

Notes: This table presents descriptive statistics for prisoners based on R&R program eligibility, categorized by prison sentence length. The data spans from 2005 to 2013. Data on educational attainment is available for 20,975 individuals in the non-eligible group and 5,469 in the eligible group. Values are means, with standard deviations in brackets.

for different cohorts before and after the program's introduction, offering a dynamic view of the treatment effects.

Threats to Identification In the difference-in-differences framework, the parallel trends assumption is critical to establishing the validity of the results. I conduct pre-treatment trend analyses to confirm that no significant differences existed between eligible and non-eligible prisoners before the implementation of the R&R program. The event study graphs 4-6 reassures that eligible and non-eligible prisoners do not systematically differ before the introduction of the rehabilitation program.

Another concern that could undermine my identification strategy is whether judges might have changed how they sentence offenders in response to the reform. I check whether there were any shifts in sentencing patterns around the time of the reform. The analysis, shown in Figure A1, finds no evidence of changes in sentence lengths, suggesting that judges did not adjust their behavior in reaction to the program, although I cannot entirely dismiss this possibility.[11] I also address potential concerns about compositional shifts during the reform's implementation. To do this, I analyze whether there were any notable changes in the types of crimes being committed or in the demographics of the inmate population at that time. Figures A2—A6 in the Appendix indicate no substantial variations in these factors, providing additional support for the reliability of my findings.

4.1 Event Study Analysis

The R&R program was introduced on 31 December of 2007. I estimate the following model at the individual level:

$$y_{i,s} = \beta_0 + \sum_k \beta_{1,k} \text{Post}_{k=s} + \beta_2 \text{Treat}_i + \sum_k \gamma_k (\text{Post}_{k=s} \times \text{Treat}_i) + X_i' \delta + \varepsilon_{i,s}, \qquad (1)$$

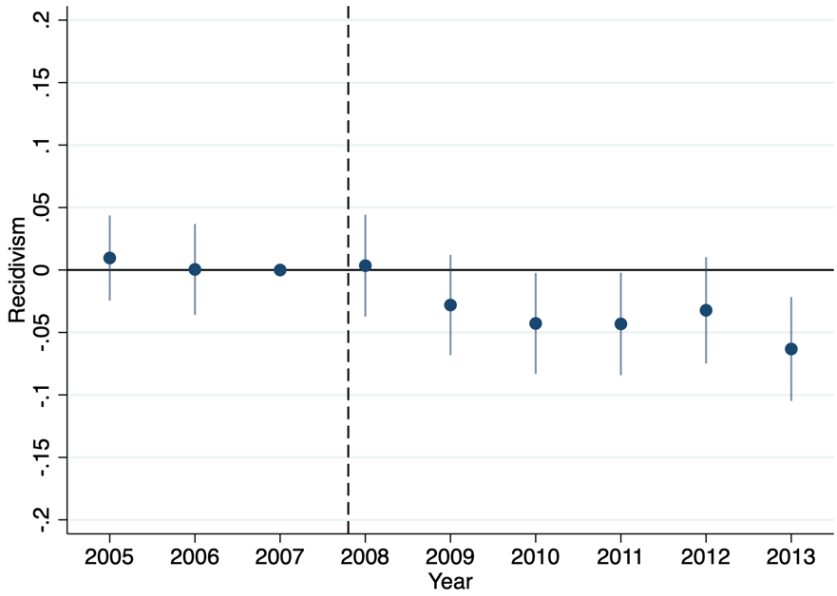
where $y_{i,s}$ denotes the dependent variable representing recidivism, employment, earnings, stable relationship and stable housing outcomes i sentenced to prison in year s. The variable $Post_{k=s}$ is an indicator that takes the value of one if the sentencing year s is k periods away from the introduction of the R&R program. The variable $Treat_i$ indicates whether an inmate is eligible to participate in the R&R program, which is the case if their sentence length exceeds four months. The interaction between $Post$ and $Treat_i$ accounts for the reform's

[11] There are two outliers shortly after the reform's implementation, each based on fewer than 30 observations. The estimates from the linear model underlying the graph are exactly zero, which reassures that manipulation is unlikely.

effect. The model incorporates additional controls, such as demographic information and crime type, denoted by X_i. $\varepsilon_{i,s}$ is the error term of the model.

Figure 4 presents the event study graph of the impact of the R&R program on recidivism, defined as committing a new crime and being reincarcerated over a 3-year period. Each data point represents the program's estimated effect for a given year. Prior to the program's implementation, the recidivism rates for both treatment (eligible offenders) and control (non-eligible offenders) groups is stable, supporting the hypothesis of comparable baseline trends. Following the program's introduction, the graph reveals a decrease in recidivism for the treatment group compared to the control group, suggesting an initial positive impact of the R&R program on reducing reoffending behavior. Over the subsequent years, the graph tracks the persistence of this effect. The lack of effect in the year the program was introduced may be due to an adjustment period or delay in the program's implementation.

Figure 4: R&R Program Effect on Reoffending Behavior

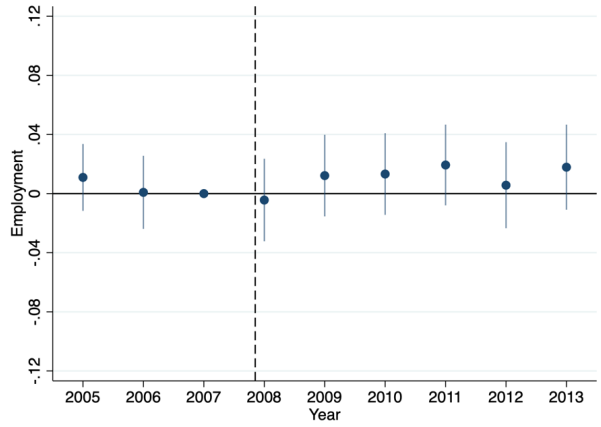


Notes: This figure illustrates the impact of the R&R program on recidivism, defined as the rate of committing a new crime and being reincarcerated over a 3-year period. The vertical line marks the introduction of the program, with 2007 serving as the baseline year. The model, estimated as in Equation 1, incorporates year fixed effects and robust standard errors.The graph includes a 95 percent confidence interval.

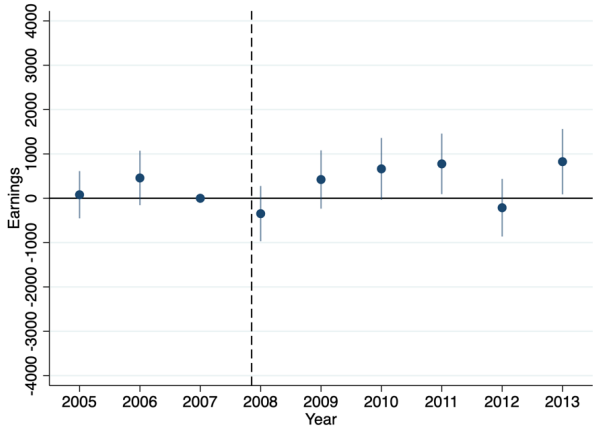
Figures 5a and 5b present the event study analysis of the R&R program's impact on employment and earnings, respectively. For employment, the figure indicates minimal impact

Figure 5: R&R Program Effect on Labor Market Outcomes

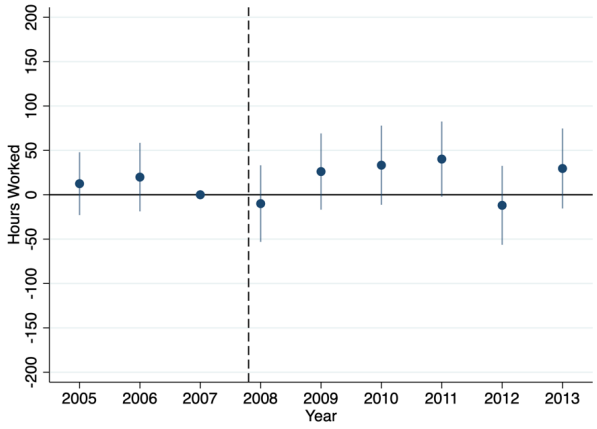
(a) Employment



(b) Earnings



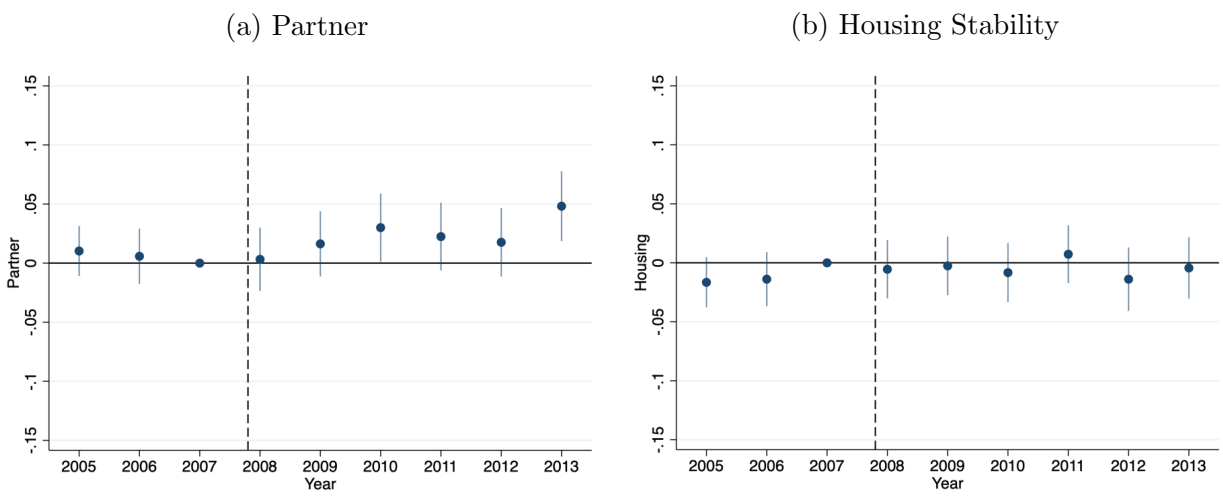
(c) Hours Worked



Notes: This figure illustrates the impact of the R&R program on employment, earnings, and hours worked over a 3-year period. The vertical line marks the introduction of the program, with 2007 serving as the baseline year. Employment in Panel (a) is measured as a dummy variable, while earnings in Panel (b) represent yearly earnings in euros, and hours worked in Panel (c) reflect total annual hours. The model, estimated as in Equation 1, incorporates year fixed effects and robust standard errors. The graph includes a 95 percent confidence interval.

of the program. For earnings, there is a positive effect following the program's introduction, though this effect is not always precisely estimated. A similar pattern is observed in Figure 5c for hours worked. The 2012 drop in labor market outcomes likely reflects the effects of the Eurozone crisis and Dutch austerity measures, which caused economic contraction and increased unemployment. Figure 6 provides a visual representation of the estimated effects of the R&R program on two social stability outcomes—partner stability and housing stability. Panel (a) shows the impact on the likelihood of having a stable relationship, whereas Panel (b) illustrates the impact on housing stability. While there is a positive, albeit imprecisely estimated, effect on partner stability, there is no observable effect on housing stability. The lack of a visible effect on housing stability contrasts with the small positive effect observed in the difference-in-differences analysis. The absence of a clear effect in the figure may be due to noisy point estimates and the high baseline level of housing stability among ineligible prisoners.

Figure 6: R&R Program Effect on Social Outcomes



Notes: This figure illustrates the impact of the R&R program on personal relationships and housing stability over a 3-year period. The vertical line marks the introduction of the program, with 2007 serving as the baseline year. In Panel (a), Partner is a dummy variable indicating being in a marriage or registered partnership for at least one year. In Panel (b), Housing Stability is defined as being registered at the same address for at least one year, also measured as a dummy variable. The model, estimated as in Equation 1, incorporates year fixed effects and robust standard errors. The graph includes a 95 percent confidence interval.

4.2 Difference-in-Differences Analysis

To improve the precision of my estimates, I combine outcome averages from the pre-treatment and post-treatment years. My Difference-in-Differences specification is as follows:

$$y_{i,s} = \beta_0 + \beta_1 \text{Treat}_i + \gamma(\text{Post} \times \text{Treat}_i) + X_i'\delta + \theta_t + \varepsilon_{i,s}, \tag{2}$$

where $y_{i,s}$ denotes the dependent variables representing recidivism, employment, earnings, stable relationship and stable housing outcomes for offender i sentenced to prison in year s. The variable $Post$ is an indicator that takes the value of one if the period is post the introduction of the R&R program, i.e., after 31 December 2007. The variable $Treat_i$ indicates whether a prisoner is eligible to participate in the R&R Program, which is the case if their sentence length exceeds four months. I am interested in the estimate of γ, the interaction between $Post$ and $Treat_i$. This coefficient represents the impact of eligibility for the R&R program on the dependent variable. The model also incorporates additional controls, such as demographic information and crime type, denoted by X_i, and year fixed effects θ_s. $\varepsilon_{i,s}$ is the error term of the model. By combining outcome averages over the pre-treatment and post-treatment year, I try to gain precision in my impact estimates.

Recidivism Table 2 shows the impact of eligibility for the R&R program on the likelihood of reoffending within 3 years after release. Participation in the program results in a substantial reduction in recidivism, decreasing the probability of reoffending by 4.5 percentage points. This effect is economically relevant, representing a 14% decrease relative to the mean of the non-eligible control group. This effect size is comparable to a similar prison rehabilitation program in Quebec, Canada, where an increase in program availability translates to a 19% reduction in recidivism within three years (Arbour et al., 2024). A closer examination in reoffense by crime type reveals reductions in violent crime and property crime by 1.9 and 1.7 percentage points, respectively. The effect on drug offenses is also significant, while the program does not significantly impact other types of crime. These findings suggest that the R&R program is effective in reducing certain types of crime. For instance, the observed reductions in violent crimes could imply that the program's aggression and regulation module is particularly impactful. However, it is important to note that the assignment to each intervention is based on the criminogenic needs of the prisoners, which limits my ability to draw definitive conclusions about the effectiveness of specific program components.

Table 2: R&R Program Effect on Prisoners' Recidivism

	Recidivism (1)	Recidivism in Violent Crimes (2)	Recidivism in Drug Offenses (3)	Recidivism in Property Crimes (4)	Recidivism in Other Crimes (5)
R&R Program	-0.045***	-0.019***	-0.008**	-0.017**	0.000
	(0.009)	(0.005)	(0.003)	(0.007)	(0.004)
Non-eligible offenders mean	0.311	0.052	0.018	0.155	0.084
Sentencing year FE	Yes	Yes	Yes	Yes	Yes
Observations	58,033	58,033	58,033	58,033	58,033

Notes: This table reports the estimates of the difference-in-differences model evaluating the impact of the rehabilitation and reintegration reform on offenders' criminal recidivism. The outcome variables are indicator variables for being reincarcerated within 3 years after release. Column (1) reports the effect for any type of crime, while Columns (2) through (5) represent the estimated impacts on violent crimes, drug offenses, property crimes, and other crimes, respectively. All specifications are estimated using linear probability models and include year of sentencing fixed effects. "R&R Program" denotes the interaction coefficient of the DiD-model. "Non-eligible offenders mean" represents the unconditional mean of the outcome variables for non-eligibile offenders, that it with less than four months sentence lenght. Robust standard errors in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Labor Market and Social Outcomes A key strategy for reducing recidivism involves addressing three critical areas of an individual's life: housing, employment, and relationships. Research highlights that stable housing is fundamental to lowering recidivism. A secure living environment provides the stability needed for reintegration and reduces the risk of reoffending (Jacobs & Gottlieb, 2020; Reece & Link, 2023; Artz & Welsch, 2024). Similarly, access to employment opportunities is strongly linked to lower recidivism rates. A stable job not only offers financial stability but also fosters a sense of purpose and responsibility, which can deter individuals from returning to criminal behavior (Valentine & Redcross, 2015; Schnepel, 2017). Additionally, maintaining strong relationships, particularly with a spouse or partner, can help steer someone away from criminal behavior (Bersani et al., 2017; Wyse et al., 2014). I explore whether improvements in any of these outcomes could explain the persistent reduction in recidivism. Table 3 reports the estimated effects of the R&R program on labor market outcomes and social outcomes.

Panel A of Table 3 presents the findings on employment, earnings, and hours worked. Eligibility for the program does not significantly affect the probability of employment ($\gamma = 0.004$). However, eligible prisoners earns, on average, €223.1 more per year. This represents a 4.5% increase compared to non-eligible prisoners. Nonetheless, the impact is not stastically significant. As part of the labor market outcomes analysis, I further investigate whether there is an effect on hours worked and earnings conditional on working. The coefficient for

hours worked shows a modest increase of 5.6 hours; however, this effect is not statistically significant and remains small relative to the control group mean of 402 annual hours worked. Similarly, employed individuals earn an additional €508 per year, though this effect is also not significant. Overall, the effects on labor market outcomes are not precisely estimated. Section 4.3 explores if these average effects mask heterogeneity across different subgroups.

Table 3: R&R Program Effect on Offenders' Labor Market and Social Outcomes

Panel A: Labor Market Outcomes				
	Employment	Earnings	Hours Worked	Earnings if Employed
	(1)	(2)	(3)	(4)
R&R Program	0.004	223.1	5.6	508.1
	(0.006)	(151.9)	(9.9)	(430.9)
Non-eligible offenders mean	0.285	4,882.4	402	16,469.2
Panel B: Social Outcomes				
	Social Benefits	Having a Partner	Housing Registration	
	(1)	(2)	(3)	
R&R Program	0.002	0.015**	0.012**	
	(0.009)	(0.006)	(0.005)	
Non-eligible offenders mean	0.506	0.096	0.916	
Sentencing year FE	Yes	Yes	Yes	Yes
Observations	58,033	58,033	58,033	58,033

Notes: This table reports the estimates of the difference-in-differences model evaluating the impact of the rehabilitation and reintegration reform on offenders' labor market and social outcomes. Panel A includes outcome variables for employment, earnings, hours worked, and earnings conditional on employment three years after release. Panel B reports effects on receiving social benefits, having a partner, and stable housing registration three years after release. All specifications are estimated using linear probability models and include year-of-sentencing fixed effects. "R&R Program" denotes the interaction coefficient of the DiD model. "Non-eligible offenders mean" represents the unconditional mean of the outcome variables for non-eligible offenders, defined as those with a sentence length of less than four months. Robust standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.

Panel B of Table 3 presents the impact of the R&R program on key social and housing outcomes measured three years post-release. The findings reveal that program eligibility does not increase the reception of social benefits, suggesting that prisoners eligible for the rehabilitation programs do not rely more on welfare. The program significantly enhances the likelihood of having a partner, showing an increase of 1.5 percentage points—a 15% rise compared to non-eligible offenders. Additionally, the program results in a 1.2 percentage points (1.5%) increase in housing registration, indicating improved housing stability among

participants. However, this effect is relatively modest, given that the baseline mean for non-eligible prisoners is already quite high, (approximately 91%).Taken together, the observed improvements in these areas among eligible prisoners may help explain the reduction in recidivism rates.

Spillovers A potential concern with the R&R program is the risk of negative spillovers resulting from the prison environment, where incarceration can sometimes reinforce criminal behavior through exposure to peers with similar criminogenic needs (Bayer et al., 2009). Participation in group behavioral interventions within this context might further amplify these negative spillovers. Drug offenses and property crimes are often considered behaviors that can be acquired or intensified through prison experiences, serving as proxies for such potential negative effects (Grenet et al., 2024). Table 2 shows that there is no observed increase in these types of crimes. This finding suggests that the R&R program may not worsen the negative spillovers typically associated with incarceration. Moreover, if anything, the negative spillovers would likely work against the reduction in recidivism.

4.3 Treatment Effect Heterogeneity

Heterogeneity by Demographic Characteristics The overall impact of the R&R program on recidivism, labor market outcomes, and social conditions offers valuable insights, but these averages may mask important variations across different prisoner groups. Identifying these differences is essential to fully understand the program's effectiveness and to tailor future rehabilitation efforts to better address the diverse needs of offenders. This section examines how the program's impact varies by factors such as country of origin, prior employment status, age, education level, and sex. By analyzing subgroup data, I aim to determine which groups benefit most and which may require additional support. Table 4 summarizes these findings, organized into three panels: Panel A focuses on recidivism, Panel B on labor market outcomes, and Panel C on social and housing outcomes.

The treatment effects on recidivism exhibit some heterogeneity. Both native and offenders with an immigrant background experience statistically significant reductions in reoffending, with decreases of 5 and 4.3 percentage points, respectively. Offenders who were unemployed in the year prior to prison see a larger reduction of 4.3 percentage points, whereas those with prior employment show no significant change. Older offenders (aged 35+) experience a 5.3 percentage points decrease, compared to 3.8 percentage points for younger offenders (aged 18-34). There is no significant difference in recidivism reduction based on education level, as offenders with both lower and higher levels of education experience similar decreases. While

male offenders show a significant drop in recidivism of 4.6 percentage points, the reduction for female offenders is smaller and not statistically significant, likely due to the smaller sample size.

The program's effects on labor market outcomes demonstrate considerable heterogeneity. While there is no significant effect on overall employment rates, native offenders experience an increase in annual earnings of €617.1 (+12%). In contrast, offenders with an immigration background experience no significant changes. The only significant finding on hours worked is a reduction of about 86 hours for female offenders, suggesting that the program may have negatively impacted women's labor market engagement.

Table 4 also shows that the program had positive effects on social and housing outcomes for certain subgroups. Older offenders, previously employed individuals, and those with lower education levels see improvements in partner status and housing stability.

Several mechanisms may explain the observed heterogeneity. In terms of recidivism, native offenders may benefit more due to stronger access to localized support networks and reintegration resources post-release. Offenders with an immigrant background, while still benefiting, might face barriers such as social isolation, cultural differences, or limited access to resources. Similarly, the greater reduction in recidivism for previously unemployed offenders suggests that the program provides critical support—such as skills development and social integration—that this group lacked prior to incarceration. Meanwhile, those who were employed before incarceration may experience fewer additional benefits, given their pre-existing stability.

Age differences also point to underlying mechanisms: older offenders are generally more likely to desist from crime due to life-course changes, and the program may enhance this natural process by providing structured reintegration support. Younger offenders, on the other hand, may still face pressures that complicate desistance, such as social instability or peer influence, which could diminish the program's impact on them. Gender differences in program effectiveness further underscore the need for targeted approaches. While male offenders show significant reductions in recidivism, the smaller and statistically insignificant effect for female offenders may reflect gender-specific challenges, such as caregiving responsibilities or trauma, that the program may not fully address. Similarly, the reduction in employment and work hours for female offenders suggests that they may be prioritizing flexible or part-time work post-release, balancing employment with other responsibilities.

Finally, the variation in labor market outcomes between native offenders and those with an immigrant background underscores the potential barriers that the latter group may face, such as discrimination, language barriers, and legal obstacles. These challenges could restrict offenders with an immigrant background from fully benefiting from the program in terms of

employment and earnings.

In summary, the findings suggest that the R&R program's effectiveness is shaped by the specific characteristics and circumstances of different offender subgroups. Those with weaker pre-existing support structures, such as the unemployed and older offenders, seem to benefit most, while others may require more tailored interventions to experience meaningful change.

Heterogeneity by Crime Type I explore heterogeneity by type of crime to better understand the effectiveness of the different modules of the prison rehabilitation program. This analysis helps identify specific mechanisms that contribute to the program's overall impact.

Table 5 breaks down the impact of the R&R program by the type of crime committed. As before, Panel A focuses on recidivism, Panel B on labor market outcomes, and Panel C on social and housing outcomes. The program significantly reduces recidivism for prisoners who committed violent and property offenses, with reductions of 3.9 and 5.7 percentage points, respectively. This suggests that the program's interventions—particularly anger management and cognitive skill development—may be especially effective in addressing the psychological and behavioral factors contributing to violent and property crimes.

The significant increase in earnings of €543.8 (+9%) for individuals committing violent offenses may be closely linked to the integrated approach of the anger management module combined with job skills training. The anger management component likely fosters behavioral changes that enable these individuals to engage more positively in the workplace, enhancing their employability and work performance. This combination could lead to better job retention and opportunities for advancement, resulting in higher earnings for violent offenders.

In contrast, the lack of significant impact on recidivism for drug offenses highlights the difficulty in addressing substance abuse issues. This suggests that the program may need to enhance its focus on drug addiction treatment and relapse prevention to effectively support these offenders.

These findings should not be interpreted causally due to the non-random assignment of prisoners to different modules. Nonetheless, this suggestive evidence indicates that programs targeting violence, cognitive skills, and employment may have a stronger effect, while those focused on addiction may be less effective. This observation aligns with the study of Arbour et al. (2024), who exploit variations in program availability as an identification strategy to estimate the causal impact of prison rehabilitation programs on recidivism.

Table 4: R&R Program Effect by Subgroup

	Native (1)	Immigrant Background (2)	Previously not employed (3)	Previously employed (4)	Aged 18-34 (5)	Aged 35+ (6)	Less than high school (7)	More than high school (8)	Female (9)	Male (10)
Panel A: Crime										
Recidivism	-0.050***	-0.043***	-0.043***	0.026	-0.038***	-0.053***	-0.054**	-0.035*	-0.012	-0.046***
	(0.014)	(0.012)	(0.011)	(0.026)	(0.012)	(0.013)	(0.027)	(0.018)	(0.033)	(0.009)
Panel B: Labor Market Outcomes										
Employment	0.011	0.001	0.003	-0.002	0.015*	-0.011	0.014	-0.003	-0.045*	0.008
	(0.009)	(0.009)	(0.007)	(0.022)	(0.009)	(0.008)	(0.017)	(0.013)	(0.025)	(0.006)
Earnings	617.1**	-61.72	63.60	-28.58	124.2	267.6	389.5	11.73	-205.9	263.3*
	(244.2)	(189.5)	(151.9)	(667.0)	(190.2)	(244.9)	(297.3)	(321.0)	(539.0)	(158.1)
Hours Worked	21.80	-4.98	5.00	-24.91	8.93	-3.54	27.35	-6.39	-86.19**	11.66
	(15.19)	(13.11)	(10.94)	(39.32)	(13.87)	(13.88)	(24.53)	(21.43)	(36.55)	(10.38)
Panel C: Social Outcomes										
Partner	0.020**	0.013*	0.010	0.054***	0.003	0.027**	0.030*	0.003	-0.023	0.018***
	(0.009)	(0.008)	(0.007)	(0.019)	(0.006)	(0.011)	(0.015)	(0.011)	(0.025)	(0.006)
Housing Registration	0.007	0.016*	0.009*	-0.031	0.004	0.014*	0.019	-0.008	0.011	0.012
	(0.009)	(0.008)	(0.007)	(0.021)	(0.008)	(0.008)	(0.015)	(0.011)	(0.023)	(0.006)
Social Benefits	-0.000	0.006	0.002	-0.014	-0.009	0.005	-0.027	0.004	0.021	-0.000
	(0.013)	(0.013)	(0.011)	(0.027)	(0.012)	(0.013)	(0.025)	(0.017)	(0.034)	(0.009)
Observations	27,037	30,996	38,386	10,366	32,355	25,678	8,464	17,980	4,479	53,554

Notes: This table presents estimates from the difference-in-differences model assessing the impact of the R&R program. Column (1) shows the effect for native offenders, Column (2) for offenders with an immigrant background, Column (3) for those previously not employed, Column (4) for previously employed individuals, Column (5) for offenders aged 18-34, Column (6) for those aged 35 and older, Column (7) for offenders with less than a high school education, Column (8) for those with more than a high school education, Column (9) for females, and Column (10) for males. Panel A includes recidivism rates within 3 years of release. Panel B covers employment status, earnings, and hours worked. Finally, Panel C includes indicators for having a partner, housing registration (indicating a stable address), and social benefits (indicating receipt of social assistance). All specifications are estimated using linear probability models and include year of sentencing fixed effects. Robust standard errors in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level, respectively.

Table 5: R&R Program Effect by Crime Type

	Violent Offense	Drug Offense	Property Offense	Other Crimes
	(1)	(2)	(3)	(4)
Panel A: Crime				
Recidivism	-0.039**	0.020	-0.057***	-0.060***
	(0.018)	(0.022)	(0.017)	(0.018)
Panel B: Labor Market Outcomes				
Employment	0.008	-0.018	0.024**	-0.012
	(0.012)	(0.015)	(0.011)	(0.012)
Earnings	543.8*	68.16	287.10	-13.50
	(310.3)	(382.4)	(208.4)	(394.4)
Hours Worked	13.85	-1.73	21.17	-13.34
	(20.78)	(25.56)	(16.06)	(21.58)
Panel C: Social Outcomes				
Partner	0.011	0.022	-0.001	0.031**
	(0.012)	(0.016)	(0.008)	(0.015)
Housing Registration	-0.004	0.013	0.020*	0.015
	(0.011)	(0.014)	(0.010)	(0.012)
Social Benefits	0.026	0.005	-0.030**	-0.001
	(0.017)	(0.023)	(0.015)	(0.019)
Observations	13,290	5,861	21,685	17,197

Notes: This table presents estimates from the difference-in-differences model evaluating the impact of the R&R program by crime type. Column (1) shows the effect for violent offenses, Column (2) for drug offenses, Column (3) for property offenses, and Column (4) for other crimes. Panel A reports the impact on recidivism rates within 3 years of release. Panel B examines labor market outcomes: employment status, earnings, and hours worked 3 years after release. Panel C focuses on social and housing outcomes, including having a partner, housing registration (indicating stable housing), and social benefits (indicating receipt of social assistance) 3 years after release. All models include year of sentencing fixed effects and are estimated using linear probability models. Robust standard errors are reported in parentheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Earnings Conditional on Working To increase the precision of my earnings estimates, I analyse the data by focusing on individuals who are employed. Conditioning on working improves precision by removing variability related to employment status, allowing for a clearer view of the program's impact on yearly earnings among workers. Moreover, since I find little evidence on employment, selection bias in not a concern. Table 6 shows the effect of the R&R program on earnings, conditional on working, across various prisoner subgroups. For the entire sample, the additional earnings of €508.1 are not statistically significant. However, native offenders experience a substantial and significant increase of €1,552.8, or approximately 8.9% relative to the mean earnings of non-eligible individuals, while older offenders see a significant gain of €2,159.3, representing a 12% increase compared to their non-eligible mean. Conversely, no meaningful change is observed for prisoners who were unemployed before incarceration. Likewise, offenders with less than a high school education and male offenders show non-significant results. The significant increases in earnings for native and older offenders suggest the R&R program is particularly effective for these groups, whereas the lack of significance for other subgroups may reflect sample size limitations or the need for more targeted interventions.

Table 6: R&R Program Effect on Earnings Conditional of Working

	Earnings Conditional on Working					
	Whole sample	Native	Prev. not employed	Aged 35+	Less than high school	Male
R&R Program	508.1	1,552.8**	16.46	2,159.3**	331.9	403.1
	(430.9)	(682.4)	(497.8)	(899.8)	(929.2)	(437.4)
Non-eligible offenders mean	16,469.2	17,510.1	15,830.0	17,854.1	14,282.9	16,584.3
Sentencing year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,560	7,712	8,925	5,808	1,691	15,859

Notes: This table presents estimates from the difference-in-differences model evaluating the impact of the R&R program on yearly earnings conditional on working. Column (1) shows the effect for the whole sample, Column (2) for native offenders, Column (3) for previously not employed offenders, Column (4) for inmates aged above 35, Column (5) for offenders with less than high school education, and Column (6) for male offenders. All models include year of sentencing fixed effects and are estimated using linear probability models. "R&R Program" denotes the interaction coefficient of the DiD model. "Non-eligible offenders mean" represents the unconditional mean of the outcome variables for non-eligible offenders, that is, those with a sentence length of less than four months. Robust standard errors are reported in parentheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

5 Robustness Checks

In this section, I conduct a series of robustness checks to ensure the reliability and validity of my main findings. I assess the consistency of the R&R program's effects across various model specifications and different sentence length bandwidths. Additionally, I conduct alternative analyses incorporating controls and explore the impact on recidivism and labor market outcomes on a year-by-year basis.

Table 7 reports the results of a placebo test, using the year prior to the program's implementation as the placebo year. None of the placebo estimates for recidivism, employment, earnings, social benefits, partner status, or housing registration show significant deviations from zero. This lack of significant findings supports the validity of my main results by confirming that the observed effects in the primary analysis.

Table 7: Placebo

	Recidivism	Employment	Earnings	Social Benefits	Partner	Housing
	(1)	(2)	(3)	(4)	(5)	(6)
Placebo DiD	-0.011	-0.006	-209.2	0.019	-0.009	0.008
	(0.016)	(0.010)	(260.1)	(0.016)	(0.010)	(0.009)
Non-eligible offenders mean	0.356	0.310	5,343.8	0.487	0.096	0.905
Sentencing year FE	YES	YES	YES	YES	YES	YES
Observations	30,663	30,663	30,663	30,663	30,663	30,663

Notes: This table reports estimates of the placebo effect on various outcomes, with the placebo year being the year prior to the reform. Estimates are computed using data from 2005-2008. "Placebo DiD" denotes the interaction coefficient of the DiD model. The "Non-eligible offenders mean" represents the unconditional mean of the outcome variables for the control group. All specifications are estimated using linear probability models and include year of sentencing fixed effects. Robust standard errors are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 8 presents the results of the R&R program's impact across different bandwidths surrounding the treatment assignment. The first column displays the main specification, which analyzes outcomes over a bandwidth of 0-12 months, serving as a baseline for comparison. The estimates in this column are the same those reported in the main analysis, in Tables 2 and 3. Subsequent columns reduce the bandwidth, analyzing the effects over 0-8 months, 0-6 months, and 2-6 months. By varying the bandwidth, I examine how sensitive the results are to variations in sentence length. The findings reveal significant negative effects on recidivism across the first three specifications, with reductions of 4.5 percentage points, 3.2 percentage points, and 4.1 percentage points, respectively. However, the coefficient estimated for the 2-6 month bandwidth, while still negative, is no longer statistically

significant. This may be attributable to the smaller sample size, as a substantial proportion of prisoners have short sentences. Nonetheless, these results underscore the robustness of the R&R program's effect on recidivism.

In terms of labor market outcomes, the employment effects remain statistically insignificant across all bandwidths, although the estimates are consistently positive and comparable in magnitude. Similarly, while earnings figures are positive, they lack precise estimation. Regarding social outcomes, the effects on partner relationships are robust, showing positive and significant estimates across all bandwidths. Housing registration also demonstrates significant positive effects, particularly in the 0-12 and 2-6 month specifications, though it does not reach significance for the other bandwidths.

Table 9 reports the coefficients of a difference-in-discontinuity design assessing the impact of the R&R program across varying bandwidths around the treatment assignment. In this approach, I combine the timing of the policy implementation with the eligibility criteria for participation. Sentence length serves as the running variable, which I control for to account for differences in the severity of prisoners' sentences. Across the different bandwidths, the findings align closely with the main 0-12 month specification's outcomes, particularly in the significant reduction in recidivism rates, underscoring the program's effectiveness in lowering reoffending.

Similarly, the labor market and social outcomes retain comparable patterns, with modest earnings increases and improvements in relationship and housing stability across bandwidths. Theses additional robustness checks confirm that the R&R program's effect is consistent across different analytical approaches and bandwidths.

I also assess the robustness of my findings across different model specificications. Table A1 in the Appendix reports the estimates from the linear probability model of the R&R program, including additional controls. Columns (1), (3), and (5) present estimates that incorporate only sentencing year fixed effects, while columns (2), (4), and (6) expand the baseline specification by controlling for predetermined characteristics (gender, age at trial, country of origin), sentence length, and crime type fixed effects. The lower number of observations compared to table 2 and 3 is due to the limited availability of educational outcomes for all individuals. Columns (1), (3), and (5) use the same sample as the specifications with controls to ensure comparability across results. While the point estimates decrease slightly in magnitude when additional controls are included, the findings remain consistent with those from the model without controls.

Further examination of the program's impact over time is presented in Tables A2 and A3, which illustrate the effects on recidivism and earnings over a period of up to five years. The results indicate that the program exerts a positive impact on recidivism, both in the

Table 8: Effect of R&R Program by Bandwidth

	Main 0-12 Months	0-8 Months	0-6 Months	2-6 Months
Panel A: Crime				
Recidivism	-0.045***	-0.032***	-0.041***	-0.023
	(0.009)	(0.011)	(0.011)	(0.014)
	[0.311]	[0.311]	[0.311]	[0.309]
Panel B: Labor Market Outcomes				
Employment	0.004	0.002	0.008	0.005
	(0.006)	(0.007)	(0.007)	(0.009)
	[0.285]	[0.285]	[0.285]	[0.284]
Earnings	223.1	60.09	127.0	201.1
	(151.9)	(168.5)	(185.2)	(223.6)
	[4,882.4]	[4,882.4]	[4,882.4]	[4,868.6]
Hours Worked	5.6	-4.6	-0.5	0.6
	(9.9)	(11.3)	(12.2)	(14.7)
	[402.0]	[402.0]	[402.0]	[399.9]
Panel C: Social Outcomes				
Partner	0.015**	0.014**	0.018**	0.017*
	(0.006)	(0.006)	(0.007)	(0.009)
	[0.096]	[0.096]	[0.096]	[0.101]
Housing Registration	0.012**	0.008	0.008	0.016*
	(0.005)	(0.007)	(0.007)	(0.009)
	[0.916]	[0.916]	[0.916]	[0.914]
Social Benefits	0.002	0.004	0.001	-0.002
	(0.009)	(0.010)	(0.011)	(0.014)
	[0.506]	[0.506]	[0.506]	[0.481]
Observations	58,033	54,519	53,069	17,629

Notes: This table reports the estimates of the effect of the R&R program for bandwidths of 0-12, 0-8, 0-6, and 2-6 months. All the outcomes are measured 3 years post-release. All specifications are estimated using linear probability models and include year of sentencing fixed effects. Robust standard errors are in parentheses. The mean for the non-eligible prisoners is in square brackets. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 9: Difference-in-Discontinuity: Effect of R&R Program by Bandwidth

	Main 0-12 Months	0-8 Months	0-6 Months	2-6 Months
Panel A: Crime				
Recidivism	-0.045***	-0.031***	-0.040***	-0.021
	(0.009)	(0.011)	(0.012)	(0.014)
	[0.311]	[0.311]	[0.311]	[0.309]
Panel B: Labor Market Outcomes				
Employment	0.004	0.001	0.008	0.004
	(0.006)	(0.007)	(0.008)	(0.009)
	[0.285]	[0.285]	[0.285]	[0.284]
Earnings	223.1	45.6	117.5	192.3
	(151.9)	(169.1)	(185.6)	(224.1)
	[4,882.4]	[4,882.4]	[4,882.4]	[4,868.6]
Hours Worked	5.6	-6.2	-1.1	-0.0
	(9.9)	(11.38)	(12.2)	(14.7)
	[402.0]	[402.0]	[402.0]	[399.9]
Panel C: Social Outcomes				
Partner	0.015**	0.014**	0.017**	0.016*
	(0.006)	(0.006)	(0.008)	(0.009)
	[0.096]	[0.096]	[0.096]	[0.101]
Housing Registration	0.012**	0.008	0.009	0.015*
	(0.005)	(0.006)	(0.008)	(0.009)
	[0.916]	[0.916]	[0.916]	[0.914]
Social Benefits	0.002	0.006	0.003	-0.001
	(0.009)	(0.010)	(0.012)	(0.014)
	[0.506]	[0.506]	[0.506]	[0.481]
Observations	58,033	54,519	53,069	17,629

Notes: This table reports the estimates of the effect of the R&R program for bandwidths of 0-12, 0-8, 0-6, and 2-6 months. All the outcomes are measured 3 years post-release. All specifications are estimated using a difference-in-discontinuity model, controlling for sentence length and includes year of sentencing fixed effects. Robust standard errors are in parentheses. The mean for the non-eligible prisoners is in square brackets. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

short term and the long term. Although earnings also show positive effects, these estimates are less precise.

Overall, these robustness checks reinforce the primary findings of my study, particularly the reduction in recidivism.

6 Policy Implications

The R&R program offers significant benefits, including reducing recidivism and increased earnings for certain categories of former prisoners, which result in savings on judicial costs as well as increased tax revenues. However, there are also costs, particularly related to staffing, coordination between the central government and municipalities, and the implementation of various reintegration activities, such as education and work programs. Balancing these benefits and costs is challenging, as some effects, like improved public safety or reduced crime, are hard to quantify.

Cost-Benefit Analysis According to the Custodial Institutions Agency (DJI) in the Netherlands, reintegration activities within prisons involve a range of personnel, including case managers who coordinate with municipalities, senior staff who mentor prisoners, labor division staff who oversee work activities, and teachers, the majority of whom are employed by regional vocational schools.[12] These roles collectively facilitate the reintegration of prisoners into society. Estimating the precise costs associated with these activities poses a challenge, as multiple agents contribute their time to these functions, albeit not exclusively. Nevertheless, it is estimated that the total reintegration costs per prisoner range between €4,600 and €6,300 (de Koning et al., 2019).

In 2022, the total expenditure for police services amounted to €8,219 million, while law court costs amounted to €2,485 million (CBS, 2024). Given that there were 797,735 registered crimes that year, the average judicial cost per registered crime can be calculated by dividing the combined costs of police services and law courts, resulting in an estimated judicial cost of approximately €13,418 per registered crime.

The R&R program provides substantial benefits, including a reduction in recidivism rates by 4.5 percentage points, translating to an estimated 14% decrease in reoffending among eligible offenders compared to their non-eligible counterparts. This decline in recidivism enhances public safety and generates significant cost savings related to decreased judicial

[12]The Custodial Institutions Agency (DJI) in the Netherlands, with approximately 16,000 employees across 50 locations, is responsible for the daily care and rehabilitation of offenders, working to prepare them for reintegration into society and contributing to public safety. For more information visit https://www.dji.nl/.

and detention expenses. For instance, with an average daily detention cost of €284 (Council of the European Union, 2022) and the judicial cost of €13,418 per registered crime, each prevented reoffense could yield savings of around €16,826 annually per individual, assuming a 12-month detention scenario.

Comparing the costs of reintegration activities with the savings from lower recidivism clearly shows that the R&R program is cost-effective. While reintegration costs are estimated between €4,600 and €6,300 per prisoner, these expenses are significantly lower than the savings generated by preventing reoffending. Additionally, the program positively impacts labor market outcomes for native and older offenders, which helps increase tax revenues. It is also important to consider the costs related to victimization, which can lead to substantial expenses for mental health services and lost productivity (Bindler & Ketel, 2022). Overall, these factors highlight the economic benefits of the R&R program.

7 Conclusion

Rehabilitation programs for prisoners can have positive societal impacts. By addressing the root causes of criminal behavior and providing prisoners with education, job training, and skills development, these programs aim to reduce recidivism rates and facilitate the reintegration of ex-prisoners into society. Lower crime rates, in turn, can enhance public safety and lead to substantial cost savings by alleviating the burden on the criminal justice system.

This paper presents causal evidence on the impact of the Rehabilitation & Reintegration program, introduced in the Netherlands at the end of 2007, on recidivism, labor market outcomes, and social outcomes. Using a difference-in-differences strategy and drawing on comprehensive administrative data from Statistics Netherlands and the Dutch Ministry of Justice and Security, my analysis demonstrates the program's efficacy in reducing recidivism and improving social reintegration for former prisoners.

The R&R program, which targets offenders with prison sentences of at least four months, has led to a substantial decrease in reoffending behaviors by 4.5 percentage points over a three-year period. This reduction, which represents a 14 percent decline relative to the control group of non-eligible offenders, is particularly pronounced in the categories of violent and property crimes. While the program's impact on labor market outcomes is less prominent, there are positive changes in earnings, especially among native and older prisoners. The differential impacts across demographic groups suggest that tailored approaches may be necessary to maximize the benefits of such interventions.

Beyond recidivism and labor market outcomes, the R&R program also results in im-

provements in social reintegration, particularly in terms of stable housing and personal relationships—two critical factors for reducing reoffending. Participants are more likely to have secure housing and stable partnerships, reinforcing the idea that successful reintegration hinges not only on employment but also on broader social stability.

Overall, the study provides compelling evidence of the R&R program's potential to facilitate successful reintegration of former prisoners. By enhancing personal relationships, housing stability, and labor market outcomes, the program plays a crucial role in supporting offenders in their transition back into society.

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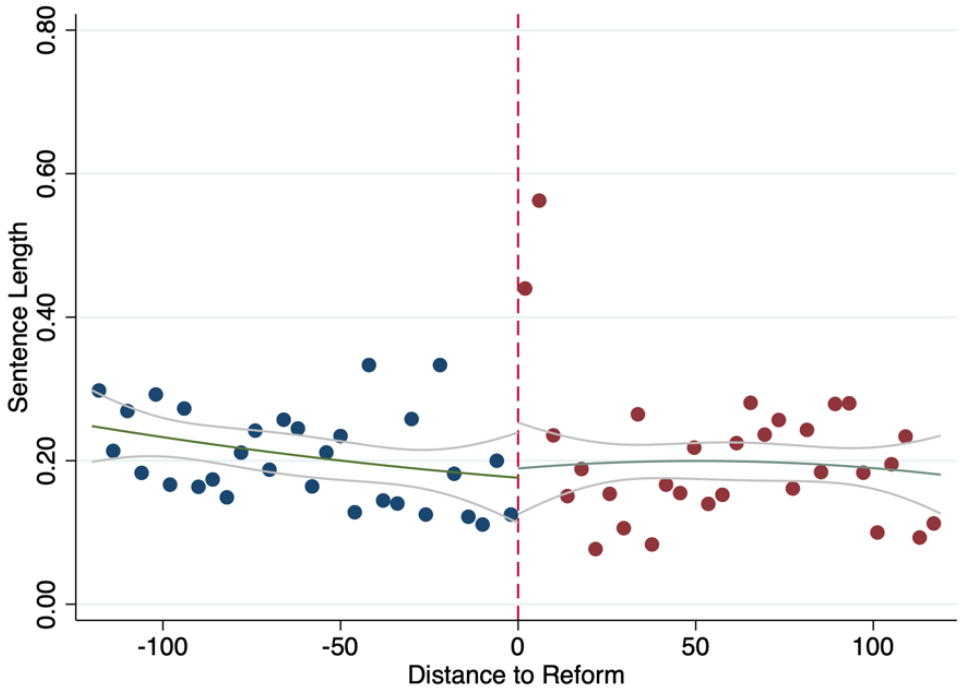
A Appendix

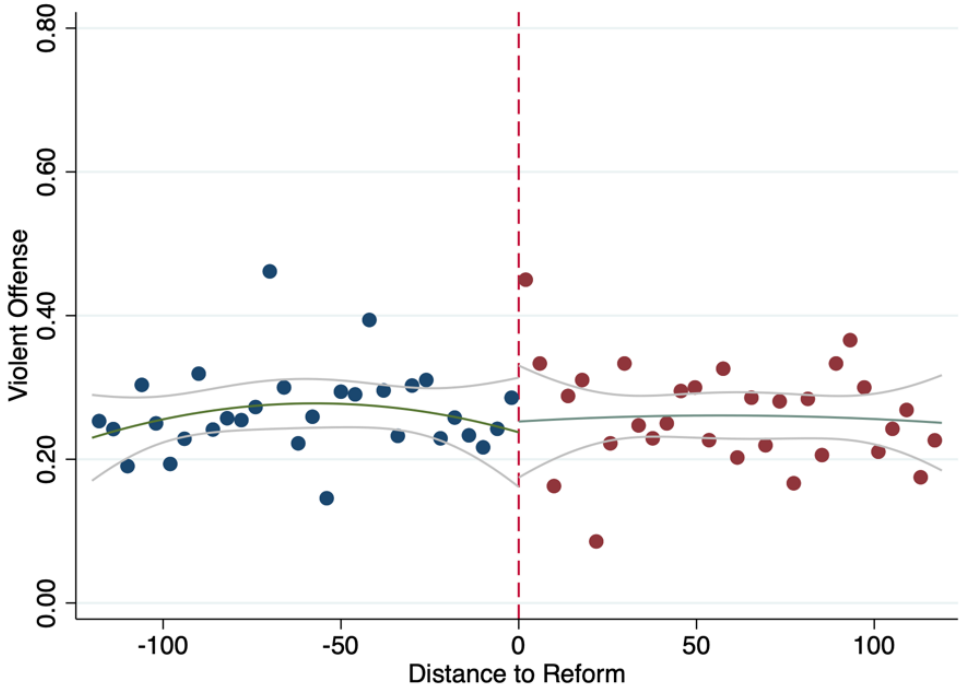
A.1 Additional Graphs and Tables

Figure A1: Manipulation



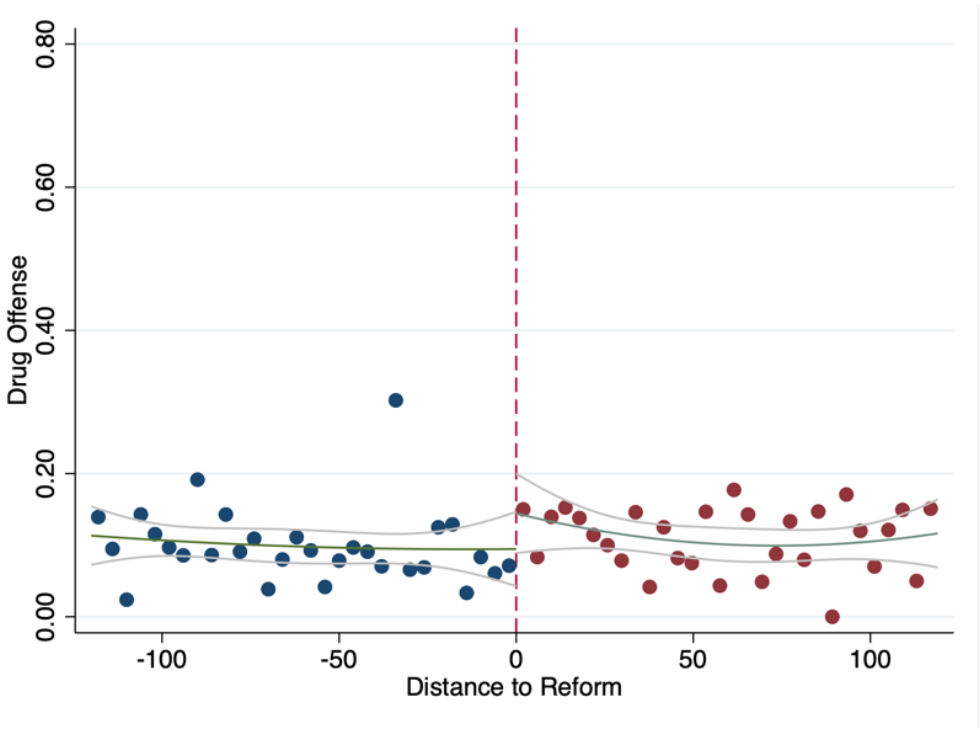
Notes: This graph examines potential manipulation in judges' sentencing behavior around the implementation of the threshold. The y-axis represents the likelihood of receiving a sentence length longer than 4 months (treatment).

Figure A2: Composition Change Violent Crimes



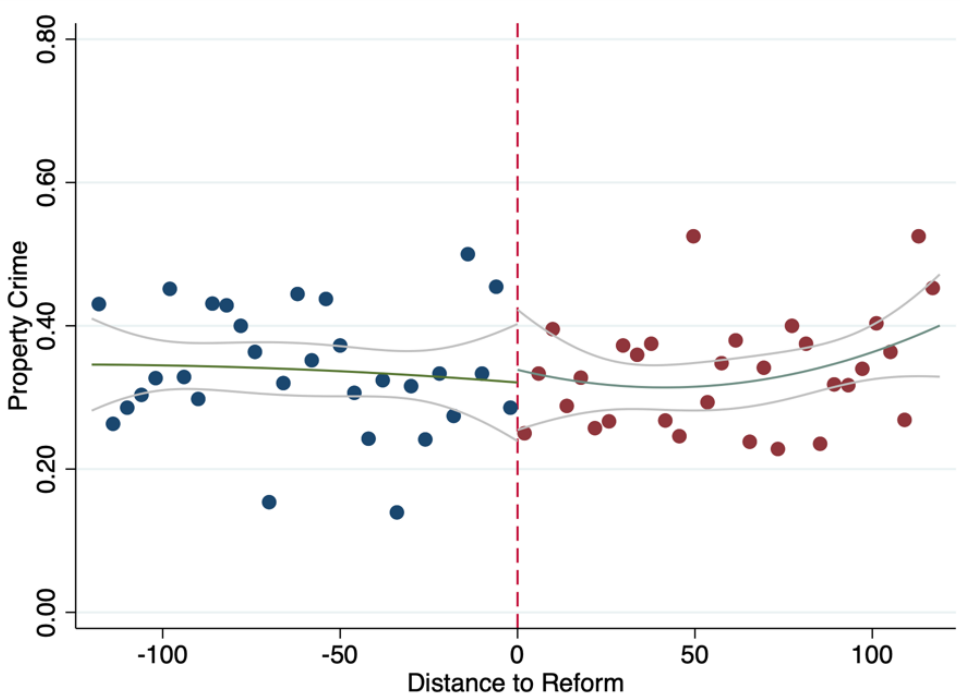
Notes: This graph examines potential compositional changes in violent crimes around around the implementation of the threshold. The y-axis represents the likelihood of being sentenced for a violent crime.

Figure A3: Composition Change Drug Crimes



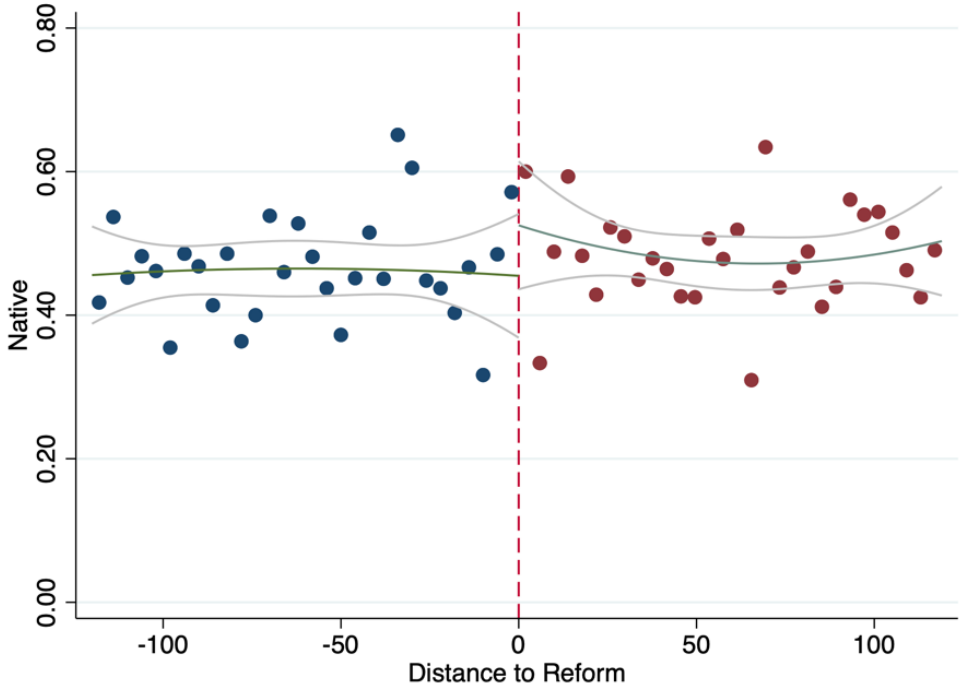
Notes: This graph examines potential compositional changes in drug crimes around around the implementation of the threshold. The y-axis represents the likelihood of being sentenced for a drug crime.

Figure A4: Composition Change Property Crimes



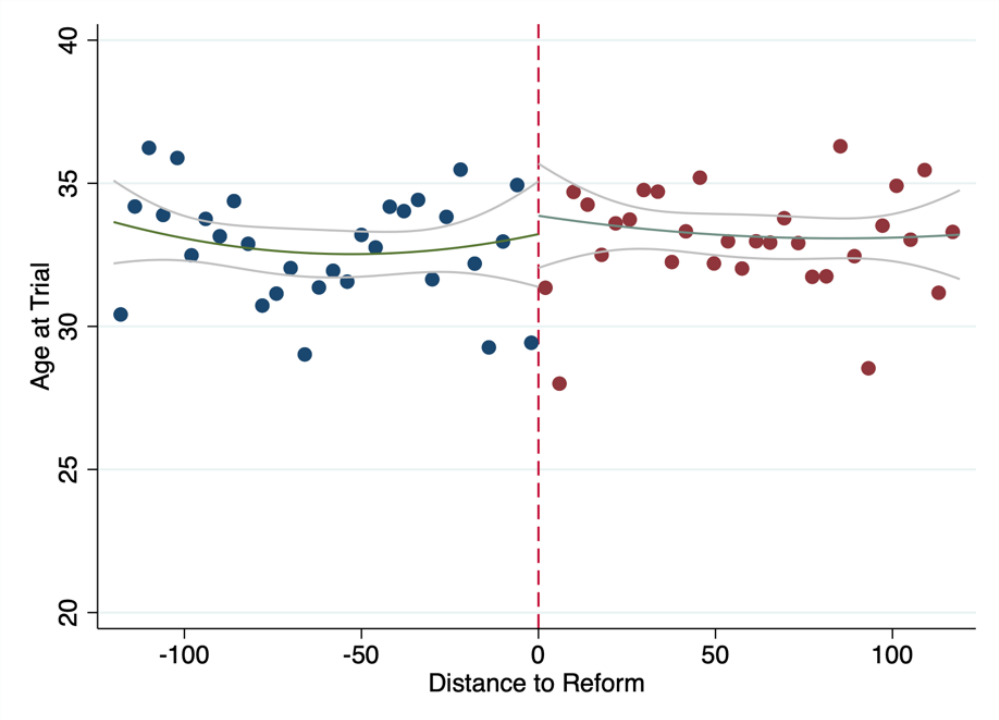
Notes: This graph examines potential compositional changes in property crimes around around the implementation of the threshold. The y-axis represents the likelihood of being sentenced for a property crime.

Figure A5: Composition Change Share of Natives



Notes: This graph examines potential compositional changes in share of natives around around the implementation of the threshold. The y-axis represents represents the share of natives who were sentenced.

Figure A6: Composition Change Age



Notes: This graph examines potential compositional changes in age around around the implementation of the threshold. The y-axis represents represents the age of individuals who were sentenced.

Table A1: R&R Program Effect with Controls

	Recidivism		Employment		Earnings	
	(1)	(2)	(3)	(4)	(5)	(6)
R&R Program	-0.043***	-0.036**	-0.007	0.002	10.87	167.0
	(0.015)	(0.014)	(0.015)	(0.010)	(295.2)	(234.1)
Non-eligible offenders mean	0.288	0.288	0.286	0.286	4,699.9	4,699.9
Sentencing year FE	Yes	Yes	Yes	Yes	Yes	Yes
Crime type FE	-	Yes	-	Yes	-	Yes
Individual controls	-	Yes	-	Yes	-	Yes
Observations	26,444	26,444	26,444	26,444	26,444	26,444

Notes: This table reports the estimates of the difference-in-differences model evaluating the impact of the rehabilitation and reintegration reform on offenders' criminal recidivism and labor market outcomes. All specifications are estimated using linear probability models and include year-of-sentencing fixed effects. "R&R Program" is the interaction coefficient of the DiD model. The outcome variable for recidivism is an indicator variable for reoffending behaviors within 3 years after release. The outcome variable for employment is a dummy variable indicating if the prisoner has a job 3 years after release. "Earnings" indicates yearly earnings. Columns (1), (3), and (5) report estimates including only sentencing year fixed effects, whereas columns (2), (4), and (6) expand the baseline specification by controlling for predetermined characteristics (gender, age at trial, country of origin), sentence length, and crime type fixed effects. The lower number of observations compare to table 2 and **??** is due to the limited availability of educational outcomes for all individuals. Columns (1), (3), and (5) use the same sample as the specifications with controls to ensure comparability across results. "Non-eligible offenders mean" represents the unconditional mean of the outcome variables for non-eligible offenders, those with a sentence length of less than four months. Robust standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.

Table A2: Recidivism Over Time

	Recidivism 1 year (1)	Recidivism 2 years (2)	Recidivism 3 years (3)	Recidivism 4 years (4)	Recidivism 5 years (5)
R&R Program	-0.021***	-0.039***	-0.045***	-0.049***	-0.052***
	(0.007)	(0.008)	(0.009)	(0.009)	(0.009)
Non-eligible offenders mean	0.137	0.243	0.311	0.343	0.378
Sentencing year FE	Yes	Yes	Yes	Yes	Yes
Observations	58,033	58,033	58,033	58,033	58,033

Notes: This table reports the estimates of the difference-in-differences model evaluating the impact of the rehabilitation and reintegration reform on offenders' criminal recidivism. All the specifications are estimated using linear probability models and include year of sentencing fixed effects. "R&R Program" is the interaction coefficient of the DiD-model. The outcome variables are indicator variables for reoffending behaviors within 1, 2, 3, 4 and 5 years respectively after release. "Non-eligible offenders mean" represents the unconditional mean of the outcome variables for non-eligibile offenders. All specifications are estimated using linear probability models and include year of sentencing fixed effects. Robust standard errors in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table A3: Earnings Over Time

	Earnings 1 year (1)	Earnings 2 years (2)	Earnings 3 years (3)	Earnings 4 years (4)	Earnings 5 years (5)
R&R Program	-2.811	169.9	223.1	146.0	187.0
	(164.4)	(164.4)	(151.9)	(165.9)	(180.2)
Non-eligible offenders mean	4,791.8	5,216.5	4,882.4	5,011.3	5,044.8
Sentencing year FE	Yes	Yes	Yes	Yes	Yes
Observations	51,068	53,299	58,033	53,040	50,926

Notes: This table reports the estimates of the difference-in-differences model evaluating the impact of the rehabilitation and reintegration reform on offenders' earnings over time. The outcome variables represent earnings at various time points after release. "R&R Program" is the interaction coefficient of the DiD-model. "Non-eligible offenders mean" indicates the average earnings for the control group. Robust standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.