New Zealand Economic Papers

ISSN: 0077-9954 (Print) 1943-4863 (Online) Journal homepage: www.tandfonline.com/journals/rnzp20

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To cite this article: Livvy Mitchell (09 Oct 2025): A policy evaluation of non-custodial sentencing for first-time offenders: evidence from New Zealand, New Zealand Economic Papers, DOI: 10.1080/00779954.2025.2565630

To link to this article: https://doi.org/10.1080/00779954.2025.2565630

NEW ZEALAND ECONOMIC PAPERS
https://doi.org/10.1080/00779954.2025.2565630

Routledge
Taylor & Francis Group

DATA NOTE

A policy evaluation of non-custodial sentencing for first-time offenders: evidence from New Zealand

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ABSTRACT

The economic theory of crime posits that crime rates will decrease if the expected costs of crime exceed the expected benefits. The expected costs of crime are positively correlated with the probability of apprehension and the punishment if caught. This paper tests the effect of non-custodial punishments on recidivism by exploiting a large-scale sentencing reform in New Zealand. Regression discontinuity design estimates suggest that, relative to short-term imprisonment, receiving a non-custodial sentence after the 1 October 2007 policy significantly increases first-time offenders' recidivism rate by 8.7% after one year, 9.5% after two years, and 9.6% after five years. However, these effects largely stem from serious breaches of non-custodial sentence conditions, highlighting that administrative non-compliance, rather than substantive new criminal activity, is the primary driver of the increased recidivism.

ARTICLE HISTORY
Received 2 April 2025
Accepted 20 September 2025

1. Introduction

In recent decades, most OECD countries have experienced substantial growth in prison population rates, and by the mid-2000s, more than half of OECD countries had prison occupancy levels exceeding 100% (OECD, 2016). Overcrowded prisons make it difficult to maintain prisoner health, sanitation, and safety, and generally can lead to inhuman conditions (UNODC, 2013). To combat the heightened risk of prison overpopulation, several countries, including Australia, France, New Zealand, the United Kingdom, and the United States, have introduced non-custodial alternatives to imprisonment, such as electronic monitoring sentences, where the offender serves their sentence at an approved place of residence instead of prison.

In Becker's (1968) canonical model of crime, he posits that a potential offender will choose not to commit a crime if the expected costs outweigh the expected benefits of the crime, whereby the expected costs of crime are positively correlated with enforcement and

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This article was originally published with errors, which have now been corrected in the online version. Please see Correction (http://dx.doi.org/10.1080/00779954.2025.2582300)

Supplemental data for this article can be accessed online at https://doi.org/10.1080/00779954.2025.2565630.

punishment.[1] Therefore, if a new punishment is perceived to be softer than the original punishment, Becker's model suggests rational criminals will engage in more crime.

However, one cannot simply compare the recidivism rates of offenders who received the (perceived) softer punishment with offenders who received the (perceived) harsher punishment since the decision of punishment severity is endogenous to the characteristics of the offence and the offender. There is a small empirical literature that plausibly overcomes this selection issue to evaluate the causal effect of being sentenced to electronic monitoring relative to imprisonment. The most common empirical strategy in this regard is instrumental variables: Henneguelle, Monnery, and Kensey (2016) use variation in the access to electronic monitoring in France as an instrument, while Williams and Weatherburn (2022) and Di Tella and Schargrodsky (2013) use the quasi-random assignment of judges as an instrument in Australia and Argentina,[2] respectively. Each of these studies find electronic monitoring reduces recidivism among eligible offenders relative to imprisonment.

This paper provides new quasi-experimental evidence on the effects of reduced perceived punishment severity on recidivism amongst first-time offenders. Using population-wide linked administrative data, I exploit a large-scale sentencing reform in New Zealand that exogenously changed the probability of receiving a non-custodial sentence over a short-term imprisonment sentence. Specifically, conditional on being eligible for short-term imprisonment, offenders sentenced prior to 1 October 2007 would receive short-term imprisonment while those sentenced after 1 October 2007 could receive short-term imprisonment, home detention, community detention, or intensive supervision. The treatment to a non-custodial sentence is therefore part of a much larger sentencing package than has previously been studied in the empirical literature focusing on electronic monitoring. New Zealand's administrative court charges data, the discontinuous jump in the probability of receiving a non-custodial sentence, and the inability of offenders or their lawyers to manipulate court hearing dates allows for a unique quasi-experiment to test whether non-custodial sentencing increases recidivism relative to short-term imprisonment.[3]

The estimated effects suggest that, relative to short-term imprisonment, receiving a non-custodial sentence after the 1 October 2007 policy cut-off significantly increases first-time offenders' recidivism rates by 8.7% points after one year, 9.5% points after two years, and 9.6% points after five years. These positive effects persist when measuring recidivism from the sentencing date, upon release, and on a 'free-time' timeline. However, the effect is not statistically different from zero when excluding reconvictions that result from offences against justice, which incapsulates serious breaches of non-custodial sentence conditions. This distinction suggests that the observed increase in recidivism is primarily driven by administrative non-compliance rather than new criminal activity.

These findings underscore how less surveillance and greater exposure to reoffending opportunities under non-custodial sentences contribute to higher recorded recidivism rates. Policymakers should consider not only the higher recidivism rate, but also the nature of the observed reoffending (namely, offences against justice) when weighing the fiscal savings and societal benefits of non-custodial sentencing against its potential costs.

The remainder of the paper proceeds as follows: Section 2 provides background on New Zealand's 2007 sentencing reform; Section 3 describes the data; Section 4 discusses the empirical methodology; Section 5 provides the results; and Section 6 concludes.

2. New Zealand's 2007 sentencing reform

New Zealand's prison population has steadily increased since 1989 (Gluckman, 2018) and experienced a sharp rise between 2002 and 2006 when the incarceration rate jumped from 145 to 181 prisoners per 100,000 individuals (World Prison Brief, n.d.b). Over the same period, the OECD average ranged from approximately 125–136 individuals per 100,000 (Australian Bureau of Statistics, 2009; OECD, 2007).[4] In November 2006, the Criminal Justice Reform Bill was submitted to the New Zealand Government to introduce financially and socially sustainable mechanisms to reduce New Zealand's incarceration rate. The Bill suggested enacting home detention, community detention, and intensive supervision as three non-custodial alternatives to short-term imprisonment, with the goal of reducing crime and recidivism, and having 'a greater emphasis on the acquisition of [offenders'] basic work and life skills' which should provide more 'positive support for offenders' reintegration and rehabilitation' (Simich, 2006).

Consequently, on 1 October 2007, New Zealand underwent a significant sentencing reform by enacting three new non-custodial sentences: home detention, community detention, and intensive supervision.[5] These sentences were enacted as New Zealand's second and third-equal most serious sentences, respectively.[6] The nature of these sentences are explained below.

2.1. Home detention

New Zealand's stand-alone home detention sentence enables a judge to directly sentence an offender to home detention without requiring an initial imprisonment sentence. Offenders on home detention are required to wear an electronically monitored ankle bracelet that tracks their movements 24 hours a day, seven days a week, to ensure they are located at a suitable place of residence and only leave such residence to attend employment. The bracelet will signal an alarm to the offender's probation officer if there is any tampering or unapproved movement. The home detention sentence ranges from a minimum of 14 days to a maximum of 12 months (Department of Corrections, n.d.b) and can only be administered if the judge would have otherwise imposed a short-term imprisonment sentence of up to two years. For individuals aged 18 or older, there are no legislative restrictions for the type of offence that warrants a home detention sentence.[7] Judges use their discretion in deciding when and how a sentence is imposed depending on the characteristics of the offence, the circumstances and actions of the offender, and the sentences received by other offenders who have previously committed similar crimes (Ministry of Justice, 2011).

2.2. Community detention

Community detention is a community-based sentence that also uses electronic monitoring. However, unlike home detention, community detention restricts an offender's movements to a certified place of residence only during specified curfew hours. A curfew period is a minimum of two hours and cannot exceed 84 hours per week. Community detention is aimed at low-risk offenders who have a pattern of offending at specific times, such that assigning a curfew during those hours would likely reduce the probability of

reoffending. The minimum community detention sentence is 14 days and the maximum is six months (Department of Corrections, n.d.a).

2.3. Intensive supervision

Intensive supervision is a rehabilitation-focused community-based sentence where offenders are required to attend special programmes focused on rehabilitation and community reintegration. Intensive supervision sentences range six months to two years, aimed at medium-to-high-risk offenders who commit serious offences and have complex rehabilitative needs. A probation officer will strictly monitor the offender's compliance with the order to attend special programmes, as well as monitoring the offender's reporting requirements (Department of Corrections, n.d.c).

For an offender serving a home detention, community detention, or intensive supervision sentence, a probation officer will monitor the offender's behaviour with regular visits and report any breaches to the Department of Corrections. If an offender violates any of their sentencing conditions, they will face case-specific repercussions. Such violations are considered 'offences against justice', which can lead to reconviction depending on the severity of the infringement.

Overall, the 2007 sentencing reform induced substantial change for how offenders are penalised in New Zealand. Not only did the legislative provision enable the possibility of shorter sentences for all crime warranting a maximum imprisonment sentence of two years, but it also enabled offenders to engage with the community throughout their sentence. Broadly speaking, this opportunity could be approached in one of two ways. The offender could oblige by their community-based non-custodial sentence by attending their rehabilitative programmes and employment with the hope of improving their reintegration prospects; or the offender could more easily re-engage in crime since these non-custodial sentences have less surveillance than 24-hour prison security. This paper evaluates the impact of non-custodial sentencing on recidivism to better understand which pathway prevails for first-time offenders.

3. Data

3.1. New Zealand's Integrated Data Infrastructure

In this study, I use population-wide linked administrative data supplied by Statistics New Zealand's Integrated Data Infrastructure (IDI). The IDI data are sourced from government agencies, Statistics New Zealand surveys, and non-government organisations, and includes individual-level information on a range of characteristics, such as education, training, income and work, benefits and social services, population, health, justice and housing (Statistics New Zealand, 2022). A key advantage of the IDI is the ability to link individuals across all databases using a unique identifier.[8]

The primary dataset for this study is the court charges data from the Ministry of Justice, which provides information about an offender's offence type, charge, conviction, and sentencing outcomes. I link four additional datasets to the court charges data to provide a full description of the offender population. These include: Census 2013 and personal details data, which collectively provide offenders' demographic information, including age,

Table 1. Treatment and control group sample size.

Observation window	Control group	Treatment group	Total
50 days	81	75	156
100 days	168	195	363
365 days	597	975	1572
730 days	1188	2133	3321
1,825 days	2952	5925	8877

Notes: This table shows the counts of the first-time offender population in different observation windows around the 1 October 2007 cut-off. Those sentenced before 1 October 2007 are the control group, those sentenced after 1 October 2007 are the treatment group.

sex, ethnicity, and migrant status; Department of Internal Affairs birth register, which provides information whether the offender has any children; tax data from the Inland Revenue Department, which provide information about an offender's labour earnings, benefit receipt, and total taxable income; and derived address data which indicates the region of the offender's last recorded address and the associated New Zealand Deprivation Index (NZDep2018).

3.2. First-time offenders

The population of interest comprises first-time offenders at the margin of non-custodial sentencing eligibility. To arrive at this sample, I impose four conditions on the court charges data. First, I restrict the court charges data to only those charges for which offenders were convicted. From 1992 to 2018, this comprises 5,330,274 convicted charges.

Second, I identify first-time convicted offenders by observing each convicted offender at their earliest sentencing outcome date.[9] If an offender received more than one charge at their earliest sentencing date, I observe them for their most serious charge as identified by their most serious sentence received at this time. If there are multiple charges with equal seriousness rank, then I observe them for the charge that resulted in the longest sentence. This leaves 854,637 first-time convicted offenders.

Third, I drop any offenders that die within five years from their first sentencing to avoid downwardly biasing the recidivism rates. This leaves 842,130 first-time convicted offenders who remain alive for at least five years post-conviction.

Fourth, I restrict the sample to first-time offenders who received a short-term imprisonment sentence or one of the three new non-custodial sentences.[10] This leaves 27,036 first-time offenders.

Table 1 provides counts of these offenders 50, 100, 365 days (one year), 730 days (two years), and 1,825 days (five years) either side of the 1 October 2007 cut-off. Offenders sentenced before the cut-off make up the control group while offenders sentenced after the cut-off are the treatment group. For the empirical estimation, the size of the observation window around the cut-off is determined by a data-driven bandwidth optimising procedure.

3.3. Recidivism

In the main specification, I define three recidivism dummies that measure recidivism as the probability of being reconvicted within one, two, and five years from the date

of sentencing, respectively.[11] Recidivism is measured from an offender's sentencing date because it is a repercussion of non-custodial sentencing that the offender remains in society with (arguably) more of an opportunity to reoffend throughout their sentence. In contrast, reoffending possibilities are limited for imprisoned offenders due to the practical constraints of 24-hour prison security. To estimate the true effect of non-custodial sentencing on recidivism, it is important that the definition of recidivism reflects all consequences of the sentence.

Notably, recidivism measured from the start of the sentence captures all offences against justice. For example, if an offender was on home detention and assaulted someone during their sentence, they would be both charged with assault as well as breaching their sentence conditions. The latter is categorised as an offence against justice.

As robustness tests, I employ two alternative definitions of recidivism. First, following the approach of Di Tella and Schargrodsky (2013) and Marie (2009), I define post-release recidivism dummies that measure recidivism one, two, and five years after offenders have completed their sentence. I proxy an offender's release date as their sentencing date plus their sentence length (measured in days).[12]

Second, in line with the approach by Williams and Weatherburn (2022) and Henneguelle et al. (2016), I define recidivism as measured from the start of 'free-time', defined as time spent in the community. For this approach, recidivism is observed one, two, and five years from the start of a non-custodial sentence (since offenders are still in the community) but upon release from an imprisonment sentence.

3.4. Descriptive statistics

Table 2 provides descriptive statistics for the population of 5,925 first-time offenders who were sentenced to short-term imprisonment, home detention, community detention, or intensive supervision between 1 October 2007 and 1 October 2012 (i.e. five years after the policy).

Table 2 shows the offender sample is predominantly male (70%) and are a majority European and Māori (31% each). One third of offenders are parents and another one third are migrants. Almost half (47%) of offenders were employed in the calendar year prior to conviction, while one third received a benefit. About 40% of offenders lived in one of New Zealand's main cities prior to conviction.

37% of offenders committed violent offences (such as homicide, injury-causing, or sexual offences), another 37% committed property offences (such as burglary, theft, break-and-enter), and the remaining 25% committed other offence types, including traffic offences, offences against justice, and drug and weapon crimes. The most common sentence was home detention (38%, average length = 219 days), followed by community detention (31%, average length = 123 days), and then short-term imprisonment (19%, average length = 321 days) and intensive supervision (11%, average length = 444 days). 17% of offenders received the maximum length for their given sentence. The average age at the time of committing the offence is 29 years old, while the average age at the time of conviction is 30.5 years old. On average, 24% of offenders were reconvicted within one year, 32% within two years, and 40% within five years.

Table 2. Summary statistics for population of interest convicted between 1 October 2007 and 1 October 2012.

Characteristic	Statistic	Unit
Sample of offenders 5 years from 1 October 2007	100.00	%
Demographic		
Females	29.01	%
People with missing sex information	13.97	%
European	31.34	%
Māori	31.24	%
Pacific	10.58	%
Asian	5.37	%
MELAA/Other	2.73	%
People with missing ethnicity	18.78	%
People NZ-born	62.73	%
People with children as at calendar year before conviction	30.68	%
Socioeconomic		
People employed in calendar year prior to conviction	47.39	%
People who received benefits in calendar year prior to conviction	32.91	%
Average annual labour earnings in calendar year prior to conviction	9019.51	NZD
Average annual total income in calendar year prior to conviction	12846.11	NZD
People residing in main city	39.90	%
People with main city info missing	19.95	%
Average NZDep2018 score	7.34	Index
Crime		
People who committed violent offences	37.32	%
People who committed property offences	37.47	%
People who committed other offences	25.22	%
People serving Imprisonment	19.44	%
People serving Home detention	38.33	%
People serving Community detention	30.73	%
People serving Intensive Supervision	11.49	%
Average age at charge outcome	30.48	Years
Average age at offence	29.05	Years
People without age information	14.53	%
People who received the maximum sentence	17.01	%
Average sentence length for short-term imprisonment sentences	321	Days
Average sentence length for home detention sentences	219	Days
Average sentence length for community detention sentences	123	Days
Average sentence length for intensive supervision sentences	444	Days
People who were reconvicted within 1 year of charge outcome	24.10	%
People who were reconvicted within 2 years of charge outcome	32.46	%
People who were reconvicted within 5 years of charge outcome	39.75	%
Counts	5925	Counts

Notes: This table provide the summary statistics for demographic, crime, and socioeconomic characteristics for the population of first-time offenders sentenced to short-term imprisonment, home detention, community detention, or intensive supervision between 1 October 2007 and 1 October 2012. Violent offences include ANZSOC categories 1 (homicide), 2 (injury causing), 3 (sexual), 4 (dangerous acts), 5 (abduction and harassment), and 6 (robbery and extortion). Property offences include ANZSOC categories 7 (burglary), 8 (theft), 9 (fraud, deception), and 12 (property). Other offences include ANZSOC categories 10 (drugs), 11 (weapons), 13 (public order), 14 (traffic), 15 (against Justice), and 16 (miscellaneous).

4. Estimation strategy

To understand the causal relationship between non-custodial sentencing and recidivism, the empirical challenge is to establish the counterfactual observation: *what would the recidivism rate be for first-time offenders who received non-custodial sentences had they instead been sentenced to short-term imprisonment?* To answer this question, I use a fuzzy regression discontinuity design (FRDD). In this set-up, assignment into non-custodial sentencing is assumed random around the 1 October 2007 cut-off, allowing the observed recidivism rate for the control group to be used as the counterfactual recidivism rate for

the treatment group. The FRDD is specified by Equation (1):

$$y_i = \alpha_0 + \alpha_1 ChargeTimeline_i + \alpha_2 NonCustodial_i + \alpha_3 (ChargeTimeline_i * NonCustodial_i) + u_i \quad (1)$$

where y_i is a recidivism indicator for offender i; $ChargeTimeline_i$ represents the number of days between offender i's sentencing date and 1 October 2007, such that positive values mean offender i was sentenced after the reform (treatment group) while negative values mean offender i was sentenced before the reform (control group); $NonCustodial_i$ is an indicator that equals one if offender i was sentenced to home detention, community detention, or intensive supervision, and equal to zero if sentenced to short-term imprisonment; while α_0 is the constant and u_i is the error term.

In Equation (1), α_3 represents the causal effect of non-custodial sentencing on recidivism relative to short-term imprisonment. The causal interpretation of this estimate relies on several assumptions, including the Stable Unit Treatment Value Assumption; independence; the exclusion restriction; and monotonicity (Angrist, Imbens, & Rubin, 1996). Further support for the causal interpretation of α_3 can be provided by empirically testing for continuity in the distribution functions and conditional regressions (Imbens & Lemieux, 2008).

Continuity in the distribution of sentencing hearings implies offenders (and their legal representatives) must have imperfect control over their sentencing hearing date. New Zealand's *Lawyers and Conveyancers Act (Lawyers: Conduct and Client Care) Rules 2008* supports this assumption by stating that lawyers have an absolute duty of honesty to not mislead or deceive the court. Lawyers cannot manipulate court hearing or sentencing dates to attain a lesser penalty for their clients, so the frequency of sentencing hearings should be continuous immediately around the 1 October 2007 cut-off, enabling sentence assignment to be as good as random within this window. This can be tested by a running variable density test around the cut-off (McCrary, 2008). Appendix Table A1 provides the p-value for the density test around the cut-off in each of the 50-day, 100-day, 365-day, 730-day, and 1,825-day observations windows. The density of sentencing hearings is continuous across the 1 October 2007 cut-off for the 50-day, 100-day, and 1,825-day windows, but there is some evidence of manipulation within the 365-day and 730-day windows.

Continuity in conditional regressions implies that, on average, the treatment and control groups should be identical across observable and unobservable characteristics. Appendix Tables A2–A6 include covariate balance tests across demographic, socioeconomic and crime characteristics for the main sample of first-time offenders within a 50-day, 100-day, 365-day, 730-day, and 1,825-day observation window, respectively. Results show the smaller the observation window, the more comparable the treatment and control groups.

The only characteristic that should change discontinuously across the 1 October 2007 cut-off is the probability of receiving a non-custodial sentence. This first-stage effect is presented in Panel A of Figure 1 for a one-year recidivism rate within a 365-day observation window. The probability of receiving a non-custodial sentence increases by 68% points across the 1 October 2007 policy cut-off, a jump that is highly statistically significant.

Overall, while all five observation windows show strong first stage effects,[13] the 50-day and 100-day windows are the most econometrically robust since there is no evidence of sentencing date manipulation and the treatment and control groups within these windows

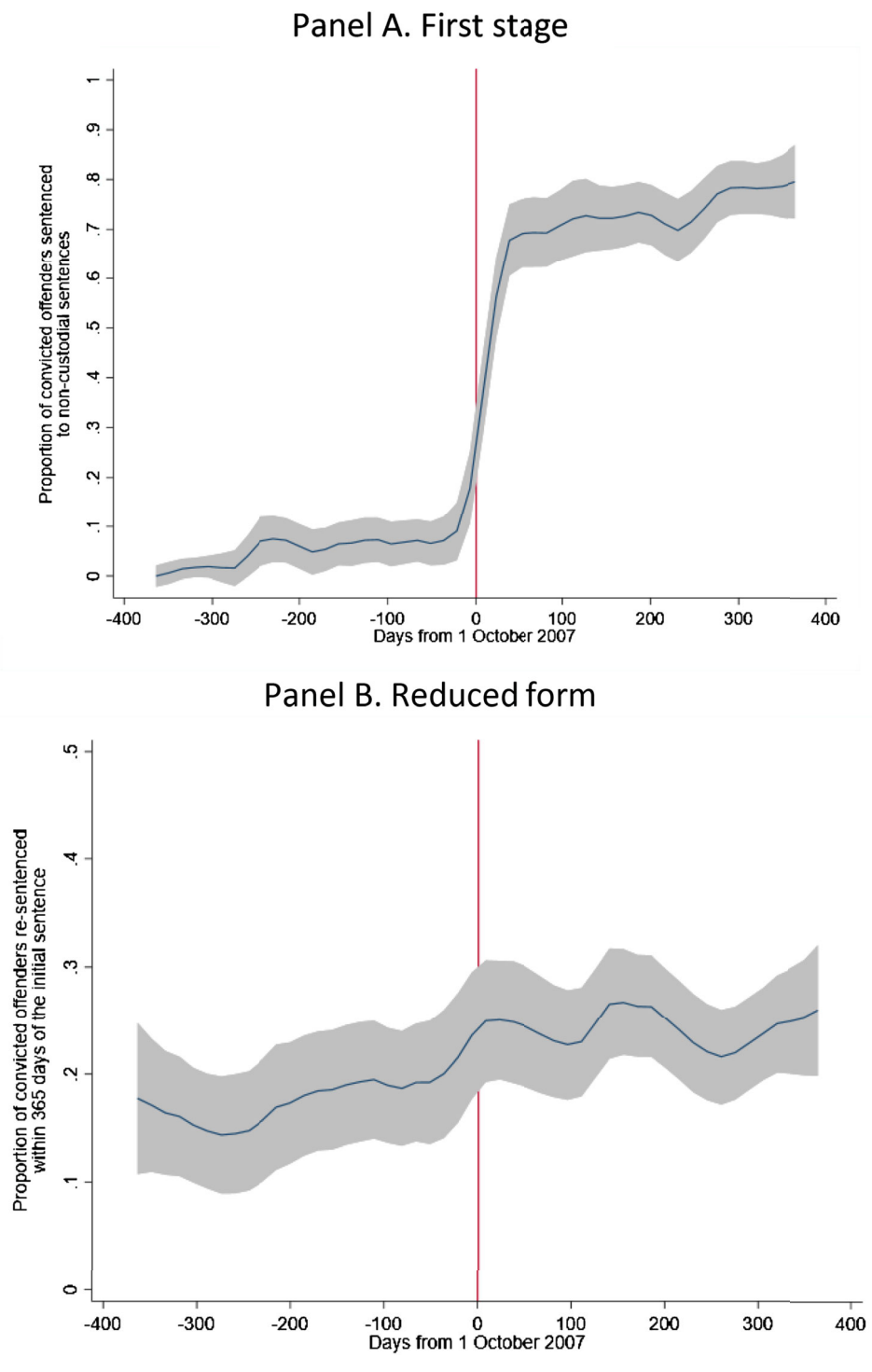

Figure 1. The Wald estimate of the effect of non-custodial sentencing on a one-year recidivism rate.

are statistically comparable across a range of observable characteristics. Not coincidentally, when estimating Equation (1), the FRDD algorithm optimises a triangular kernel for all models, thus offenders sentenced closest to the 1 October 2007 cut-off are given more weight in the FRDD estimation than offenders sentenced further from the cut-off.[14] Robustness tests explore the sensitivity of the FRDD results when a uniform kernel and/or a bandwidth is imposed on the model.

5. Results

I begin the results section with a visual presentation of the Wald estimator (Figure 1), followed by the primary FRDD estimates. I then present various robustness tests showing that my estimates of the effect of non-custodial sentencing on recidivism is consistent across a range of model specifications and sample criteria.

5.1. Main results

The Wald estimator shown in Equation (2) provides the baseline estimate of the effect of non-custodial sentencing on recidivism.

$$\widehat{Wald} = \frac{E(Y|Z=1) - E(Y|Z=0)}{E(D|Z=1) - E(D|Z=0)} = \frac{Reduced\ Form}{First\ Stage}$$

The numerator of Equation (2) is the difference in expected recidivism rate (Y) for offenders whose sentencing date was after ($Z = 1$) and before ($Z = 0$) the 1 October 2007 cut-off, and the denominator is the difference in the probability of receiving a non-custodial sentence (D) after and before the cut-off. Figure 1 plots these first stage (Panel A) and reduced form (Panel B) effects for a one-year recidivism rate for offenders observed within 365-days from 1 October 2007.

The probability of being sentenced to a non-custodial sentence increases by 68% points as offenders' sentencing dates cross the 1 October 2007 cut-off. At the same time, the one-year recidivism rate increases by 6.4% points across the 1 October 2007 cut-off.[15] Taking the ratio of the reduced form and first stage effects as per Equation (2), the Wald estimator suggests that first-time offenders sentenced to non-custodial sentences around the 1 October 2007 reform are 9.4% points more likely to reoffend within one year than are those sentenced to short-term imprisonment.

Table 3 presents the main estimates of non-custodial sentencing on recidivism across one-, two- and five-year periods. Column 1 provides the Wald estimates and column 2 provides the FRDD estimates. For comparative purposes, column 3 provides estimates from a two-staged least squares (2SLS) specification since a FRDD is also an instrumental variables approach (Angrist & Pischke, 2009).

Relative to short-term imprisonment, non-custodial sentencing increases first-time offenders' recidivism rate by 8.7% points within one year, 9.5% points within two years, and 9.6% points within five years. These effects are most significant for the one-year and two-year recidivism rates, and marginally significant for the five-year rate.

Table 3. Estimates of non-custodial sentencing on recidivism by estimation method.

Recidivism period	(1) Wald	(2) FRDD	(3) 2SLS
365-day recidivism	0.094	0.087 (0.040)**	0.100 (0.034)***
730-day recidivism	0.082	0.095 (0.045)**	0.079 (0.038)**
1,825-day recidivism	0.083	0.096 (0.051)*	0.073 (0.040)*

Notes: The Wald estimator in column (1) and the 2SLS estimation in column (3) imposed uniform weighting on observations within a 365-day observation window. The FRDD estimations in column (2) optimise the bandwidth using the full courts data (1992-2017) and impose a triangular kernel weighting function for all specifications. Standard errors are in parenthesis. Asterisks indicate the significance level of the 2SLS and FRDD estimates, where *** if $p < 0.01$, ** if $p < 0.05$, and * if $p < 0.1$.

Table 4. Estimates of non-custodial sentencing on a one-year recidivism rate by FRDD specification.

FRDD specification	(1) Uniform kernel	(2) Optimised weight
(1) Unrestricted observation window	0.055 (0.050)	0.087 (0.040)**
(2) 365-day observation window	−0.031 (0.207)	0.021 (0.225)

Notes: This table presents LATES estimates for non-custodial sentencing on a one-year recidivism rate across a range of FRDD specifications, varying the observation window (either optimised or 365-days) or the observation weighting (either optimised or uniform). The optimised weighting function selected by the FRDD estimation in column (2) was a triangular kernel for both specifications. Standard errors are in parenthesis. Asterisks indicate the significance level of the estimates, where *** if $p < 0.01$, ** if $p < 0.05$, and * if $p < 0.10$.

5.2. Robustness tests

5.2.1. FRDD specification

As reported in Table 3, the primary FRDD estimate for a one-year recidivism rate is 8.7% points. This estimate was computed from an unrestricted FRDD model that optimises the bandwidth and weighting kernel using the full period of court charges data, ranging from 1992 to 2017. Table 4 presents variations of this estimate when imposing observation windows and weighting functions on the FRDD model.

Non-custodial sentencing increases recidivism relative to short-term imprisonment across most of the FRDD specifications. The fully optimised model (row 1, column 2) produces a positive and statistically significant estimate. Models with only one restriction imposed – i.e. with optimised bandwidth but imposed weighting (row 1, column 1) or with imposed bandwidth but optimised weighting (row 2, column 2) – also produce a positive estimate, but both are insignificant. The FRDD model with both bandwidth and weighting restrictions imposed (row 2, column 1) produces a negative estimate, albeit statistically insignificant.

5.2.2. 2SLS observation window selection

One of the reasons that a FRDD is preferred over a 2SLS design is that the FRDD bandwidth choice is the result of an optimisation procedure, while the 2SLS observation window is chosen by the researcher. Here, I explore the sensitivity of the 2SLS estimate across different observation windows. Figure 2 plots the 2SLS estimates and respective 95% confidence intervals for a one-year recidivism rate (Panel A) and a two-year recidivism rate (Panel B) for the following five observation windows: 50, 100, 365, 730 days, and 1,825 days. Results

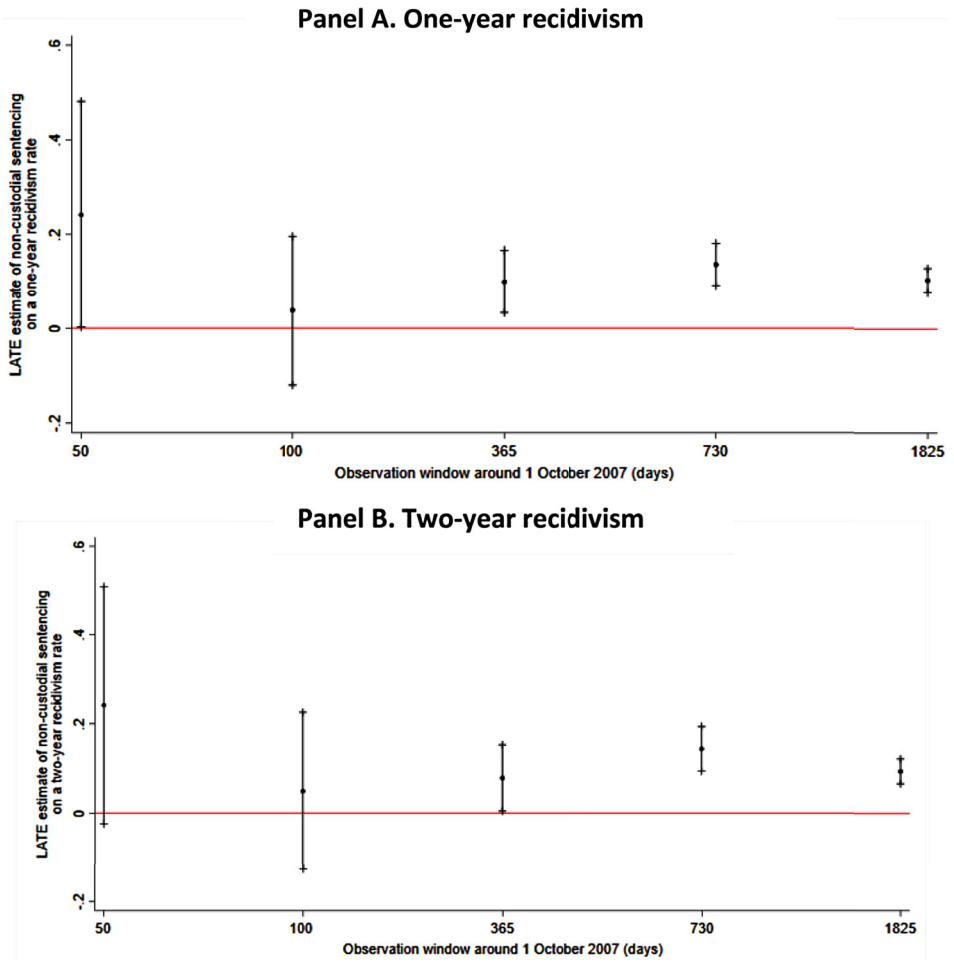

Figure 2. 2SLS estimates of non-custodial sentencing on recidivism.

show non-custodial sentencing increases first-time offenders' recidivism rates within all observation windows for both the one-year and two-year recidivism periods and, particularly for the wider windows, such effects are similar in magnitude and significance to the FRDD estimates presented in Table 3.

5.2.3. Criteria of the offender sample

The population of interest for the primary analysis comprises first-time offenders who were sentenced to short-term imprisonment, home detention, community detention or intensive supervision around 1 October 2007. To test the sensitivity of the main result to this criterion, I compute FRDD and 2SLS estimates of the effect of non-custodial sentencing on one – and two-year recidivism rates for a wider sample of first-time offenders, namely those sentenced to *any* imprisonment sentence, not just short-term imprisonment. Estimates presented in Table 5 show the main results is robust to the selection of the offender sample.

Table 5. Estimates of non-custodial sentencing on recidivism, including all imprisonment sentences.

Sample	Recidivism period	(1) FRDD	(2) 2SLS
All imprisonment, home detention, community detention, intensive supervision	365-day recidivism	0.100 (0.043)**	0.122 (0.033)***
	730-day recidivism	0.107 (0.052)**	0.110 (0.037)***

Notes: The optimised weighting function selected by the FRDD estimations in column (1) was a triangular kernel. The 2SLS estimation in column (2) imposed uniform weighting on observations within a 365-day observation window around 1 October 2007. Standard errors are in parenthesis. Asterisks indicate the significance level of the estimate where *** if $p < 0.01$, ** if $p < 0.05$, and * if $p < 0.10$.

Table 6. Estimates of non-custodial sentencing by definition of recidivism.

	(1) FRDD	(2) 2SLS
Panel A		
Recidivism: 365-days post-release	0.081 (0.046)*	0.047 (0.037)
Recidivism: 730-days post-release	0.059 (0.050)	0.042 (0.039)
Panel B		
Recidivism: 365-days free-time	0.125 (0.037)***	0.100 (0.032)***
Recidivism: 730-days free-time	0.184 (0.043)***	0.139 (0.035)***

Notes: Panel A looks at a one- and two-year recidivism rate measured from the offender's release date. Panel B looks at a one- and two-year recidivism rate measured from a 'free-time' timeline, which is measured from the date of sentencing for a non-custodial sentence but the release date for a short-term imprisonment sentence. The FRDD estimations in column (1) optimises a triangular kernel weighting function for all specifications. The 2SLS estimation in column (2) imposes uniform weighting on observations within the 365-day observation window. Standard errors are in parenthesis. Asterisks indicate the significance level of the estimate where *** if $p < 0.01$, ** if $p < 0.05$, and * if $p < 0.10$.

5.2.4. Definition of recidivism

Next, I test whether the overall conclusion that non-custodial sentencing increases recidivism amongst first-time offenders is sensitive to the definition of recidivism. Table 6 presents the estimates from FRDD and 2SLS specifications for two alternative recidivism measures. In Panel A, I follow Di Tella and Schargrodsky (2013) and Marie (2009) by measuring recidivism upon release; and in Panel B, I follow Williams and Weatherburn (2022) and Henneguelle et al. (2016) by measuring recidivism from the start of 'free-time'. Table 6 shows both definitions of the one- and two-year recidivism rates show non-custodial sentencing increases recidivism for first-time offenders. The effects are larger in magnitude and more highly significant when measuring recidivism from the start of 'free-time' compared to post-release recidivism.[16]

5.2.5. Reconviction offence type

If an offender breaches their non-custodial sentence conditions, their non-compliance could result in a further conviction (Department of Corrections, n.d.a, n.d.b, n.d.c). A formal breach is classified as an 'offence against justice'. Table 7 shows the average one-, two-, and five-year recidivism rates for the treatment (column 2) and control (column 1) groups defined 365-days around 1 October 2007 for only reconvictions where the most serious offence was an offence against justice.

Table 7. Proportion of sample that are reconvicted for offences against justice.

	Recidivism	(1) Control group recidivism rate	(2) Treatment group recidivism rate	(3) Difference
Most serious reconviction is from offence(s) against justice	365-days	0.150	0.282	0.132***
	730-days	0.237	0.356	0.118***
	1825-days	0.275	0.383	0.108***

Notes: This table shows the average reconviction rate for reoffences where the most serious offence was against justice for the control and treatment groups defined for a 365-day window around 1 October 2007. Asterisks indicate the significance level of the difference in means, where *** if $p < 0.01$, ** if $p < 0.05$, and * if $p < 0.10$.

Table 8. Estimates of non-custodial sentencing on recidivism for reconvictions excluding offences against justice.

Recidivism excluding offences against justice	(1) FRDD	(2) 2SLS
365-day recidivism	0.008 (0.039)	0.016 (0.030)
730-day recidivism	0.013 (0.050)	0.007 (0.036)
1825-day recidivism	0.029 (0.056)	0.009 (0.040)

Notes: The FRDD estimations in column (1) optimised a triangular kernel weighting function for all specifications. The 2SLS estimation in column (2) imposed uniform weighting on observations within the 365-day observation window. Standard errors are in parenthesis. Asterisks indicate the significance level of the estimates, where *** if $p < 0.01$, ** if $p < 0.05$, and * if $p < 0.10$.

Column 3 shows the difference in means for these reconviction rates, whereby the treatment group are between 10.8%−13.2% points significantly more likely to be reconvicted for offences against justice than are the control group. This could explain why the FRDD estimates show non-custodial sentencing increases recidivism relative to short-term imprisonment, since offenders sentenced to community-based sentences are more exposed to reoffending opportunities by the nature of their sentence compared to offenders in prison.

To further explore this mechanism, I re-run Equation (1) excluding reconvictions that result from offences against justice. This will reveal whether non-custodial sentencing still increases the likelihood of being reconvicted of crimes other than offences against justice. Results presented in Table 8 show no such effect persists. Both the FRDD and 2SLS models reveal positive, but small and insignificant coefficients for the effect of non-custodial sentencing on the one-, two-, and five-year recidivism rates. This suggests that the higher recidivism rates among offenders serving non-custodial sentences (Table 3) is primarily driven by the compliance demands of community-based sentences, where breaches (such as failing to report or adhere to conditions) are more likely to result in formal reconvictions. In contrast, imprisoned offenders are subject to stricter surveillance and may face fewer opportunities for such breaches while incarcerated.

5.2.6. The three non-custodial sentences separately

Table 9 presents the estimates for the one-, two-, and five-year recidivism rates from FRDD and 2SLS specifications looking at each of the three non-custodial sentences separately. While these estimates cannot be interpreted as causal, the direction of the estimates provide intuition as to whether home detention, community detention, and intensive supervisions are all positively correlated with first-time offenders' recidivism rates, or whether a negative

Table 9. Estimates of non-custodial sentencing on recidivism by sentence type.

Non-custodial sentence	Recidivism	(1) FRDD	(2) FRDD N	(3) 2SLS	(4) 2SLS N
Home detention	365-day recidivism	0.052 (0.050)	20061	0.068 (0.040)*	1239
	730-day recidivism	0.029 (0.057)	20061	0.021 (0.045)	1239
	1,825-day recidivism	0.017 (0.059)	20061	−0.001 (0.049)	1239
Community detention	365-day recidivism	0.390 (0.104)***	18861	0.336 (0.069)***	1053
	730-day recidivism	0.396 (0.114)***	18861	0.318 (0.075)***	1053
	1,825-day recidivism	0.358 (0.081)***	18861	0.277 (0.078)***	1053
Intensive supervision	365-day recidivism	0.381 (0.134)***	15684	0.421 (0.108)***	939
	730-day recidivism	0.431 (0.151)***	15684	0.390 (0.119)***	939
	1,825-day recidivism	0.393 (0.163)**	15684	0.315 (0.125)**	939

Notes: The FRDD estimations in column (1) optimised a triangular kernel weighting function for all specifications. Column (2) provides the number of observations in each FRDD regression. The 2SLS estimation in column (3) imposed uniform weighting on observations within the 365-day observation window. Column (4) provides the number of observations in each 2SLS regression. Standard errors are in parenthesis. Asterisks indicate the significance level of the estimates, where *** if $p < 0.01$, ** if $p < 0.05$, and * if $p < 0.10$.

correlation between recidivism and one non-custodial sentence might be 'cancelled-out' by a positive correlation between recidivism and another non-custodial sentence when analysing all three sentences together.

Table 9 shows each of the three non-custodial sentences have a positive correlation with recidivism across all specifications and recidivism periods for first-time offenders. There is one exception: the estimate is negative for the effect of home detention on the five-year recidivism rate when estimated by 2SLS; however, this estimate is very small in magnitude and statistically insignificant.

The effect is very large and highly significant for community detention and intensive supervision sentences, and much smaller in magnitude and mostly insignificant for home detention sentences. These findings suggests that the level of surveillance is a key mechanism behind higher recidivism rates, as home detention imposes 24/7 monitoring, while community detention and intensive supervision provide greater freedom and hence more opportunities to breach the sentence conditions.

Overall, Table 9 provides suggestive evidence that all three non-custodial sentences have a positive correlation with first-time offenders' recidivism rates, rejecting the idea that the main results in Table 3 are driven by a cancelling-out effect from the combined non-custodial treatment.

5.2.7. Constant release environments

In this section, I address the issue of constant release environments and identify the differences in future sentencing expectations between the treatment and control groups. Results provide direction for future research in this regard.[17]

In this paper, the treatment and control groups received their first sentence in different sentencing environments. The control group were sentenced in an environment where their expected sentence was short-term imprisonment; the treatment group were sentenced in an environment where their expected sentence was either short-term imprisonment, home detention, community detention, or intensive supervision. This initial difference in sentencing environments is the foundation of my research question: *Did the 2007 non-custodial sentencing reform reduce the recidivism rate of first-time offenders?*

Table 10. Weighted average number of days spent in the new sentencing environment by control group observation window and recidivism period.

Post-release period	Control group observation window	Counts of offenders	Weighted avg. proportion of days in new environment
365-days post-release period	50	81	0.999
	100	168	0.996
	365	597	0.918
	730	1191	0.662
730-days post-release period	50	81	0.999
	100	168	0.998
	365	597	0.959
	730	1191	0.831
1,825-days post-release period	50	81	1.000
	100	168	0.999
	365	597	0.984
	730	1191	0.932

Notes: This table shows the weighted average number of days that control group offenders spend in the new sentencing environment for a 365-day, 730-day, and 1,825-day post-release recidivism period. The first column shows how the control group is defined, either by a 50-day, 100-day, 365-day, or 730-day window before 1 October 2007. The second column shows the number of offenders for which each observation window pertains. The third column presents the weighted average number of days spent in the new sentencing environment.

To answer this question, it is important that the treatment and control groups have constant sentencing environments in the observed recidivism period. This requires all offenders in the control group to be released into the non-custodial environment, i.e. after 1 October 2007. This is because the choice to recommit a crime (post-release) must only be affected by the sentence the offender initially served, not due to differences in the expectation of future sentences. Thus, to recover the causal effect of non-custodial sentencing on recidivism, reoffending rates of the treatment and control groups should be compared in an environment where non-custodial sentencing is anticipated for all offenders.

To test the possible extent of this issue, I observe the control group for 365 days post-release and take the weighted average of the number of days spent in the non-custodial sentencing environment. I do this for the control group defined by a 50-day, 100-day, 365-day, and 730-day observation window. Results are presented in Table 10.

Table 10 shows for a one-year recidivism period (365-days post release), over 99% of person-days within the one year period was spent in the new sentencing environment for the control group defined by both the 50-day and 100-day windows. This weighted average decreases to 92% for the control group defined by a 365-day window, and further decreases to 66% for the 730-day window. Similar trends are seen the two-year and five-year recidivism periods, where the weighted average number of days spent in the new sentencing environment is larger when observing the control group in narrower windows (50, 100 and, to a lesser extent, 365 days), than for the wider 730-day window.

Furthermore, while Table 10 shows almost all the control group were released into the non-custodial sentencing environment for the smaller observation windows, future research could analyse the extent to which the differences in release environments possibly biased the treatment effect estimation for the control group observed in a wider observation window.

6. Conclusion

Prison overpopulation continues to be an issue for New Zealand, with the 2018 prison population rate reaching 214 per 100,000 population (World Prison Brief, n.d.b). This paper offers evidence concerning the effectiveness of non-custodial alternatives to short-term imprisonment on recidivism, finding that receiving a non-custodial sentencing increases the recidivism rate of first-time offenders sentenced around New Zealand's 1 October 2007 reform by 8.7% points after one year, 9.5% points after two years, and 9.6% points after five years. This would suggest that non-custodial sentencing is not effective at reducing future reoffending amongst first-time offenders relative to the experience of short-term imprisonment. Exploration into the types of offences driving this increase in recidivism reveals that administrative non-compliance plays a key role. Thus, while non-custodial sentences offer significant fiscal savings and potential societal benefits, policymakers must also account for the increased reoffending costs, driven by breaches of sentencing conditions, when evaluating cost–benefit analyses for future sentencing policies.

Notes

1. A large empirical literature supports this theory, showing that increasing the severity of punishment severity reduces crime (Chalfin & McCrary, 2017). For example, Ehrlich (1975) reported significant negative elasticities for the relationship between murder rates and the probability of execution by capital punishment in the United States. Drago, Galbiati, and Vertova (2009) found that as an offender's expected sentence length increases by one month, the propensity to recommit a crime reduces by 1.25% in Italy. Abrams (2012) demonstrated that sentence enhancements for gun-related crime resulted in a 5% reduction in gun robberies in the United States.
2. Williams and Weatherburn (2022) study non-serious and non-violent offenders in Australia. Di Tella and Schargrodsky (2013) focus on serious and violent offenders in Argentina.
3. Marie (2009) also used a regression discontinuity design to evaluate the effect of electronic monitoring on recidivism, exploiting a sentencing rule in England and Wales where offenders whose imprisonment sentence exceeds three months were eligible for early-release to electronic monitoring while those with imprisonment sentences less than three months were not. However, electronic monitoring in this study was a back-end policy, so may not be informative about the effects of using electronic monitoring, or non-custodial sentencing in general, as a direct substitute for imprisonment.
4. In addition to being above the OECD-average, New Zealand's 2006 incarceration rate was higher than countries such as the Netherlands (66 per 100,000), Sweden (79 per 100,000), France (91 per 100,000), Australia (126 per 100,000), and Argentina (152 per 100,000), but lower than countries such as the United States (752 per 100,000) and South Africa (318 per 100,000) (World Prison Brief, n.d.-a).
5. Many other Western countries have adopted similar non-custodial, community-based alternatives to imprisonment other than electronic monitoring or home detention sentencing (Villettaz, Gillieron, & Killias, 2015). For example, across the late 1990s and early 2000s, the United States began a widespread adoption of 'intensive supervision programs' targeting high-risk offenders (Gill, 2018). A 2003 sentencing reform in the United Kingdom combined various community sentences into one 'community order' and restructured the 'suspended sentence order' with the goal of providing robust alternatives to immediate and short-term imprisonment sentences (Irwin-Rogers & Roberts, 2019; Mair & Mills, n.d.). From 2010 onward, states in Australia began to introduce 'intensive correction orders' to reduce imprisonment rates and promote rehabilitation for less serious offenders (NSW Bureau of Crime Statistics and Research, 2017).
6. As set out by Section 10A of the Sentencing Act 2002, the post-2007 hierarchy of New Zealand's sentences and orders from most to least restrictive is as follows: (1) imprisonment,

(2) home detention, (3) community detention and intensive supervision, (4) community work and supervision, (5) a fine and reparation, and (6) a discharge order.

7. Section 15B of the Sentencing Act 2002 provides that home detention can only be imposed on an offender aged 17 or younger if the crime committed was a purely indictable offence, such as murder, manslaughter, or sexual violation.
8. The IDI identifier is not available if an individual has received court-ordered name suppression at the time of their charge. Suppression orders forbid the linking of individuals to the IDI as the court prohibits the publishing of any identification details related to that person. This accounts for approximately 2 percent of all charges (Statistics New Zealand, 2018).
9. The analysis focuses on first-time offenders to isolate the impact of the sentence served during the study period. By reducing potential confounding from prior sentencing history, this restriction promotes a more homogeneous sample for studying the effects of the 2007 reform.
10. It is therefore assumed that offenders who received community work, supervision, monetary, or deferment sentences (ranked five to eight respectively by the Ministry of Justice) would have still received said sentences irrespective of the 2007 sentencing reform. Moreover, these offenders are excluded from the offender sample.
11. Note that the definition of recidivism is distinct from the estimation window. The estimation window relates to the bandwidth around the 1 October 2007 cut-off used to select which first-time offenders are included in the analysis, whereas the recidivism outcome refers to whether an individual reoffends within a specified period (e.g. 365 or 730 days) following their sentencing date.
12. A limitation of this release date proxy is that it does not consider the curtailing of sentence length due to good behaviour or parole release. Roodman (2017) states that early release should be thought of as a reduction in the period of supervision, which in turn fast-tracks the opportunity to re-engage in crime. However, data limitations in the Ministry of Justice court charges data mean an offender's actual release date is unobserved. Moreover, in this study it is assumed that the sentence assigned at the sentencing hearing is served in full by each offender. This assumption is made for every sentence type and all definitions of recidivism. This is another reason why my primary recidivism outcome is measured from an offender's sentencing date, to avoid any biases that might arise from an imputed release date.
13. The first stage is 56% points for a 50-day observation window; 58% points for a 100-day observation window; 68% points for a 365-day observation window; 73% points within a 730-day observation window; and 79% points for a 1,825-day observation window. All of these first-stage estimates are highly significant, with p-values of 0.000.
14. Within-year seasonality could be an issue if a 50-day or 100-day observation window was imposed on the model. However, the FRDD optimisation procedure mitigates this issue since the bandwidth selection is data-driven using all court charges data ranging 1992–2017.
15. This reduced form effect is significant at the 1% level with a p-value of 0.003.
16. Since I do not observe exact release dates, I proxy release as the sentencing date plus the full sentence length, assuming no early release or parole. This may bias post-release and 'free time' recidivism measures if early release is more common for custodial than non-custodial sentences (or vice versa). In such cases, reoffending after actual prison release could be misclassified as occurring during the sentence, and thus excluded from the post-release recidivism definition. This would then downwardly bias recidivism rates for the custodial group, overstating the gap between non-custodial and custodial recidivism rates. Thus, the exact estimates in Table 6 should be interpreted with caution; the key takeaway is that the point estimates remain positive across different recidivism definitions.
17. I discuss the differences in sentencing environments with respect to recidivism measured from the date of release. However, given Table 6 showed that the estimates of the effect of non-custodial sentencing on recidivism do not differ across definitions of recidivism, this extension could equally be applied to recidivism periods measured from the date of sentencing.

Acknowledgements

I would like to thank my supervisors, Peer Skov and Gail Pacheco, for their guidance and encouragement throughout my Masters. I would also like to thank Mikkel Mertz and Lars Andersen for their insightful comments, and the seminar participants at NZAE, the Nordic Econometric Meeting, the Rockwool Foundation Research Unit, and AUT for their feedback.

Data availability statement

This empirical analysis is based on NZ administrative register data from Statistics New Zealand. The data can be access via Statistics NZ's secure virtual environment, in approved facilities (the Data Lab). Statistics New Zealand provides the following guideline on how to get access: https://www.stats.govt.nz/integrated-data/apply-to-use-microdata-for-research/.

Disclosure statement

These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) which is carefully managed by Stats NZ. For more information about the IDI please visit https://www.stats.govt.nz/integrated-data/. The results are based in part on tax data supplied by Inland Revenue to Stats NZ under the Tax Administration Act 1994 for statistical purposes. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

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