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Prison Rehabilitation Programs and Recidivism: Evidence from Variations in Availability

William Arbour[†], Guy Lacroix[‡], Steeve Marchand[§]

Abstract

Increasing evidence suggests that incarceration can improve the social reintegration of inmates in some circumstances. Yet, the mechanisms through which incarceration may favor rehabilitation remain unknown. This paper exploits variations in program availability to estimate their effects. We find that programs decrease reincarceration. However, this is mitigated by an increase in future community sentences, usually associated with milder offenses. Programs addressing violence issues, education and employment exhibit strong effects. Those focusing on addiction and other program types are not found to affect recidivism. These results suggest that specific programs can explain the beneficial effects of incarceration found in the literature.

Keywords: Incarceration, Recidivism, Rehabilitation Programs

JEL code: K42

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Data Availability Statement: This paper uses confidential data from administrative correctional files of the Ministry of Public Security of Quebec. Researchers wishing to access the data must contact the Ministry and submit a proposal at the following address: direction-recherche@msp.gouv.qc.ca

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1. Introduction

Incarceration may impact criminal behavior in several ways. It may prove criminogenic due to greater access to criminal networks and expertise or by lessening an inmate's capacity to reintegrate the labor market due to social stigma or human capital depletion. Yet, recent evidence suggests that lengthy incarceration in prisons that are rehabilitation-oriented may have beneficial effects on recidivism (Landersø 2015; Bhuller et al. 2020; Lotti 2022; Hjalmarsson and Lindquist 2022; Loeffler and Nagin 2022; Mastrobuoni and Terlizzese 2022). It is often conjectured that programs that focus on education, on job skills or that provide psychological assistance might be responsible for such effects. In addition to being potentially beneficial to offenders, such programs could turn out to be cost-efficient from society's perspective if they reduce future costly incarceration.

Unfortunately, empirical evidence on relative program efficiency is fairly scant. In their meta-analysis on rehabilitation programs for adult offenders, Wilson, Gallagher and MacKenzie (2000) and Davis et al. (2013) both conclude that, while evidence suggests that program participation decreases recidivism and increases employment, the research designs they survey are deemed too poor to provide reliable estimates. The major caveat in most studies is the failure to thoroughly consider selection issues associated with voluntary program participation.

This paper addresses these concerns. We exploit the relative time-varying availability of rehabilitation programs in seven male provincial prisons in Quebec (Canada) to isolate their causal effects on recidivism. Each prison offers an array of programs, ranging from educational and vocational training to addiction and substance use treatments. We find that some programs substantially decrease future incarceration, but that this decrease is partly offset by an increase in future community sentences which are nevertheless associated with less serious offenses.

Our study is based on inmates serving sentences of less than two years.¹ This population is particularly relevant for the analysis of rehabilitation programs. Indeed, since prison sentences are relatively short, participants may readily put their newly acquired skills to use. In addition, the offenses for which these individuals are incarcerated are less serious than those of inmates serving lengthier sentences in federal penitentiaries. They are thus perhaps more likely to successfully reintegrate into society. In this respect, Quebec prisons are mandated by law to offer an array of programs to facilitate social rehabilitation. Prisons managers collaborate with government bodies, community organizations and private agencies to develop various programs such as addiction or violence-related interventions, education and job skill courses, or self-development programs.

In our data, the duration of incarceration is negatively correlated with recidivism, suggesting possible beneficial effects of incarceration. The data also show a positive correlation between the duration of incarceration and the number of programs chosen by individual inmates. While these correlations could arise from the causal effect of programs on recidivism, isolating such an effect is challenging due to voluntary participation. Yet, participation is conditional on program availability, which fluctuates exogenously. Indeed, many programs are administered by local school boards and are seldom available during the summer recess and the December break. In addition, fluctuating prison-specific personnel and funding constraints limit the availability and nature of rehabilitation programs. To exploit these features, we construct an instrumental variable that measures program availability. Our instrumental variable design captures variations in the number of programs a prisoner may possibly enroll in at a specific prison and given his sentence length. We show that the instrument is strongly related to participation but not to other individual characteristics, which suggests it is both strong and as good as random.

Our reduced-form results suggest that a one standard deviation increase in the number of available programs decreases the likelihood of reincarceration in a provincial prison by 4 percentage points over a five-year window. However, it also slightly increases the probability of a community sentence by 2 percentage points. Community sentences are used for offenders who have not committed a serious or violent crime, or a crime that does not carry a minimum sentence. As such, our results are consistent with participants committing less serious offenses. We provide further evidence that programs decrease the seriousness of future offenses by showing that greater availability decreases the likelihood of pretrial detention for the next offense, often associated with dangerousness. We also find precise but not statistically significant program effects on reoffenses that lead to federal sentences (i.e. sentences of more than two years associated with most serious offenses). Instrumenting participation with program availability, we find that each additional program take-up decreases the probability of reincarceration by as much as 7 percentage points over five years. Our results are robust to the inclusion of additional control variables, to alternative recidivism definitions, to variations in the instrument and to other specifications.

Our heterogeneity analysis shows that programs that focus on violent behavior, education deficiencies or employment unreadiness all significantly decrease the likelihood of committing a new crime leading to reincarceration. We also find some evidence, though less robust, that self-development programs may decrease incarceration. On the other hand, addiction programs and those related to arts, spirituality and sports yield precise null effects. While our results suggest that individuals serving longer sentences are most impacted by the number of programs made available, inmates who serve shorter sentences experience modest yet significant benefits.

The shift from incarceration to community-based sentences suggests that programs may help alleviate prison overcrowding and high incarceration costs, as community sentences are less

costly. In addition, our results suggest that it may be beneficial to focus resources on programs that exhibit stronger effects. To explore these questions, we conduct a cost-benefit analysis that considers the monetary benefits of reduced incarceration and the costs of providing programs. We find an average benefit-to-cost ratio of three, with programs related to violence issues yielding the highest ratio.

Contributions to the Literature

Our paper mainly contributes to the growing literature that evaluates different types of programs aimed at offenders at varying stages of their criminal trajectory. An important strand of the literature focuses on programs aimed at young offenders. [Heller et al. \(2017\)](#) provide evidence that behavioral interventions may reduce recidivism among this population. They exploit three RCTs located in Chicago that focused on at-risk youths and juvenile delinquents and find that participation in tailored programs significantly reduced rearrests and readmissions. [Seroczynski et al. \(2016\)](#) also study similar programs through a RCT design and find it decreases recidivism significantly whereas [Armstrong \(2003\)](#) find no such effect.

Studies on programs targeted at adult offenders can be separated into two groups: prison-based and external. [Doleac et al. \(2020\)](#) review three randomized controlled trials of external reentry programs and find, at best, mixed evidence of their effectiveness.² [Blattman, Jamison and Sheridan \(2017\)](#) study the effect of behavioral therapy and show that it can reduce violent crimes. Many studies have sought to estimate the effects of prison-based programs, but as mentioned earlier, this literature faces challenges due to selection issues.³ However, recent studies have found encouraging results. [Balafoutas et al. \(2020\)](#) randomly asked inmates to reflect on their incarceration and show that this simple intervention increased the inmates' social aptitudes. Studying the same setting as the current paper, [Arbour \(2022\)](#) focuses on a behavioral

intervention targeted specifically at high-risk offenders and finds large reductions in reoffenses in the short run. [Kuziemko \(2013\)](#) exploits a 1998 policy reform which canceled parole eligibility for convicts in the state of Georgia. She presents evidence that inmates respond by decreasing their rehabilitation effort, including reduced program participation while incarcerated, thereby increasing the likelihood of reoffending. [Macdonald \(2023\)](#) exploits a reform in Arizona which eliminated judges' discretion over early release. He conjectures that the ensuing increase in recidivism is most likely due to reduced rehabilitation efforts while incarcerated. All in all, scarce empirical evidence suggests that inmates may benefit from rehabilitation programs. Our paper contributes to this literature by focusing explicitly on prison-based interventions and by highlighting the types of programs that are most beneficial.

Our paper also contributes to the broad literature investigating the link between incarceration and post-release outcomes. Incarceration may affect post-release outcomes through various channels, which may explain the mixed results found in the literature.⁴ Interestingly, recent papers have shown that incarceration in rehabilitation-friendly prisons can be beneficial ([Landersø, 2015](#); [Bhuller et al., 2020](#)), which could be driven in part driven by the availability of rehabilitation programs in these types of prison. A related literature compares punitive prisons to rehabilitation-oriented ones, with a particular focus on differences in prison conditions, and provides evidence supporting that rehabilitation-oriented prisons can improve outcomes.⁵ Our paper complements this literature by estimating the effect of several prison-based interventions and by providing evidence that they are indeed a driving force underlying the beneficial effects that prisons may have.

The remainder of the paper is structured as follows. Section 2 discusses the setting, the data, and the various definitions of recidivism used in the analysis. In Section 3, we present summary statistics and elaborate on the associations between incarceration time, program participation

and availability, and recidivism. Section 4 presents the main results along with robustness checks and heterogeneity analyses. Section 5 explores the impact of programs on crime severity and conducts a cost-benefit analysis. We conclude in Section 6.

2. Institutional Details and Data

2.1 Institutional Details

In Canada, a person charged with a criminal offense may be released while awaiting trial or, depending on the seriousness of the charge or whether it involves violence, be incarcerated until trial (known as “pretrial” detention). If found guilty, the judge determines the type (custodial vs community) and the duration of the sentence. If the sentence is less than two years, it will be served either in a provincial correctional centre (“prison”) or in the community. Sentences of at least two years lead to incarceration in a federal penitentiary. The prison where offenders serve their sentence is not random. The judge may select a specific one based on the nature of the crime, the criminogenic needs of the offender, and the availability of appropriate services and programs.

The most common type of community sentence by far is probation. In Canada, probation corresponds to the release of a convict into the community under a set of stringent conditions and compulsory regular reporting to a probation officer. Examples of conditions include performing community services, not consuming drugs or alcohol, remaining within the court’s jurisdiction, not communicating with a victim of the offense, or not possessing a weapon. Note that probation differs from parole, which is an early release from an incarceration sentence.⁶ The other form of community sentence is conditional sentencing (also called house arrests), which can be seen as a stricter form of probation. For these sentences, offenders are confined

to their residence and receive stricter surveillance. Our data do not allow to distinguish between probation and conditional sentencing.

Community sentences do not apply to crimes that carry a mandatory minimum sentence. They are typically less costly than incarceration and offer offenders the opportunity to work or attend school.⁷ In contrast, incarceration often results in the loss of employment and other opportunities which may undermine reintegration upon release. Though provincial incarceration is deemed harsher than community sentences, federal sentences are considered yet harsher.

Our analysis focuses on convicts sentenced to less than two years, with an average sentence of four months. In practice, most will serve only two thirds of their original sentence.⁸ We refer to the date corresponding to two thirds of the sentence as the *planned* date of release. Prisoners may be released sooner if granted parole, in which case they may be offered other forms of rehabilitation assistance.⁹

To facilitate their social reintegration, all provincial prisons offer inmates a diversified set of programs, which we discuss below. In addition to delivering programs, rehabilitation-oriented prisons offer healthcare services, counseling and family support. Furthermore, at the onset of their incarceration, inmates' physical and mental conditions are assessed by a qualified professional. Those serving a sentence less than six months will be briefly assessed by a correctional officer. Those serving a longer sentence will be thoroughly assessed and evaluated using the comprehensive standardized risk assessment tool known as the "Level of Service/Case Management Inventory" (LS/CMI, afterward).¹⁰ Contrary to other jurisdictions, the evaluation in Quebec occurs after the trial and is thus not used for sentencing. The evaluation is meant to provide risk scores and to identify rehabilitative needs.

2.2 Program Delivery and Availability

Prisons managers collaborate with government bodies, such as the Ministry of Education and the Ministry of Labor, to offer programs tailored to the local labor market. Community organizations and private agencies can also be called upon to develop specific programs such as addiction interventions and anger management workshops. Participation in such programs is voluntary and may not be mandated by the sentencing judge. However, the judge may request incarceration to the prison deemed best suited to the offender's criminogenic needs. Once incarcerated, and following their initial assessment discussed above, inmates may be encouraged to enroll in specific programs. Ultimately, prisoners decide whether to participate or not and may enroll in as many programs as available. Program duration varies significantly across and within program types. The majority of the programs are structured to incorporate one to two-hour sessions on a weekly or bi-weekly basis, typically spanning five to six weeks. Job skills and education programs are often more intensive, and therefore more costly. For instance, to obtain a permit to work on a construction site, an inmate must undergo a minimum of 30 hours of instruction over the course of a week, while other job programs, like mechanics or carpentry courses, are spread over several weeks. Participants enrolled in high school studies dedicate an average of 20 to 25 hours per week over several weeks to attend classes. Finally, the availability of programs—and their duration—are also prison-specific as they depend on several factors such as financial and staffing resources.

Prison managers have a legal obligation to deliver such programs.¹¹ However, the law does not provide any guidelines as to the number of programs that must be offered nor as to their content and duration. In practice, these are determined at the prison level and can vary over time for various reasons.

To understand the underlying causes of fluctuating rehabilitation program availability in prisons, we conducted ten semi-guided interviews with prison counselors overseeing these programs. We asked the two following questions via email or over the phone: 1) *Based on your experience, what affects the availability of programs on a daily basis?*, and 2) *To your knowledge, are there fewer programs during specific periods of the year?* According to all counselors, the most significant factor affecting program availability was the operational downtime during summer months, a period marked by school board recesses and staff vacations, or other holidays. All counselors agreed that such downtime led to notable reductions in program availability. One counselor reported numerous instances recorded in prisoners' files as "[The prisoner] wanted to participate, but no programs were available", because of such downtime. The variability in prison staff, as well as budgetary limitations, were also mentioned by most counselors as causes of limited availability. Additionally, some counselors mentioned constraints imposed by the physical infrastructure of prisons, with renovations often making suitable facilities unavailable. These insights are apparent in the data: in Section 3, we show that program availability fluctuates within prisons and decreases during the summer and the holiday season.

2.3 Data

The data used in this paper are drawn from the Administrative Correctional Files (DACOR) of the Province of Quebec Ministry of Public Security.¹² DACOR contains detailed information on all daily convicts incarcerated in all provincial prisons. In addition to judicial information, DACOR documents the type of crime as well as individual characteristics such as age, number of dependents, and Indigenous status. At first offense, convicts are assigned a unique identifier which is used to generate a historical record of their interactions with the judicial system.

For each sentence, DACOR records the start and end dates of the sentence, and a code for the most serious charge associated with a given crime.¹³ Pretrial detention is also reported and matched to individual records. Importantly, even though our paper focuses on releases from provincial prisons, all future reoffenses are recorded in the correctional files irrespective of whether they are served in the community, in a provincial prison or in a federal penitentiary.

DACOR also includes all individual LS/CMI assessments for offenders serving for at least six months. The data contain the evaluation of all 43 items of the assessment tool which are aggregated into eight risk scores. The tool documents risk factors related to (1) criminal history,

(2) consumption of alcohol and drugs, (3) educational attainment, (4) lack of adequate leisure, (5) family issues, (6) social relationship issues, (7) anti-social patterns, and (8) pro-criminal attitudes. These risk scores are highly informative proxies for the propensity to recidivate.¹⁴

As mentioned above, rehabilitation programs are prison-specific and managed locally. We obtained detailed *program enrollment* files from seven prisons over different time frames. These were merged to the DACOR files using individual identifiers.¹⁵ The files comprise as many as 145 different programs. These were aggregated into six categories following advice from several program managers: self-development, violence, addiction, education, job skills, and *others*, which comprises leisure, spirituality and sports activities. The stratification was based on the criminogenic risks and needs targeted by each. Thus, we observe the list of all the programs a prisoner enrolled in, but not their duration.

2.4 Measuring Recidivism

The definition of recidivism differs in the literature and across jurisdictions.¹⁶ In this paper, we consider various definitions of recidivism, all based on sentencing for a new crime occurring after the *planned* date of release. These are:

- A new provincial incarceration;
- A new federal incarceration;
- A community sentence;
- Any of the above.

As we show in our robustness analysis, our results are virtually unchanged if the follow-up period starts at the actual rather than the planned release date.¹⁷ Our results are also robust to using the beginning of the sentence as a starting date for computing recidivism. We vary the follow-up period from one to five years, discarding censored observations in each case.

3. Descriptive Statistics

Table 1 reports the average and standard deviation of all explanatory variables for program participants and non-participants separately. The types of crime are aggregated into four categories: assault, burglary and theft, drug-related, and *others*.¹⁸ Reported crimes are those deemed most serious for a given sentence and are thus mutually exclusive. Participants are more likely to be charged for assault or burglary and theft, but less likely for drug-related or *other*. Indigenous convicts represent 6.6% of the sample but as much as 9.4% of all participants. This is perhaps due to the fact some prisons have designed specific programs for this population. Interestingly, participation does not vary much across age groups.

The average number of incarceration days is greater for participants both during pretrial and post-trial detention. The relationship between participation and post-trial incarceration is intuitive: prisoners with longer sentences have more opportunities to enroll (see below). The relationship between pretrial detention and participation is less intuitive given that convicts do not typically enroll during pretrial detention.¹⁹ However, according to [Bourgon and Grech \(2011\)](#), this correlation can be explained by the fact that more serious crimes tend to entail lengthy and complex legal procedures, and as such may postpone the trial date.

The “LS/CMI: Evaluation” variable indicates whether an inmate was evaluated with the LS/CMI assessment tool. Participants are more likely to be evaluated than non-participants (69.5% versus 37.7%). This is not surprising since participants have longer post-trial sentences and given that the evaluation is conducted only if the sentence is greater than six months. The next set of rows report the average of the total LS/CMI score as well as those of its eight components.²⁰ Most LS/CMI scores are smaller among participants. While some differences are statistically significant, they are nevertheless small relative to their standard deviations.

The intensity of participation varies considerably among participants. Figure 1 depicts the distribution of program enrollment per participant. Approximately 44% of them enroll in a single program while around 19% (11%) enroll in two (three) programs. It is not uncommon to observe yet more program enrollment per prison spell. Table 2 reports participation statistics broken down by program category. Column (a) focuses on the unconditional participation rates per program while column (b) reports the conditional distribution of program enrollment. Roughly 19% of convicts participate in one program, the most common being education, self-development and addiction programs. Over the course of their stay in prison, participants enroll in three different programs on average.

Figure 2 plots the rates of recidivism by participation status defined over one to five-year intervals after the planned date of release. The figure distinguishes between reoffenses that lead to a community, a prison (provincial) or a penitentiary (federal) sentence. Overall, program participants have lower rates of recidivism save for federal sentences, which rarely occur in our data (bottom-left panel). Interestingly, the differences between the two groups are stable across intervals with respect to provincial incarceration but taper off with respect to community sentences. The bottom-right panel shows the rates of recidivism that lead to any sentence.²¹

Lengthy sentences will naturally tend to provide greater opportunities to enroll in programs, which could generate a negative relationship between sentence duration and recidivism if programs work. In our data, we indeed observe that longer sentences correlate with higher participation and lower recidivism.²² Several other factors may affect program participation. Financial resources and labor constraints vary across prisons and time so that not all convicts may face the same opportunities. To see this, we computed the number of programs a prisoner could potentially enroll in conditional on the duration of incarceration during his sentence. Figure 3 draws a scatter plot of the number of such programs with respect to duration separately for each prison in our data. As shown, program availability varies significantly across prisons. For example, a prisoner serving a 100-day sentence could in some cases have access to fewer than five different programs. In other cases, as many as 10 to 20 programs could have been offered for a similar sentence duration.

Importantly, the prison in which a prisoner is incarcerated is not random, nor is his sentence duration. Thus, the across-prison variations in program availability and those that arise from variations in sentence duration cannot be used to isolate the effects of programs. Yet, a series of other factors may exogenously affect program availability. One source of such variation is the timing of the incarceration. Indeed, fewer programs are usually available during the summer

recess and the holiday season as shown in Figure 4. Thus, a convict who must serve a sentence which overlaps the months of June-July or November-December will very likely be offered fewer opportunities. In what follows, we construct an instrument that captures such exogenous variations in program availability.

4. Estimation and Results

4.1 Research Design

Program participation is endogenous. To estimate the causal impact of participation on recidivism, we use the availability of programs as an instrumental variable. More precisely, our instrument corresponds to the number of available programs over the entire course of one's incarceration. The instrument is constructed from the *Program Enrollment* files which contain the registration date, the specific program and the personal identifier of all enrollees. Figure 5 illustrates this. Assume a timeline such that we observe three enrollees in program A, three in program B, four in program C, and four in program D. Given the timing and the duration of their incarceration, *Prisoner 1* can only enroll in programs B and C, and *Prisoner 2*, in programs C and D. In this example, the instrumental variable is equal to two for both of them. Following this, we compute our instrument z_{ip} as the number of programs in prison p for which we observed any enrollment, from the beginning of the sentence of individual i to his release date. We test the robustness of our results to this definition in Section 4.4.

We begin with a series of reduced-form regressions to measure the intent-to-treat effects of program availability on recidivism. Consider inmate i who is incarcerated in prison p and sentenced during year t . We use the following specification:

$$y_{ipt} = \beta z_{ip} + \underbrace{\alpha_t + \alpha_p + \gamma_p s_i}_{\text{randomization controls}} + X_i' \eta + \epsilon_{ipt}, \quad (1)$$

where y_{ipt} is a measure of recidivism, z_{ip} is the instrument, and s_i is the duration of incarceration during the sentence. In all specifications, we include prison fixed effects (α_p) and year of sentence fixed effects (α_t). Additionally, we include prison-specific length of stay effects (γ_p). We refer to these controls (α_t , α_p and $\gamma_p s_i$) as the set of *randomization controls*. We include these for the following reasons. First, some prisons tend to offer more programs. However, as mentioned previously, prison allocation is not random and will often be based on the offender's characteristics. This explains our choice to use prison fixed effects and exploit within-prison variations in the instrument. Second, as shown in Figure 3, prisoners serving lengthier sentences are mechanically exposed to more programs at a rate that is prison-specific. As sentence duration is not random, our estimation must not exploit variations in z_{ip} arising from s_i . Conditioning on prison-specific length of stay effects ($\gamma_p s_i$) is thus crucial in ruling out that our instrument captures such variations. Finally, the year of sentence fixed effects α_t ensure that the remaining variations in our instrument arise from timely fluctuations rather than longer-term time trends. By conditioning on this set, the instrument leverages the within-prison vertical (i.e., conditional on sentence duration) variations in program availability that are visible in Figure 3.

All regressions include a vector of individual characteristics, X_i' , that includes up to all the variables listed in Table 1. We cluster the standard errors at the prisoner level since some experience multiple spells—we verify the robustness of our findings when clustering at the prison-year level as well.²³ We also test the robustness of our results to a specification that includes only the first incarceration spell observable for each individual. The distribution of z_{ip}

is standardized to have a standard deviation of one. Therefore, β must be interpreted as the marginal effect of increasing program availability by one standard deviation on recidivism ($\sigma_z = 11$ in our sample).

We next estimate a series of 2SLS regressions. In these specifications, the number of programs in which inmate i participates, n_{itp} , is instrumented using z_{ip} . The first and second-stage regressions are given by:

$$n_{itp} = \nu z_{ip} + \alpha_{1t} + \alpha_{1p} + \gamma_{1p} s_i + X_i' \eta_1 + \epsilon_{ipt} \quad (2)$$

$$y_{itp} = \theta n_{itp} + \alpha_{2t} + \alpha_{2p} + \gamma_{2p} s_i + X_i' \eta_2 + v_{ipt}. \quad (3)$$

4.2 Validity of the Instrument

Table 3 reports estimation results of the first-stage regression—equation (2). Column (1) only includes the *randomization controls*. Column (2) adds the additional control variables, X_i . Column (3) is the same as column (2) except that it focuses on individuals that are observed up to five years upon release. In all three specifications, we find that the instrument is strongly correlated with program enrollment, as demonstrated by the high and significant F-statistics.

Table 4 next investigates the link between individual characteristics and program enrollment (n_{itp}), on the one hand, and individual characteristics and program availability (z_{ip}) on the other hand. As reported, some explanatory variables have an impact on the number of programs enrolled in during a prison spell. Drug-related crimes and assault are found to have a positive impact while Indigenous convicts enroll in fewer programs than the non-Indigenous. In addition, inmates spending more time in pretrial detention tend to participate in more programs. However, column (2) shows that program availability (the instrument) is unrelated to individual characteristics save for drug-related crimes and to Indigenous status. Nevertheless,

the resulting F-statistic is as little as to 1.59 and not statistically significant, which indicates that the variations in program availability that we exploit for identification are unrelated to individual characteristics. Column (3) uses all control variables to predict the number of programs an inmate enrolls in.²⁴ The predicted values are not correlated to the instrument, suggesting that the characteristics are balanced across participation status.

We further test the validity of the instrument by focusing on individuals who are incarcerated more than once during the time period covered by the data. We investigate the relationship between the instrument in a given sentence and its value in the previous sentence. If the two are correlated, this would imply that the availability of programs depends on unobservable time invariant individual characteristics. Columns (4) and (5) use only observations for which we observe a past incarceration for the individual. Column (4) shows that program availability is unrelated to past program availability after conditioning on our randomization controls. Column (5) adds the other controls and finds similar results, providing additional support for our instrument's validity.

As a final balance test, we apply the procedure proposed in [Pei, Pischke and Schwandt \(2019\)](#). This involves separately regressing each characteristic against the instrument. The findings are detailed in Table B.1 of the appendix. Two out of eleven characteristics statistically correlate with the instrument. Yet, when adjusting the p-values for multiple hypothesis testing for different outcomes ([Romano and Wolf 2005](#); [Clarke, Romano and Wolf 2020](#)), none of the coefficients remain statistically significant.

4.3 Main Results

We investigate the link between program take-up and four different types of recidivism: i) incarceration in a provincial facility, ii) community sentences, iii) federal sentences, and iv) all sentences. Moreover, we examine the occurrence of recidivism within different time frames, ranging from one year to five years after planned release. In the robustness analysis below, we further consider alternative start dates for measuring recidivism, including the onset of the sentence and the date of actual release.

Table 5 presents the results. Panel A focuses on reincarceration in provincial prisons. The OLS estimates show a negative association between recidivism and the number of programs taken up during a spell, with each program being associated with a decrease in reincarceration of 0.7 percentage points within three years. The results are also suggestive of a negative causal relationship: the reduced-form estimates indicate that a one standard deviation increase in program availability reduces the likelihood of reincarceration by about 4 percentage points within the first three years, which translates into a decrease of 12% relative to the mean. The 2SLS estimates show a statistically significant negative effect but of greater magnitude than the OLS estimates. Specifically, for each additional program participation, the probability of recidivism decreases by about 6 percentage points on average, a decrease of 19% per program.

The previous beneficial effects of program participation do not carry over to reoffenses that lead to community sentences. According to Panel B, while the OLS estimates are all negative, the reduced-form and 2SLS estimators yield opposite results. Thus, a one standard deviation increase in program availability is found to increase the likelihood of future community sentences by 1–3 percentage points, or about 8% relative to the mean. The 2SLS yields estimates of similar magnitude. It might be conjectured that the rehabilitative programs induce

participants to commit less serious offenses once released from prison—we test this channel more formally in Section 5.

Recall from Figure 2 that federal reincarcerations are very few and that they are usually associated with serious offenses. Panel C focuses on these. Although all point estimates suggest that program availability and that participation decrease the likelihood of reoffending, all are close to zero and not statistically significant. The reduced-form estimator yields precise null effects. For example, a 95% confidence interval of the marginal effect of one standard deviation increase in program availability over a three-year period ranges from -0.8 to 0.3 percentage points. Finally, we consider all sentences in Panel D. Note that, as mentioned previously, the rates for “All sentences” do not correspond to the sum of the three others, because one can recidivate multiple times within a given time period (see footnote 21). Program availability and participation are found to have no effect on overall recidivism.²⁵

Taken together, the estimates of Table 5 unearth interesting program effects. Globally, reintegration programs are found to impact reoffenses very little. Yet, they do impact prison reincarceration negatively and community sentences positively. This is likely beneficial from society’s perspective because community sentences are much less costly and are typically given for less serious offenses compared to those that resulted in the initial imprisonment. It is also worth noting that the positive impact of reintegration programs on reducing prison reincarceration can lead to significant reductions in prison overcrowding.

4.4 Robustness

The Appendix reports a series of robustness tests. These include omitting the control variables from the regression (Table B.3) or alternatively including the eight additional LS/CMI risk

scores and focussing on the subset of evaluated offenders (Table B.4). We also compute prison-year clustered standard errors (Table B.5) and limit the sample to the first occurrence of each individual (Table B.6). The results are robust to all these alternative specifications.

Our instrument exploits prison-specific time variations in program availability. Although we control for year fixed effects, there remains the possibility that inmates who are incarcerated at different times during the same year might differ in their unobserved characteristics. To control for such potential seasonal effects, we also included month fixed effects corresponding to the first month of incarceration (Table B.7). Further, our original instrument measures the number of available programs during the entire incarceration spell. One might be concerned about the release date being endogenous. We thus construct an alternative instrument that counts the number of available programs up to the planned release date (Table B.8). Once again, the estimates are robust to these specifications.

In our primary regressions, recidivism outcomes were measured starting at two thirds of the individual sentences, i.e., the planned date of release. We investigate the consequences of measuring recidivism starting at the beginning of the sentence or at the actual release date in Tables B.9 and B.10. The results remain unchanged regardless of the start time we use.

Finally, Table B.11 replicates our main regression results, focusing only on observations for which we observe a previous incarceration for the individual and adding the value of the instrument associated with the previous incarceration as a control variable. The results remain largely unchanged, suggesting that our main conclusions hold for the subsample of offenders who are incarcerated more than once, and that past program availability is unrelated to the outcomes.

4.5 Heterogeneity

Our baseline estimates use the number of available programs of any type as an instrumental variable. To estimate the effects of each specific program category (self-development, education, violence, job skills, addiction, and *other*), we construct an instrument for each. We then estimate the reduced-form model—equation (1)—separately for each category using the appropriate normalized z_{ip} . We control for prisoner characteristics and fixed effects in the same manner as in our main specification.

For the sake of brevity, we focus on recidivism leading to a provincial incarceration, as our main results showed the strongest and most statistically significant effects of programs for this outcome.²⁶ Figure 6 displays the estimated effects of the different program types on the probability of being reincarcerated. As shown, most programs decrease reincarceration irrespective of the time frame. Furthermore, programs that address violence issues yield marginally larger effects compared to other program types. On the other hand, programs which focus on addiction and those in the *other* category have precise null effects on recidivism. As a robustness test, we estimate the effects of program availability for each program type in a single joint regression, rather than in separate regressions.²⁷ The results, displayed in Figure A.3 of the appendix, depict a similar picture, save for self-development programs, for which the effects are not significant. Overall, our robust findings are that programs that address violence issues, education programs, and, to a lesser extent, job skill programs, seem to decrease recidivism.

The program effects potentially differ across inmates. Knowing who benefits most is essential for optimal resource allocation. For instance, programs may affect those serving short and long sentences differently. This information can then be used to tailor programs to individual needs and to maximize their impact.

We implement our baseline approach by estimating reduced-form regressions based on the total number of available programs and divide the sample into three equal-sized groups according to sentence length. In order to account for the fact that those with longer sentences have more opportunities to train, we standardize the instrument according to the number of months spent in prison.²⁸ The instrument thus measures the marginal effect of increasing the number of available programs *per month* on reincarceration. Figure 7 depicts the parameter estimates. Program availability benefits all inmates irrespective of sentence length, though those serving longer sentences benefit most. Specifically, increasing monthly program availability by one reduces the likelihood of reincarceration by 0.25 percentage point for those serving short sentences (7-33 days) and by as much as 1 percentage point for those serving long sentences (112 days +).

Figure A.4 in the Appendix reports reduced-form estimates of the baseline specification stratified according to several characteristics. Interestingly, there does not appear to be any particular heterogeneous response to program availability among the groups we consider: the dynamic pattern is the same for each age group (below or above the median age of 35), each crime category and each LS/CMI risk group (below or above the median risk score of 27).

Finally, we combine the heterogeneity assessments by characteristic and program type, conducting a reduced-form regression for each intersecting category. The outcome is reincarceration within a three-year span. This analysis, shown on Figure A.5 of the appendix, largely corroborates our previous findings: most program types exhibit a significant impact, except for addiction programs and those in the *other* category. While these regressions are based on smaller sample sizes, it is interesting to observe that education programs seem less effective for low-risk inmates but highly beneficial for offenders convicted of assault. Nevertheless, the results for each program type are largely consistent across characteristics, and all point

estimates for programs focusing on self-development, education, violence, and job skills indicate a negative impact on reincarceration rates.

5. Additional Analyses

In this section, we provide further evidence that the shift of future sentences from incarceration to community arises from programs reducing crime severity. We also evaluate the potential monetary benefits from this shift.

5.1 Effects on Pretrial Detention and Crime Severity

Our results suggest that programs may reduce crime severity and shift future sentences from incarceration to community correction. However, an alternative explanation could be that judges consider past program participation when determining sentence type, causing a higher propensity to grant a community sentence if the offender participated in the past.²⁹ Therefore, more evidence is needed to conclude that programs affect crime severity.

Measuring the severity of a crime in our context is challenging, as no severity measure exists for the categorization of crimes we observe. An intuitive proxy for severity could be the sentence duration. However, community sentences are typically lengthier even though considered less severe. Therefore, such a proxy would be ill-suited to compare crime severity between community and incarceration sentences. In our context, a relevant indicator of crime severity is the occurrence of pretrial detention. Pretrial detention often signals an individual considered too dangerous to be released before trial.³⁰ Importantly, as the decision to resort to pretrial detention happens before the trial, the effect of programs on this outcome cannot capture the sentencing judge's consideration of past participation.

To estimate the effect of program availability on the likelihood of pretrial detention, we regress a dummy variable for pretrial detention on our instruments, controlling for our randomization controls and individual characteristics. As shown on Figure A.6 in the appendix, we find that, with the exception of addiction and *other* programs types, the availability of most types of programs significantly reduces the probability of future pretrial detention. This pattern holds true across the entire sample, as well as if we focus on individuals who recidivate within one or five years. These results suggest that program successfully diminish the probability of offenders being deemed too dangerous to be released before a trial for future offenses.

5.2 Cost-Benefit Analysis

The net benefits of the shift from incarceration to community sentences are ambiguous. Indeed, community sentences, while less costly on a daily basis, are usually lengthier. Furthermore, as discussed in Section 2.2, there is substantial heterogeneity in duration across program types. We thus conduct a simple, conservative, cost-benefit analysis of programs' effects on sentencing costs taking into account these differences. The conservative assumption is that the programs' benefits *only* arise from diverting individuals from prison to community sentences.³¹ More precisely, we use our reduced form estimates of program availability on recidivism leading to a provincial incarceration within five years and assume this effect represents a shift from incarceration to community sentences. We compute program costs based on the salaries of professional counselors and on the typical heterogeneous duration of the programs. We use the average number of individuals in each program type to convert these total costs into cost per participant. The details and complete results are provided in Appendix C.

Our findings reveal that, on average, programs deliver benefits that surpass their costs by a factor of three. The results are consistent across various characteristics, resonating with the

heterogeneity results: offenders with shorter sentences have a benefit-to-cost ratio ranging between 6 and 7, while those with longer sentences have a ratio of 1.51. Evaluating different program types, we note that programs targeting violence-related issues yield the highest benefits. Programs in the addiction and *other* categories exhibit negative ratios, though these are not precisely estimated. Though these results could seem high, they are not inconsistent with previous estimations in other contexts.³²

6. Conclusion

Recent evidence suggests that lengthy incarceration may favor rehabilitation (Landersø 2015; Bhuller et al. 2020; Hjalmarsson and Lindquist 2022) and that prison conditions play an important role (Lotti 2022; Mastrobuoni and Terlizzese 2022; Tobón 2020). Many have argued that rehabilitation programs may drive these effects. Our paper supports their claim. Using rich data from provincial prisons in Quebec, Canada, we investigate different forms of recidivism (community sentence, provincial prison, federal penitentiary) each defined over several time windows ranging from one to five years. We address selection issues using an instrumental variable defined as prison-wide program availability while incarcerated. We find that the availability of rehabilitation programs addressing violent behavior, or education and employment deficiencies can substantially decrease reincarceration. These findings are robust to several tests. Interestingly, we find no evidence of heterogeneous response to program availability by age group, type of crime, or (LS/CMI) risk profile.

Our results unearth an interesting feature of recidivism that is seldom investigated in the literature. While rehabilitation programs reduce the risk of reincarceration, they also increase the likelihood of future community sentences. We conjecture that rehabilitative programs may

induce participants to commit less serious offenses once released from prison. This idea is supported by the significant decrease in the probability pretrial detention when programs are more widely available. On the whole, prison-based programs are likely socially beneficial since community sentences are much less costly, are resorted to for less serious offenses and can help alleviate the burden on the criminal justice system. We estimate that providing more opportunities to participate in programming would result in significant net benefits, even if considering only the monetary benefits of reduced incarceration. For instance, increasing the number of programs by two during summer—such that program availability would match that of other seasons— would yield net benefits of \$237 per participant. Furthermore, our heterogeneity cost-benefit analysis suggests that making these two additional programs focus on violence and job skills would yield maximal net benefits.

In this paper, the efficiency of rehabilitation programs is strictly gauged against future reoffenses. Investigating their long-term impacts on employment, housing, welfare dependency or health is a worthwhile research avenue. Inducing convicts to serve community service rather than incarceration sentences may yield additional benefits by helping them maintain connections with their families, support networks and employers.

References

- Act Respecting the Québec Correctional System. 2023. “Chapter S-40.1—General Principles.” <https://www.legisquebec.gouv.qc.ca/en/document/cs/S-40.1?&target=>. (Accessed on Jan 10, 2024)
- Aizer, Anna and Joseph J. Doyle Jr. 2015. “Juvenile incarceration, human capital, and future crime: Evidence from randomly assigned judges.” *The Quarterly Journal of Economics* 130(2), 759–803.
- Andrews, Donald A., James Bonta, and J. Stephen Wormith. 2004. “Level of service/case management inventory: LS/CMI.” Multi-Health Systems Toronto, Canada.
- Arbour, William. 2022. “Can recidivism be prevented from behind bars? Evidence from a behavioral program.” Unpublished.
- Arbour, William, Guy Lacroix, and Steeve Marchand. 2021. “Prison rehabilitation programs: Efficiency and targeting.” Unpublished.
- Arbour, William and Steeve Marchand 2023. “Can parole reduce both time served and crime?” Unpublished.
- Armstrong, Todd A. 2003. “The effect of moral reconnection therapy on the recidivism of youthful offenders: A randomized experiment.” *Criminal Justice and Behavior* 30(6), 668–687.
- Balafoutas, Louka, Aurora García-Gallego, Nikolaos Georgantzis, Tarek Jaber-Lopez, and Evangelos Mitrokostas. 2020. “Rehabilitation and social behavior: Experiments in prison.” *Games and Economic Behavior* 119, 148–171.
- Bank of Canada, 2023. “Inflation calculator.” <https://www.bankofcanada.ca/rates/related/inflation-calculator/> (Accessed on Jan 10, 2024)
- Barbarino, Alessandro and Giovanni Mastrobuoni. 2014. “The incapacitation effect of incarceration: Evidence from several Italian collective pardons.” *American Economic Journal: Economic Policy* 6(1), 1–37.
- Bayer, Patrick., Randi Hjalmarsson, and David Pozen. 2009. “Building criminal capital behind bars: Peer effects in juvenile corrections.” *The Quarterly Journal of Economics* 124(1), 105–147.
- Bhuller, Manudeep, Gordon B. Dahl, Katrine V. Løken, and Magne Mogstad. 2020. “Incarceration, recidivism, and employment.” *Journal of Political Economy* 128(4), 1269–1324.
- Blattman, Christopher, Julian C. Jamison, and Margaret Sheridan. 2017. “Reducing crime and violence: Experimental evidence from cognitive behavioral therapy in Liberia.” *American Economic Review* 107(4), 1165–1206.
- Bourgon, Kelly E. Morton and Diana Grech. 2011. “Credit for Pre-Sentencing Custody: Data from Five Canadian Courts.” Department of Justice Canada. https://publications.gc.ca/collections/collection_2018/jus/J4-76-2011-eng.pdf (Accessed on Jan 10, 2024)
- Buonanno, Paolo and Steven Raphael. 2013. “Incarceration and incapacitation: Evidence from the 2006 Italian collective pardon.” *American Economic Review* 103(6), 2437–65.
- Chen, M. Keith and Jesse M. Shapiro. 2007. “Do harsher prison conditions reduce recidivism? A discontinuity-based approach.” *American Law and Economics Review* 9(1), 1–29.
- Clarke, Damian, Joseph P. Romano, and Michael Wolf. 2020. “The Romano–Wolf multiple-hypothesis correction in Stata.” *The Stata Journal* 20(4), 812–843.
- Cook, Philip J., Songman Kang, Anthony A. Braga, Jens Ludwig, and Mallory E. O’Brien. 2015. “An experimental evaluation of a comprehensive employment-oriented prisoner re-entry program.” *Journal of Quantitative Criminology* 31(3), 355–382.

- Davis, Lois M., Robert Bozick, Jennifer L. Steele, Jessica Saunders, and Jeremy N. Miles. 2013. "Evaluating the effectiveness of correctional education: A meta-analysis of programs that provide education to incarcerated adults." Rand Corporation. Research Report RR-266-BJA,
- Doleac, Jennifer L. 2023. "Encouraging desistance from crime." *Journal of Economic Literature* 61(2), 383–427.
- Doleac, Jennifer L., Chelsea Temple, David Pritchard, and Adam Roberts. 2020. "Which prisoner reentry programs work? Replicating and extending analyses of three RCTs." *International Review of Law and Economics* 62, 105902.
- Drago, Francesco, Roberto Galbiati, and Pietro Vertova. 2011. "Prison conditions and recidivism." *American Law and Economics Review* 13(1), 103–130.
- Government of Canada (2023). "Job bank." <https://www.jobbank.gc.ca/home> (Accessed on Jan 10, 2024)
- Green, Donald P. and Daniel Winik. 2010. "Using random judge assignments to estimate the effects of incarceration and probation on recidivism among drug offenders." *Criminology* 48(2), 357–387.
- Heller, Sara B., Anuj K. Shah, Jonathan Guryan, Jens Ludwig, Sendhil Mullainathan, and Harold A. Pollack. 2017. "Thinking, fast and slow? Some field experiments to reduce crime and dropout in Chicago." *The Quarterly Journal of Economics* 132(1), 1–54.
- Hjalmarsson, Randi and Matthew J. Lindquist 2022. "The health effects of prison." *American Economic Journal: Applied Economics* 14(4), 234–70.
- Kling, Jeffrey R. 2006. "Incarceration length, employment, and earnings." *American Economic Review* 96(3), 863–876.
- Kuziemko, Ilyana. 2013. "How should inmates be released from prison? An assessment of parole versus fixed-sentence regimes." *The Quarterly Journal of Economics* 128(1), 371–424.
- Landersø, Rasmus. 2015. "Does incarceration length affect labor market outcomes?" *The Journal of Law and Economics* 58(1), 205–234.
- Lochner, Lance 2004. "Education, work, and crime: A human capital approach." *International Economic Review* 45(3), 811–843.
- Loeffler, Charles E. and Daniel S. Nagin. 2022. "The impact of incarceration on recidivism." *Annual Review of Criminology* 5, 133–152.
- Lotti, Giulia. 2022. "Tough on young offenders: Harmful or helpful?" *Journal of Human Resources* 57(4), 1276–1310.
- Macdonald, David C. 2023. "Truth in sentencing, incentives and recidivism." Unpublished.
- Mastrobuoni, Giovanni and David Rivers. 2016. "Criminal discount factors and deterrence." Unpublished.
- Mastrobuoni, Giovanni. and Daniele Terlizzese. 2022. "Leave the door open? Prison conditions and recidivism." *American Economic Journal: Applied Economics* 14(4), 200–233.
- Mueller-Smith, Michael. 2015. "The criminal and labor market impacts of incarceration." Unpublished.
- Norris, Samuel, Matthew Pecenco, and Jeffrey Weaver. 2021. "The effects of parental and sibling incarceration: Evidence from Ohio." *American Economic Review* 111(9), 2926–2963.
- Owens, Emily G. 2009. "More time, less crime? Estimating the incapacitative effect of sentence enhancements." *The Journal of Law and Economics* 52(3), 551–579.

- Parliamentary Budget Officer, 2018. "Update on costs of incarceration." https://publications.gc.ca/collections/collection_2018/dpb-pbo/YN5-152-2018-eng.pdf (Accessed on Jan 10, 2024)
- Pei, Zhuan, Jörn-Steffen Pischke, and H. Schwandt. 2019. "Poorly measured confounders are more useful on the left than on the right." *Journal of Business & Economic Statistics* 37(2), 205–216.
- Romano, Joseph P. and Michael Wolf. 2005. "Exact and approximate stepdown methods for multiple hypothesis testing." *Journal of the American Statistical Association* 100(469), 94–108.
- Rose, Evan K. and Yotam Shem-Tov. 2021. "How does incarceration affect reoffending? Estimating the dose-response function." *Journal of Political Economy* 129(12), 3302–3356.
- Seroczynski, AD, William N. Evans, Amy D. Jobst, Luke Horvath, and Guiliana Carozza. 2016. "Reading for life and adolescent re-arrest: Evaluating a unique juvenile diversion program." *Journal of Policy Analysis and Management* 35(3), 662–682.
- Statistics Canada 2022. "Operating expenditures for adult correctional services." <https://doi.org/10.25318/3510001301-eng>. (Accessed on Jan 10, 2024)
- Stevenson, Megan. 2017. "Breaking bad: Mechanisms of social influence and the path to criminality in juvenile jails." *Review of Economics and Statistics* 99(5), 824–838.
- Tobón, Santiago. 2020. "Do better prisons reduce recidivism? Evidence from a prison construction program." *Review of Economics and Statistics*, 1–47.
- van Ginneken, Esther FJC. and Hanneke. Palmen. 2022. "Is there a relationship between prison conditions and recidivism?" *Justice Quarterly*, 1–23.
- Visher, Christy A., Laura Winterfield, and Mark B. Coggeshall. 2005. "Ex-offender employment programs and recidivism: A meta-analysis." *Journal of Experimental Criminology* 1(3), 295–316.
- Vose, Brenda, Francis T. Cullen, and Paula Smith. 2008. "The empirical status of the level of service inventory." *Federal Probation* 72, 22.
- Wilson, David B., Catherine A. Gallagher, and Doris L. MacKenzie. 2000. "A meta-analysis of corrections-based education, vocation, and work programs for adult offenders." *Journal of Research in Crime and Delinquency* 37(4), 347-368.
- Yu, Rongqin, Niklas Långström, Mats Forsman, Arvid Sjölander, Seena Fazel, and Yasmina Molero. 2022. "Associations between prisons and recidivism: A nationwide longitudinal study." *PLoS one* 17(5), e0267941.
- Zarkin, Gary A., Alexander J. Cowell, Katherine A. Hicks, Michael J. Mills, Steven Belenko, Laura J. Dunlap, Kimberly A. Houser, and Vince Keyes. 2012. "Benefits and costs of substance abuse treatment programs for state prison inmates: Results from a lifetime simulation model." *Health economics* 21(6), 633–652.

Table 1: Summary Statistics for Programs Participants and Non-Participants

	Non-Participants			Participants			Diff. <i>p</i> -value (g)
	Mean	SD	Obs.	Mean	SD	Obs.	
	(a)	(b)	(c)	(d)	(e)	(f)	
Crime: Other	0.377		23514	0.225		5393	0.000
Crime: Assault	0.180		23514	0.201		5393	0.000
Crime: Burglary and theft	0.216		23514	0.293		5393	0.000
Crime: Drugs	0.227		23514	0.281		5393	0.000
Indigenous	0.060		23514	0.094		5393	0.000
Age	0.247		23514	0.252		5393	0.470
Age	0.228		23514	0.238		5393	0.120
Age	0.268		23514	0.282		5393	0.039
Age	0.257		23514	0.228		5393	0.000
At least one dependent	0.022		23514	0.028		5393	0.006
Pretrial detention (days)	28.435	70.389	23514	60.114	106.804	5393	0.000
Posttrial detention (days)	79.928	88.660	23514	191.862	115.271	5393	0.000
LS/CMI evaluation	0.377		23514	0.695		5393	0.000
LS/CMI: Total Score (0 to 43)	26.071	8.088	8869	25.604	7.645	3748	0.003
LS/CMI: Crim. History (0 to 8)	5.951	1.844	8869	5.998	1.765	3748	0.185
LS/CMI: Educ./Empl. (0 to 9)	5.633	2.673	8869	5.598	2.576	3748	0.491
LS/CMI: Family/Marital (0 to 4)	2.031	1.148	8869	1.946	1.134	3748	0.000
LS/CMI: Procrim. Attitude (0 to 4)	1.804	1.328	8869	1.709	1.277	3748	0.000
LS/CMI: Companions (0 to 4)	2.719	1.023	8869	2.719	0.972	3748	0.970
LS/CMI: Leisure/Recreation (0 to 2)	1.619	0.608	8869	1.590	0.618	3748	0.015
LS/CMI: Alcohol/Drug (0 to 8)	4.257	2.238	8869	4.136	2.303	3748	0.006
LS/CMI: Antisocial Pattern (0 to 4)	2.056	1.190	8869	1.908	1.154	3748	0.000
Number of observations			23 514			5 393	
Share of sample			0.81			0.19	

Notes: Variables that do not report a standard deviation are binary variables. Column (g) reports *p*-values for tests of differences in means or proportions between columns (a) and (d).

Table 2: Participation Statistics by Program Category

Participation	Participation rate (a)	Number of programs /participant (b)	Examples of programs (c)
Self-Development	0.064	0.946	Stress/anger management, problem solving, accountability
Violence	0.031	0.185	Violence/aggressiveness management, domestic violence
Addiction	0.060	0.363	Substance abuse, drugs/alcohol addiction
Education	0.075	0.812	Literacy, languages, mathematics
Job skills	0.031	0.226	Resume building, laundry, construction work
Other	0.045	0.468	Leisure, arts, spirituality

Notes: Column (a) shows the proportion of individuals in the sample who participate in at least one program in the corresponding category. Column (b) shows the average number of programs of the corresponding category in which a prisoner is enrolled during his sentence—computed only for those who participate in at least one program of any category.

Table 3: First Stage Regression: Number of programs

	(1)	(2)	(3)
Z_{ip}	0.615*** (0.050)	0.614*** (0.049)	0.589*** (0.046)
F-stat	153.81***	157.24***	166.21***
Average of dep. var.	0.560	0.560	0.560
Randomization controls	√	√	√
Full controls		√	√
5-year sample			√
Observations	28907	28907	28239

Notes: * $p < 0.10$, ** $p < 0.05$ *** $p < 0.01$. Standard errors in parentheses are clustered at the prisoner level. Column (1) includes the set of randomization controls (prison- and year fixed effects, and prison fixed effects sentence duration). Column (2) adds the full set of control variables (type of crime, Indigenous status, age (categorical), indicator for dependents, and number of pretrial detention days). Column (3) restricts to the sample to individuals observed for a minimum of five years upon release. is the number of programs available to an inmate during his incarceration, normalized by its standard deviation. Num. of prog. is the number of programs taken up by the individual over the course of his sentence. The F statistic measures the strength of the excluded instrument (Z_{ip}).

Table 4: Balance Tests

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	Num. of prog.	Z_{ip}	Z_{ip}	Z_{ip}	Z_{ip}
Crime: Assault	0.048*	-0.004			0.007
	(0.027)	(0.006)			(0.011)
Crime: Burglary & Theft	0.019	0.004			0.008
	(0.026)	(0.006)			(0.011)
Crime: Drugs	0.126***	0.015**			0.018
	(0.025)	(0.006)			(0.012)
Indigenous	-0.625***	0.026**			0.020
	(0.068)	(0.012)			(0.022)
Age: [27-34]	0.037	0.001			0.006
	(0.027)	(0.006)			(0.012)
Age: [35-45]	0.030	-0.003			0.006
	(0.026)	(0.006)			(0.011)
Age: [46-]	0.018	-0.004			-0.005
	(0.028)	(0.006)			(0.011)
Pre-trial det. (months)	0.012**	0.000			0.004
	(0.006)	(0.001)			(0.003)
Dependent	0.039	0.003			-0.011
	(0.048)	(0.012)			(0.021)
Predicted num. of programs			-0.021		
			(0.017)		
Z_{ip}^{lag}				-0.007	-0.009
				(0.011)	(0.011)
F-stat	12.55***	1.59	1.54	0.45	0.76
Average of dep. var.	0.561	0.765	0.765	0.758	0.758
Randomization controls	999	999	999	999	999
Observations	28907	28907	28907	8759	8759

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The standard errors in parentheses are clustered at the prisoner level. Column (1) shows a regression of the number of programs take-up during the sentence on the full set of controls. Column (2) shows a regression of the instrument on the full set of controls. Column (3) shows a regression of the instrument on the predicted number of program participation, calculated using the full set of controls. Columns (4) and (5) are regression of the instrument on the value of the instrument in the previous incarceration, without and with the full set of controls respectively, and are estimated only on individuals for which we observe a previous incarceration. All regressions include the set of randomization controls (prison- and year fixed effects, and the prison fixed effects sentence duration). Z_{ip} is the number of programs available to an inmate during his incarceration, normalized by its standard deviation. Z_{ip}^{lag} is the number of programs available to an inmate during his previous incarceration. Num. of prog. is the number of programs taken-up by an individual during his incarceration. The F statistic measures the joint significance of the controls shown in the table (excluding the randomization controls).

Table 5: Effect of the number of programs on recidivism

<i>Recidivism within...</i>	1 Year	2 Years	3 Years	4 Years	5 Years
Panel A—Recidivism: Provincial incarceration					
<i>OLS</i>					
Num. of prog.	-0.005*** (0.001)	-0.006*** (0.001)	-0.007*** (0.001)	-0.008*** (0.001)	-0.008*** (0.002)
<i>Reduced-Form</i>					
z_{iv}	-0.023*** (0.005)	-0.037*** (0.006)	-0.040*** (0.006)	-0.039*** (0.006)	-0.043*** (0.007)
<i>2SLS</i>					
Num. of prog.	-0.038*** (0.009)	-0.060*** (0.011)	-0.064*** (0.011)	-0.064*** (0.011)	-0.072*** (0.013)
Average of dep. var.	0.217	0.300	0.338	0.357	0.373
Panel B—Recidivism: Community sentences					
<i>OLS</i>					
Num. of prog.	-0.003** (0.001)	-0.004*** (0.002)	-0.007*** (0.002)	-0.007*** (0.002)	-0.008*** (0.002)
<i>Reduced-Form</i>					
z_{iv}	0.014** (0.006)	0.030*** (0.007)	0.028*** (0.007)	0.019** (0.007)	0.017* (0.008)
<i>2SLS</i>					
Num. of prog.	0.023** (0.010)	0.048*** (0.012)	0.045*** (0.013)	0.031** (0.012)	0.028* (0.015)
Average of dep. var.	0.157	0.265	0.345	0.406	0.450
Panel C—Recidivism: Federal sentences					
<i>OLS</i>					
Num. of prog.	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)
<i>Reduced-Form</i>					
z_{iv}	-0.002 (0.002)	-0.002 (0.003)	-0.003 (0.003)	-0.002 (0.003)	-0.004 (0.004)
<i>2SLS</i>					
Num. of prog.	-0.003 (0.004)	-0.004 (0.004)	-0.004 (0.005)	-0.003 (0.005)	-0.006 (0.006)
Average of dep. var.	0.014	0.023	0.029	0.032	0.034
Panel D—Recidivism: All sentences					
<i>OLS</i>					
Num. of prog.	-0.007*** (0.002)	-0.010*** (0.002)	-0.010*** (0.002)	-0.009*** (0.002)	-0.009*** (0.002)
<i>Reduced-Form</i>					
z_{iv}	-0.006 (0.007)	-0.005 (0.007)	-0.000 (0.007)	-0.003 (0.007)	-0.004 (0.008)
<i>2SLS</i>					
Num. of prog.	-0.009 (0.011)	-0.008 (0.012)	-0.000 (0.012)	-0.005 (0.012)	-0.006 (0.014)
Average of dep. var.	0.338	0.475	0.548	0.591	0.622
Observations	28907	28907	28907	28895	28239

Notes: * $p < 0.10$, * $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered at the prisoner level. All regressions include the set of randomization controls (prison- and year fixed effects, and the prison fixed effects sentence duration) and the full controls (type of crime, Indigenous status, age (categorical), indicator for dependents, and number of days of pretrial detention). Each panel uses a different recidivism outcome as the dependent variable. The columns indicate the time window over which recidivism is measured, starting at the planned date of release. ZIP is the number of program available during one's sentence, normalized by its standard deviation. Num. of prog. is the number of programs taken up during one's incarceration.

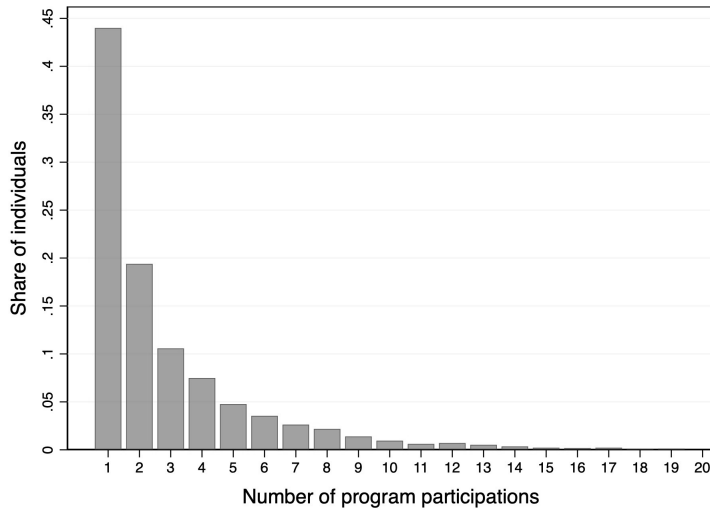


Figure 1: Frequency of program enrollment—participants only

Notes: Around 44% of participants participated in only one program. The figure is limited to 20 program participation to preserve scaling. Less than 0.05% of participants participated in more than 20 programs.

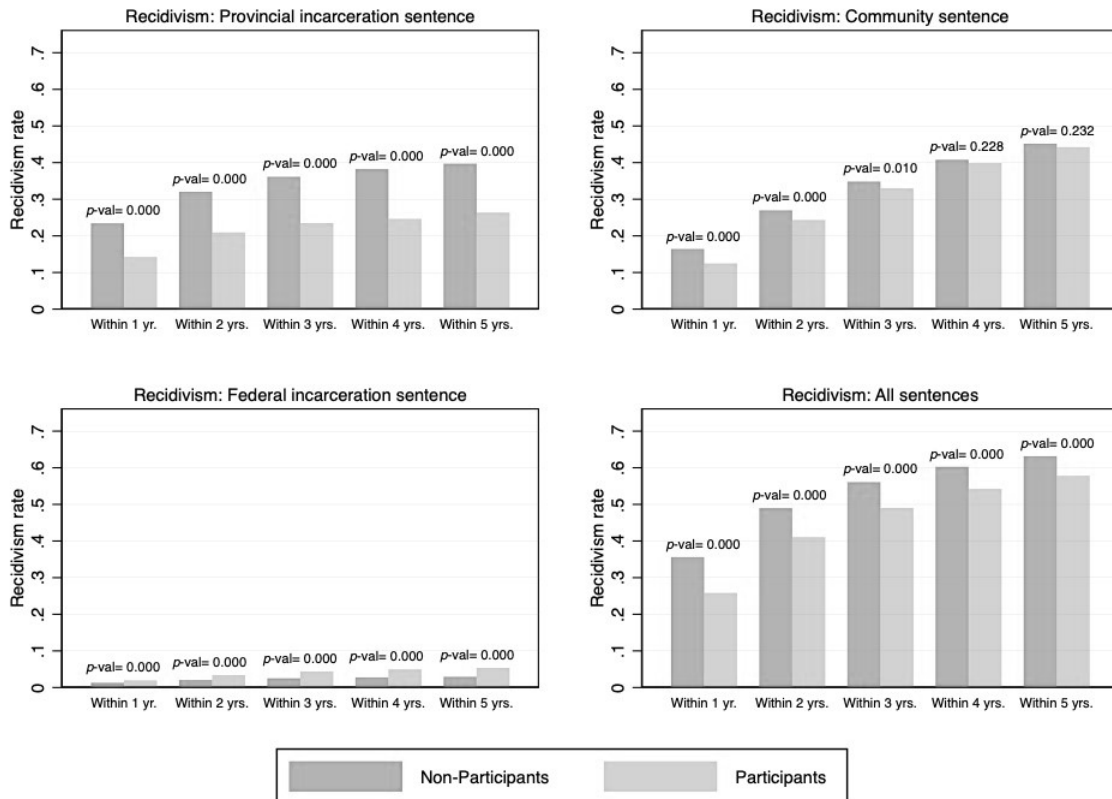


Figure 2: Rates of Recidivism

Note: This figure shows the rates of recidivism within one to five years after the planned release from a provincial prison. The four panels vary the type of sentence considered as recidivism. The *p*-values test the differences in proportions between recidivism rates for participants and non-participants.

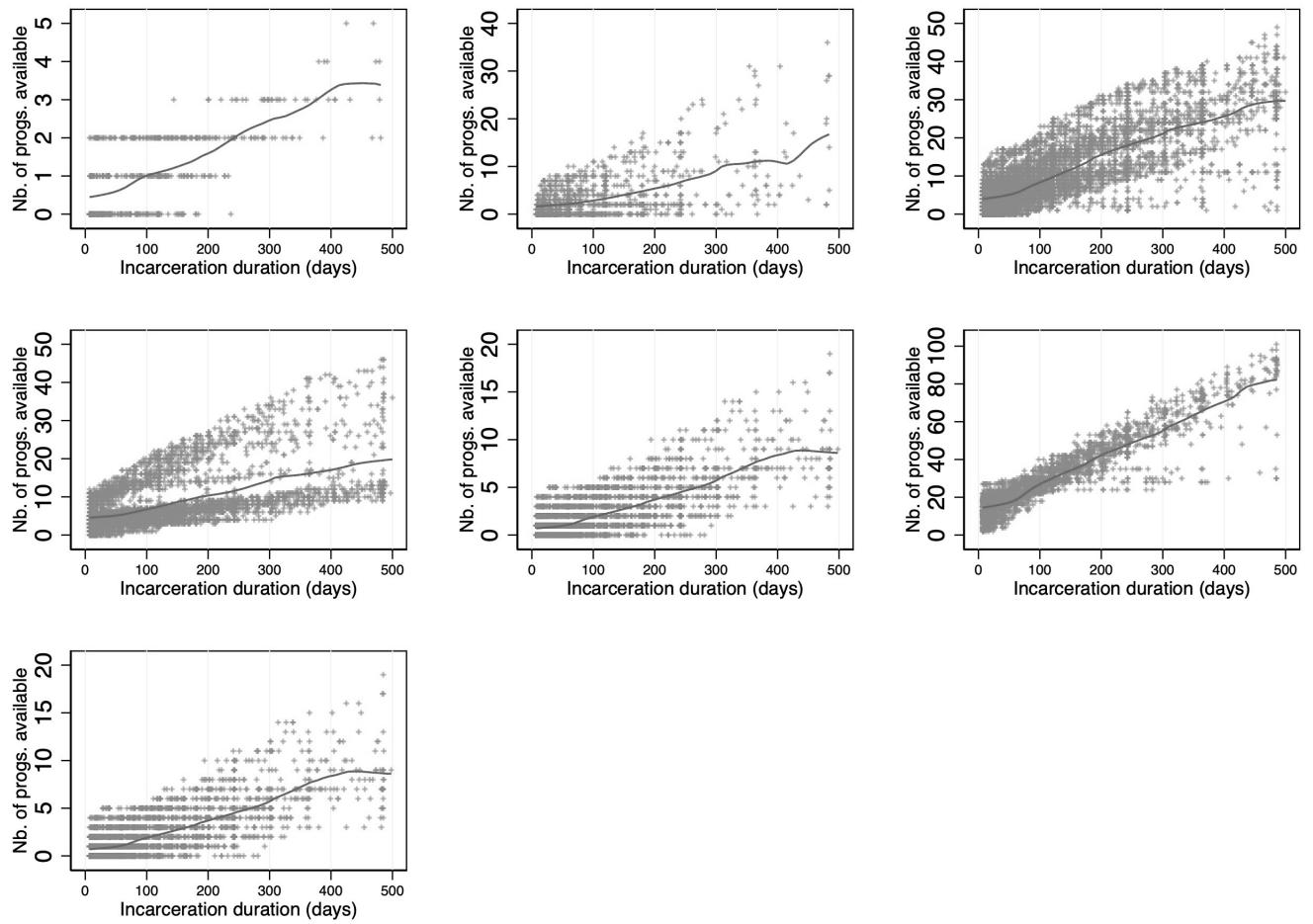


Figure 3: Incarceration Length and Available Programs, by Prison

Note: The figure presents a scatter plot of the number of programs available that a prisoner may enroll in over the course of his incarceration for each prison in our data. The lines are smoothed local polynomial regressions with a bandwidth of 30 days.

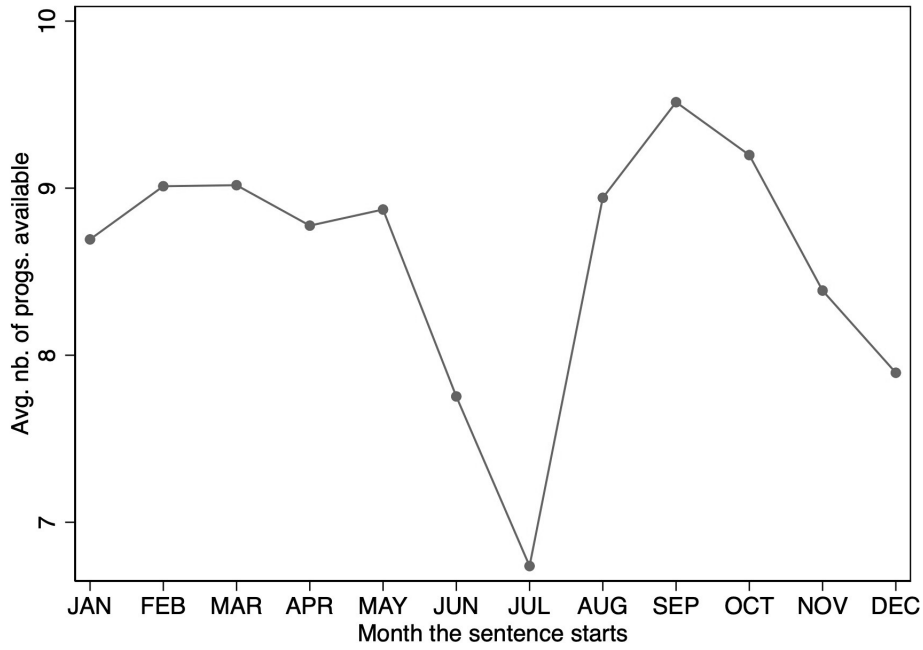


Figure 4: Average Number of Available Programs by Sentencing Month

Note: This figure presents the average number of programs available for a prisoner to enroll in during his sentence conditional on the month his sentence starts.

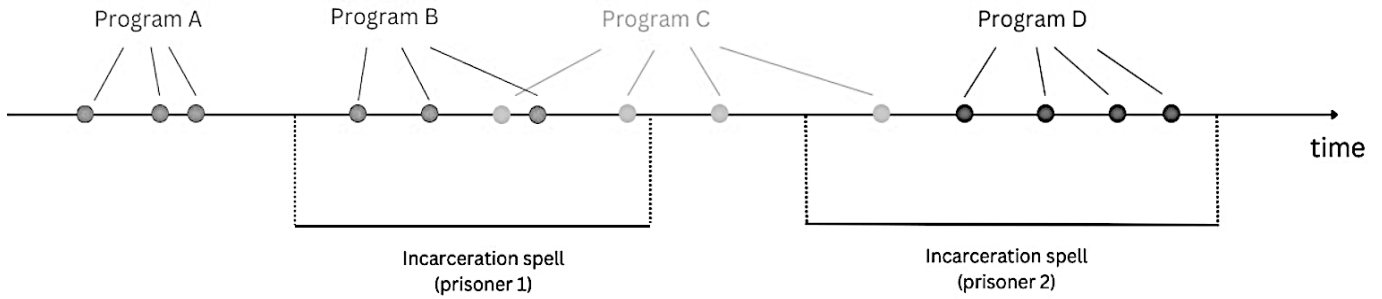


Figure 5: Computation of the instrumental variable

Notes: Each dot represents an individual enrolling in a specific program. Prisoner 1 can enroll in two programs (B and C) based on his sentence spell and observed enrollments. Prisoner 2 can also enroll in two programs (C and D). Thus, the number of available programs is 2 for both prisoners.

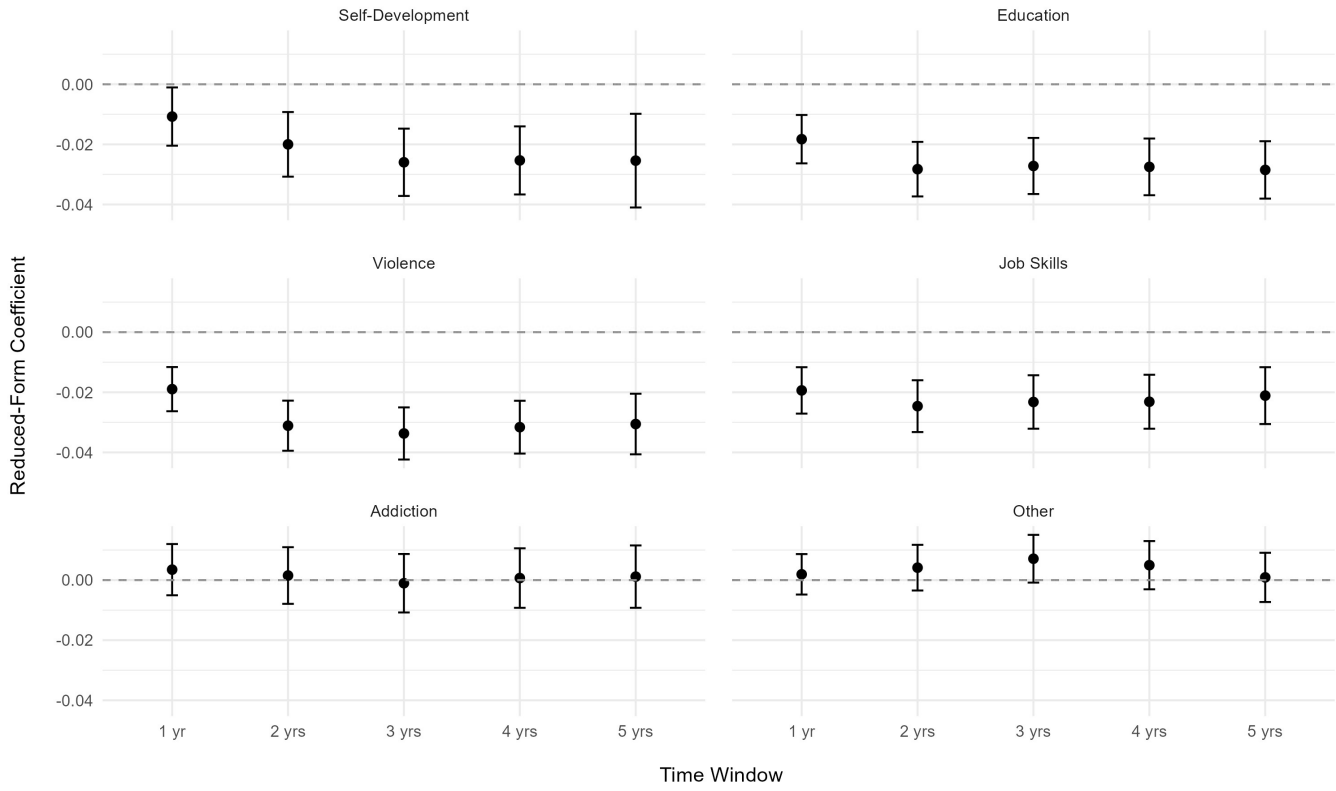


Figure 6: Heterogeneity by Program Type

Notes: Each coefficient is obtained with a reduced-form regression of the reincarceration outcome on the number of available programs of each category, standardized by its standard deviation. All regressions include the set of randomization controls (prison- and year fixed effects, and the sentence duration \times prison fixed effects) and full controls (type of crime, Indigenous status, age (categorical), indicator for at least a dependent, and number of days of pretrial detention).

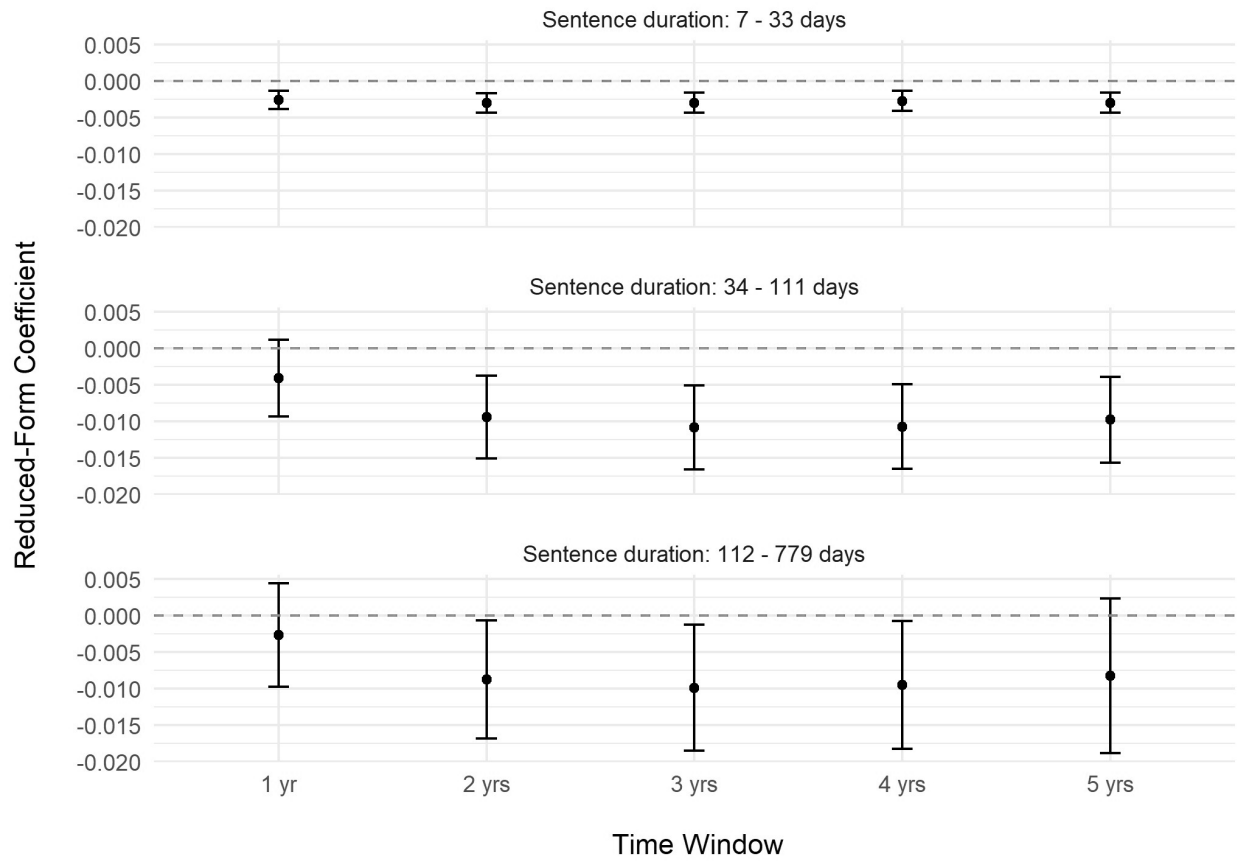


Figure 7: Heterogeneity by Sentence Duration

Notes: Each coefficient is obtained with a reduced-form regression of the reincarceration outcome on the number of available programs by month of incarceration. All regressions include the set of randomization controls (prison- and year fixed effects, and the sentence duration \times prison fixed effects) and full controls (type of crime, Indigenous status, age (categorical), indicator for at least a dependent, and number of days of pretrial detention).

¹ In Canada, offenders sentenced to less than two years serve their sentence in a provincial prison, while those with sentences of two years or more are sent to a federal penitentiary.

² Other studies find mixed results. For instance, [Cook et al. \(2015\)](#) conduct a RCT on high-risk offenders in Wisconsin. They find a decrease in the likelihood of a rearrest but no difference in the likelihood of reincarceration.

³ In her literature review, [Doleac \(2023\)](#) notes that “future work exploiting natural experiments or field experiments that avoid selection bias would be valuable for determining the power of educational programs—alone or in combination with other [prison-based] interventions—to encourage desistance from crime.” [Davis et al. \(2013\)](#) and [Visher, Winterfield and Coggeshall \(2005\)](#) recognize the same gap in the literature.

⁴ Some papers find that lengthy prison sentences may deplete human capital and alter an inmate’s capacity to reintegrate into the labor market ([Lochner 2004](#); [Aizer and Doyle Jr 2015](#); [Mueller-Smith 2015](#)). Others argue that prison spells might act as a school of crime in which networks of criminals share knowledge and influence one another ([Bayer, Hjalmarsson and Pozen 2009](#); [Stevenson 2017](#)). Conversely, incarceration may decrease crime through incapacitation ([Owens 2009](#); [Buonanno and Raphael 2013](#); [Barbarino and Mastrobuoni 2014](#)) or deterrence ([Chen and Shapiro 2007](#); [Mastrobuoni and Rivers 2016](#)). Other papers that have studied the effect of incarceration (or incarceration duration) include [Rose and Shem-Tov \(2021\)](#) and [Norris, Pecenco and Weaver \(2021\)](#) who find that incarceration decreases reoffending, and [Kling \(2006\)](#) and [Green and Winik \(2010\)](#), who find no effect of on economic outcomes or recidivism, respectively.

⁵ Such conditions may include the composition of peers, occupancy rate, employees-inmates ratios and prison activities, which have been suggested to affect recidivism ([Chen and Shapiro 2007](#); [Drago, Galbiati and Vertova 2011](#); [van Ginneken and Palmén 2022](#); [Yu et al., 2022](#)). [Lotti \(2022\)](#) finds that a shift from strict warehousing to rehabilitating of young offenders decreased recidivism substantially. [Mastrobuoni and Terlizze \(2022\)](#) finds that rehabilitation-oriented (open) prison regimes yield lower recidivism relative to harsh (closed) prisons. [Tobón \(2020\)](#) shows that moving inmates from older to newer prisons—which are less crowded and offer better living conditions, services, and rehabilitation programs—substantially reduces recidivism. Finally, [Hjalmarsson and Lindquist \(2022\)](#) show that time spent in prisons that offer various programs allows inmates with mental health issues to engage in therapy, resulting in long-lasting health benefits and reduced recidivism.

⁶ Unlike probation, parole is not part of the sentence or determined during the trial. Rather, all prisoners with incarceration spells of at least six months may apply for parole while incarcerated. As such, parole is part of an incarceration sentence and is not captured by our measures of community sentences in this paper.

⁷ In Quebec, in 2018, the average inmate daily cost is \$254 ([Statistics Canada 2022](#)). The daily cost of probation is \$49 ([Parliamentary Budget Officer 2018](#)).

⁸ In order to incentivize good behavior, time may be credited towards release upon serving two-thirds of a sentence.

⁹ [Arbour and Marchand \(2023\)](#) study the effect of parole among this population and find it can yield rehabilitative effects. Parolees represents less than 9% of our sample. They only serve one-third of their sentence unless reincarcerated due to a breach of conditions. Fewer than 40% of convicts are eligible for a hearing, of whom only 22% are granted parole.

¹⁰ The LS/CMI is a widely implemented proprietary assessment tool in North America ([Andrews, Bonta and Wormith 2004](#)) and is the culmination of ulterior versions of tools within the “Level of Supervision Inventory” family. Officers must complete the evaluation seven days at the latest before the sixth of the sentence or within 45 days after sentencing, whichever comes first. If an inmate is reincarcerated, a new evaluation is not deemed necessary if a prior evaluation is still considered appropriate and was completed less than two years prior. Only trained officers can conduct the assessment. See [Vose et al. \(2008\)](#) for a review of the LS/CMI.

¹¹ Article 21 of the [Act Respecting the Québec Correctional System \(2023\)](#) states “The Minister shall develop and offer programs and services to encourage offenders to develop an awareness of the consequences of their behavior and initiate a personal process focusing on developing their sense of responsibility.” Article 22 reads: “The Minister shall see to it that the offenders’ access to specialized programs and services offered by community-based resources to foster their reintegration into the community and support their rehabilitation is facilitated. Such programs and services are designed to initiate the process of solving the problems associated with the delinquency of the offenders, in particular problems of domestic violence, sexual deviance, pedophilia, alcoholism and substance abuse.”

¹² In French: Dossiers Administratifs CORrectionnels.

¹³ In practice, offenders can be sentenced for each charge. Our data only contain the sentence for the most serious charge for which the offender was found guilty.

¹⁴ All risk scores are highly predictive of recidivism in our sample. See our previous version of this paper for a detailed analysis ([Arbour, Lacroix and Marchand 2021](#)).

¹⁵ Twenty-two prisons were active over our sample window. Eighteen are still active as of this writing: some were closed and others were merged into new and more modern establishments. Among the seven prisons for which we have program participation files, six are among the eight largest in terms of caseloads. The other two are relatively small establishments.

¹⁶ For instance, [Kuziemko \(2013\)](#) defines recidivism as any reincarceration occurring within three years. In contrast, [Bhuller et al. \(2020\)](#) define recidivism as the event of being charged with at least one crime during a given period. The Quebec Ministry of Public Security as well as Public Safety Canada both consider as recidivism any new sentence for a different offense occurring within two years following to end of the previous sentence. Alternatively, the United States National Institute of Justice defines recidivism as any subsequent involvement with the criminal justice system within three years following release, whether or not a new sentence was issued.

¹⁷ This is not surprising given that the majority of inmates are released near the planned date. Recall that fewer than 9% of individuals in our sample are granted parole. See footnote 9 for further details.

¹⁸ The *other* category comprises crimes such as fraud, traffic-related offenses, prostitution-related crimes, illegal weapons, and others.

¹⁹ From extensive discussions with prison personnel, one reason inmates seldom enroll in any program during pretrial is the fear it may be interpreted as an admission of guilt.

²⁰ Note that the comparisons are conditional on being evaluated. Hence the smaller number of observations.

²¹ The rates associated with “All sentences” do not correspond to the sum of the other three. This is because one can recidivate several times over a given period, each time with a different sentence type. For example, consider someone who recidivates twice within a given time window. He may first receive a community sentence, then be incarcerated.

The dependent variables we measure are: $y_{inc} = 1$, $y_{com} = 1$, $y_{fed} = 0$, $y_{all} = 1$. Thus $y_{inc} + y_{com} + y_{fed} \neq y_{all}$.

²² Figure A.1 in the appendix plots the relationship between incarceration length and recidivism one and five years after planned release and shows a negative correlation between the two. Figure A.2 plots the average number of program enrollments and shows that it positively correlates with incarceration length.

²³ More precisely, 75% of individuals appear only once, 15% appear twice, and 10% appear three times or more.

²⁴ We thank a referee for this suggestion. The predictions are obtained with an OLS regression of the number of program participation on all observed characteristics and the randomization controls.

²⁵ We further investigate the effects of program availability on recidivism at the intensive margin. That is, we estimate the effect of one additional program conditional on participating in at least one program. Our results are reported in Table B.2 of the Appendix and are consistent with the main results: each additional program reduces the likelihood of reincarceration and increase that of community sentencing slightly, although the latter is not statistically robust to post-release intervals.

²⁶ We find no heterogeneous effects when considering the other outcomes. The entire set of results is available upon request.

²⁷ The idea behind this test is that, if prisoners are limited in the number of programs they can participate in, then participating in one program could imply not participating in other programs. In that case, in the separate regressions, the effect of a wider availability of on program type could capture the effect of a decrease of participation in other programs. We thank an anonymous referee for raising this possibility.

²⁸ More precisely, we divide the instrument by the number of days of incarceration multiplied by 30.

²⁹ We thank an anonymous referee for raising the possibility.

³⁰ When the police arrest an individual, they may either release the person with a court summon or incarcerate the person immediately. If incarcerated, the person will appear before a judge within 24 hours. This judge will decide if the person is to be released with certain conditions until the trial or be detained until the trial. This decision is supposed to be based on the crime’s seriousness, the individual’s potential danger to the public, their past criminal record, or the possibility that the individual does not show up to the trial. Thus, past program participation is unlikely to be assessed at this stage.

³¹ We view this assumption as conservative because programs may yield benefits beyond the monetary costs associated with the type of future sentences. If programs reduce crime severity, one could expect additional benefits such as reduced social costs associated with crimes or positive employment effects.

³² For instance, [Heller et al. \(2017\)](#) found a significantly higher benefit-to-cost ratio of 30 for a program aimed at juveniles. However, it is important to note that their analysis incorporated the social costs of crime, which are not included in our analysis. See also [Zarkin et al. \(2012\)](#).