

# Evaluating Intensive Probation for Juvenile Offenders: Evidence from Germany<sup>\*</sup>

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## **Abstract:**

This paper studies an intensive probation program in Cologne, Germany. The program, which has a clear rehabilitative focus, offers intensified personal support to serious juvenile offenders over the first six month of their probation period. To evaluate the program's impact on recidivism, we draw on two research designs. Firstly, a small-scale randomized trial assigned offenders to regular or intensive probation. Secondly, a regression discontinuity design exploits a cutoff that defines program eligibility. The results suggest that the program reduces recidivism. The effect seems persistent over at least three years. Our evidence further indicates that the drop in recidivism is strongest among less severe offenders.

*Keywords: Youth crime; recidivism; probation; RCT; RDD.*

*JEL classification: K4; C93;*

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# 1. Introduction

The distribution of crimes within western populations is heavily skewed, with a large share of crimes committed by a fairly small number of individuals.<sup>1</sup> Hand in hand with this pattern we typically observe very high recidivism rates: individuals who were convicted in the past are very likely to soon enter the criminal justice system again (Doleac 2019). A crucial policy question thus concerns interventions that reduce recidivism.

Research has so far failed to identify promising strategies that effectively lower recidivism and coherently replicate in different contexts. On the contrary, the literature provides numerous null-results that fail to document any significant impact of prisoner reentry programs (Doleac, Temple et al. 2020), intensified supervision (Georgiou 2014, Hyatt and Barnes 2017) or intensified probation programs (Petersilia and Turner, 1993).

The present paper provides novel evidence on an intensive probation program for young convicts in Germany. The program, which was independently developed by the regional Court of Cologne, offers a six month period with intensive support to high-risk youth criminals that are convicted to probation. The probation officers in this program work under a significantly reduced caseload, which allows for a swifter start of the probation period with a much higher contact frequency as compared to regular probation. Building on two research designs, we evaluate the program's impact on recidivism rates.

First, in cooperation with the local court and the probation office in Cologne, we conducted a small-scale randomized control trial (RCT). The trial – which, to the best of our knowledge, is the first RCT within the German criminal justice system – randomly assigned serious juvenile offenders to regular or intensive probation. Second, we exploit that judges defined program eligibility using a score-card. Convicted offenders with a score below a certain cutoff, were never assigned to intense probation. The cutoff allows us to implement a regression discontinuity design (RDD).

The results from the RCT indicate a large but imprecisely estimated decline in recidivism. Relative to a control group in regular probation, which has a 41% recidivism rates within 6 months after the start of the probation period, the cases assigned to intensive probation have a 10 percentage-point (pp) lower short run recidivism. The effect slightly shrinks over time; however, a statistically insignificant but quantitatively meaningful 5-7pp gap in recidivism remains during the second and third year after the start of the initial probation sentence. Our analysis further suggests that the treatment effect is mainly driven by a reduction in crime at the extensive rather than the intensive margin: the propensity to recidivate drops, but not the number of crimes.

<sup>1</sup> In 2016, in the US 3,939.55 adults per 100,000 have been brought into formal contact with the criminal law system. In Germany, this number has been 2,996.23 ([UNODC link](#)).

The RDD delivers larger and more precisely estimated program effects. Mirroring the findings from the RCT, the decline in recidivism extends well beyond the initial 6 month period of the program. Note that the RDD identifies local average treatment effects (LATEs) at the lower end of the severity score of cases that are program eligible. Finding a larger LATE (as compared to the ATE from the RCT) suggests that the program might be more useful in preventing crimes among the least problematic offenders.

As noted above, this is also the first study that randomly assigning an intervention within the German criminal justice system. Our paper is also the first to test the effect of intense probation in Germany. Germany is an interesting case in that, as a matter of judicial policy, incarceration rates are very low. As a matter of stated policy, retribution plays a very small role. Instead resocialization and rehabilitative approaches are driving factors.

It is important to emphasize that both our RCT and the RDD exploit variation between intensive and regular probation. Our results are thus different but still complementary to a related strand of research which compares rehabilitative programs with harsher punishment or more or less severe forms of imprisonment (e.g. Mastrobuoni and Terlizzese 2019, Bhuller, Dahl et al. 2020, Lotti 2020). This latter literature finds that harsher punishment can increase recidivism.

The remainder of the paper is organized as follows. Section 2 discusses the literature on intensive probation and puts the context and our evaluation of the Cologne program into perspective. Sections 3 and 4 explain our research design and our data, respectively. Our results are presented in Section 5. After a critical discussion we conclude with a brief summary of our findings.

## **2. Intensive Probation**

### **2.1 Attempts at Making Probation More Effective**

All over the world, policymakers have explored intermediate sanctions that are less severe, and less costly, than incarceration, but more intense, and hopefully also more effective, than just releasing the convict on probation or parole (for overviews see Lipsey and Wilson 1998, Cullen and Gendreau 2000, Council 2007, Lipsey and Cullen 2007). Experiences have not been too encouraging, especially with respect to curbing recidivism.

The largest endeavor to assess the effectiveness of intermediate sanctions goes back to an initiative launched in Georgia in the 1980s (Erwin 1986). All over the US, policymakers were intrigued by the prospect of containing crime more effectively, and spending less money for the purpose, by using intensive probation (for a review of the initiatives see Petersilia and Turner 1993). In 1986 the Bureau of Justice Assistance launched an initiative to evaluate the effectiveness of these programs, and entrusted the Rand Corporation with the implementation. In multiple jurisdictions, more than 2000 convicts were evaluated (Petersilia

and Turner 1993: 292). Overall results were sobering. At no site convicts on intensive probation were less often arrested than controls, they did not take more time before they first recidivated, they did not commit less serious offences, and they were not less frequently convicted (Petersilia and Turner 1993: 310-312).

In all jurisdictions that participated in the evaluation exercise, convicts were randomly assigned to intensive probation or ordinary probation (Petersilia 1989). In the State of California, three counties participated (more detail from Petersilia and Turner 1990a, Petersilia and Turner 1990c, Petersilia and Turner 1991). The most elaborate design was implemented in Ventura County. Here family and peer relationships were also evaluated. Convicts were put into the pool from which Rand randomly selected participants if they scored high enough on a risk assessment scale. The program targeted juveniles at medium risk of committing crime in the near future. For those treated the program took between seven and nine months. The program was evaluated a year later, including interviews with participants. However only 57% of them participated in the interviews (Lane, Turner et al. 2005, Brank, Lane et al. 2008). There was no significant difference between treatment and control with respect to recidivism for ordinary crime, but those treated committed more technical violations (Petersilia and Turner 1990a, Petersilia and Turner 1991, Lane, Turner et al. 2005).

Contemporaneous experiments in Utah (Austin, Joe et al. 1990), Oregon (Petersilia and Turner 1990b, Petersilia and Turner 1993: , 304 f.), with female drug offenders in San Francisco (Guydish, Chan et al. 2011) and with parolees in Texas (Turner and Petersilia 1992, Petersilia and Turner 1993: 307) did not find significant effects either. In Ohio, correlational evidence suggests a small positive effect (Lowenkamp, Paler et al. 2006). A clear positive effect is found in Philadelphia. Convicted juveniles are randomly assigned to either ordinary or intensive aftercare programs. Of 44 treated, 22 were rearrested within 9.9 months for misdemeanor or felony, while of 46 controls 34 were rearrested within 11.7 months. 11 of the treated, and 19 of the controls, were rearrested for a felony (Sontheimer and Goodstein 1993).

Evaluations outside the US did also not find a significant reduction in recidivism through various forms of intensive probation. Programs failed in the UK (Folkard, Fowles et al. 1974, Folkard, Smith et al. 1976) and in Finland (Huttunen, Pekkala Kerr et al. 2014).

This sobering evidence resonates with the evaluation of other correctional interventions. A Californian program to assist prisoner reentry into society did not have a significant effect on recidivism (Farabee, Zhang et al. 2014), nor did a Dutch program assigning juveniles at risk to multisystemic therapy (Asscher, Deković et al. 2014). Yet results look brighter for other interventions. In general, behavioral/cognitive programs (Pearson, Lipton et al. 2002) and programs aiming at the rehabilitation of adult offenders have been shown to be effective in reducing recidivism (Wilson, Gallagher et al. 2000), and interventions have successfully targeted truancy (Berg, Hullin et al. 1977) and low performance in high school students (Rodriguez-Planas 2012).

## 2.2 Cologne's Intensive Probation Program

Legal orders like the German are skeptical about the benefits of incarceration. Many actors try to avoid prison sentences as long as possible. The German criminal code for juveniles ("*Jugendgerichtsgesetz*") adopts a hybrid approach between sanctioning, educating, and rehabilitating. Specialized juvenile courts have considerable discretion in defining what deems the appropriate reaction of the criminal justice system. One tool in their box is probation. Judges have considerable leeway in designing probation conditions. It is this discretion on which Cologne's probation project is built.

Regular probation (henceforth RP) typically represents a relatively mild sanction with a low level of support and explicit or implicit supervision. Hence, most judges did not perceive RP as a suitable alternative to imprisonment for particularly severe youth crime. However, motivated by concerns about the potential criminogenic effects from youth jails/prisons (Bayer, Hjalmarsson et al. 2009, Stevenson 2017) the Cologne regional court and the local probation office developed an alternative, intensive probation program (henceforth IP, with the German term "*ambulate Intensivbetreuung*"). The 6 month program is meant to be an alternative to incarceration for high-risk juvenile offenders that already reach a relatively long criminal record at an early age. The typical target is a convict whom the judge would be justified to send to prison.

IP differs from RP in numerous dimensions. First, IP has a component of "swiftness" (Hawken and Kleiman 2009): the first contact between the convicted offender and the assigned probation officer typically takes place within one or two weeks. Under RP, the first interaction with the probation officer might only occur after several weeks. Within our RCT sample introduced below, the probation office's e-documentation system reveals an average time gap between trial and a first personal meeting of 16 days in IP and 26 days in RP (two-sided t-test on mean,  $p = 0.031$ ;  $N = 49$ ).

Second, as indicated by its name, IP assures a more intensive and closer contact between officers and convicts. This point is documented in Figure 1. Juveniles in RP see their probation officer on average only once a month (they have on average 0.25 personal contacts per week). By contrast, convicts in the IP program have initially a weekly, personal meeting. If we include other forms of contact recorded in the probation office's e-documentation system (mostly phone calls but also text messages and letters), the difference in contact frequencies becomes even more pronounced: in IP, there are on average 3-4 weekly contacts over the first 4 months of probation; during the same time period, there are only 0.5-1.0 weekly contacts in RP (see bottom panel of Figure 1). The stark difference in interaction frequencies (in particular, in the

re-ency of personal meetings) shrinks over time but remains higher in IP than RP throughout the 6 month period of the program.<sup>2</sup>

The higher contact intensity clearly increases monitoring in IP. Probation officers are more closely following convicts' behavior and compliance with probation conditions. The main objective of IP, however, is not increased supervision but intensified support. Officers try to re-establish basic habits (starting with basic things like getting up at reasonably early hours) that facilitate (re-)integration. Officers try to make sure that convicts regularly attend school, go to job-interviews or take part in anti-aggression therapy. In addition, IP officers provide help in many of these situations (e.g., they jointly go to appointments or support convicts in finding an apprenticeship or a housing opportunity).

When the program was started in 2006, the Cologne probation office did not get additional funds. It had to man the program with its regular workforce. Four probation officers were assigned to take over IP cases. IP officers work under a significantly reduced case load, typically handling five IP (plus 25 RP) cases at a time. Probation officers not assigned to the program shoulder a much higher caseload, handling an average of 60 RP cases at a time.<sup>3</sup>

Based on anecdotal evidence, the judges at Cologne's juvenile court as well as the probation office perceived the program as a success. The common impression was that the program would, at the very least, delay recidivism during the 6 month program period. In turn, this would contribute to a lower crime risk while aging and growing out of the high-crime youth period. The positive perception was also reflected in an excess demand for IP: juvenile courts asked for more slots in the IP program than could be offered by the probation office. This point will be reflected in our research strategy.

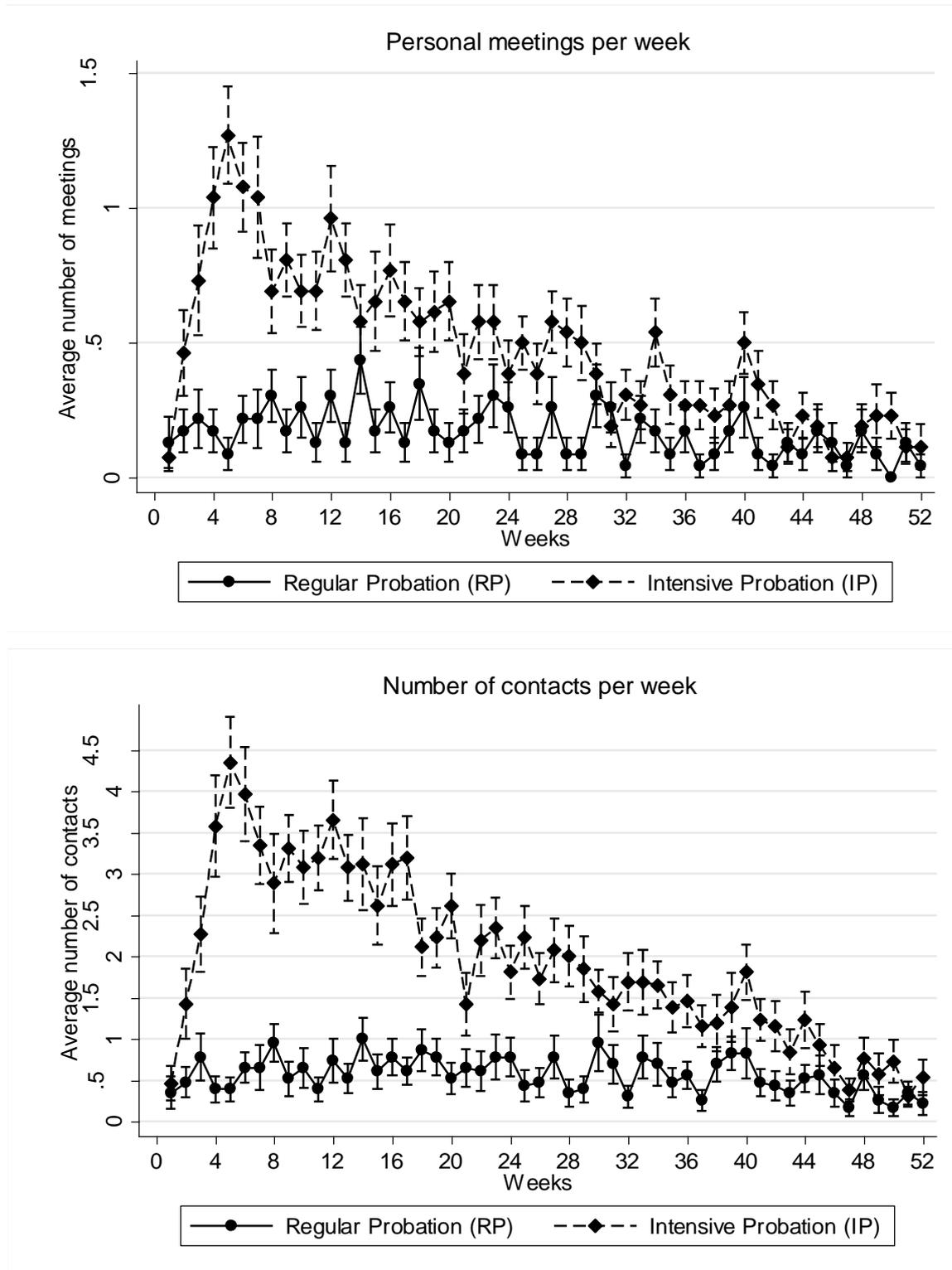
### **3. Research Design**

In 2010, the Cologne court approached us to evaluate the effectiveness of the program. In cooperation with the judges and the Cologne probation office, we developed an experimental research design. The core of the evaluation was a randomized controlled trial that built on judges' excess demand for available IP slots. In addition, we present evidence from a regression discontinuity design that exploits a cutoff inherent in the definition of program eligibility.

<sup>2</sup> IP officially lasts for 6 months. Given that probation periods last longer (with a minimum of 12 month and modal probation period of 24 months), convicts return to regular probation (i.e., at a lower interaction frequency) but remain with the same probation officer. In practice, however, there is no exact cut after 6 months and the transition is more fluent (see Figure 1).

<sup>3</sup> While there was some modest turnaround among officers before our sample period, the assignment to IP or RP remained constant during the evaluation. This implies that we will not be able to isolate officer specific effects.

Figure 1 – Contact between Probation Officers and Offenders.



Note: The figure plots the weekly number of documented contracts between the probation officers and the convicted offenders for two groups who were randomly assigned to regular probation (RP; N = 26) or intensive probation (IP; N = 23). The top panel shows personal, fact-to-face contact, the panel at the bottom includes also other forms of contact (mainly phone calls, but also text messages and letters). Data are based on the probation office's e-documentation system.

### 3.1 Randomized Treatment Assignment (RCT)

In close cooperation with the judges at the juvenile court and the probation office, we first developed a scorecard meant to evaluate juvenile convicts (see Appendix 4). The scorecard captured the severity of the criminal history, the level of aggressiveness, drug and alcohol problems, as well as the convicts' family, housing and schooling situation. The scorecard further included a set of "exclusion criteria". If a judge would tick a box that indicates at least one reason for exclusion (e.g., severe drug problems), a convict would not be program eligible.

Judges agreed to filling out the scorecard for any juvenile convicted for a probation sentence during the evaluation period. Similar to Petersilia and Turner (1990c), we thus relied on judges' competence for defining which convicts are eligible for the program. Every convict with 13 or more points (and no exclusion reason, see above) on the scorecard was considered eligible for the program. Among this eligible population, we randomly assigned convicts to IP or RP.

Randomization took place in typically bi-weekly intervals. Before a randomization date, probation officers reported open IP slots to the research team. At the same time, the youth judges submitted scorecards for all new probation cases.<sup>4</sup> A member of the research team then entered the information from the scorecards into our data base and, in the presence of a judge, used a simple randomization software to determine outcomes. The randomization procedure assured that all eligible convicts (who were in the pool at a given point of time) had an equal opportunity to be assigned to the program. An eligible convict would enter IP if (a) randomization assigned the convict to IP and if (b) at least one IP slot was available in this draw.<sup>5</sup> Otherwise, the juvenile convict would enter regular probation. In case of program assignment, the IP probation officer(s) would immediately be informed by the research team. Random treatment assignment was carried out over 1.5 years, from January 2011 till July 2012. In the light of scarce resources (few IP slots) and the excess demand described above, judges were very supportive and approved the procedure.<sup>6</sup> The trial was officially approved by the Appellate Court (*Oberlandesgericht*) of Cologne and North-Rhine Westfalia's Ministry of Justice (Ordinance of the Ministry of Oct 18, 2010). Note that our RCT is, to the best of our knowledge, the first randomized trial conducted within the German criminal justice system.

<sup>4</sup> These cases could either be convictions from the past days, but also cases from trials where the hearing had already taken place, but the judge's written decision would be finalized in the following week.

<sup>5</sup> In principle, the randomization could have resulted in an outcome where, e.g., one open IP slot remained "vacant" for (at least) a two-week period. In practice, this never happened. In case of multiple open IP slots with different probation officers, the software randomly assigned convicts to different slots/officers.

<sup>6</sup> Judges made it clear that, in some exceptional cases, they might exclude convicts from the procedure and ad-hoc assign them to IP. During the evaluation period, judges made use of this option in three cases. As discussed below, we will exclude these cases from our main analysis.

### 3.2 Regression Discontinuity Design (RDD)

The definition of program eligibility implied a discontinuity: convicts with a score below 13 points had no chance to enter IP; convicts with a score of 13 or above had a positive chance of treatment assignment. The cutoff rule thus implies a “fuzzy” treatment discontinuity: at the cutoff, the chance of getting into IP jumps from zero to (roughly) 50%.<sup>7</sup> We will use this discontinuity at the threshold to implement a fuzzy regression discontinuity design (henceforth RDD, for background see Lee and Lemieux 2010). Formally, we estimate reduced form equations of the structure,

$$Y_i = \mu + \tau D_i + f(Z_i) + g(Z_i) + e_i \quad (1)$$

where  $Y_i$  is an outcome variable,  $D_i$  is a dummy indicating treatment eligibility,  $Z_i$  is the assignment variable – i.e., the score normalized around the cutoff (such that  $Z_i \geq 0$  implies  $D_i = 1$ ), with  $f$  and  $g$  being functions of the running variable  $Z_i$ , defined for the range below ( $Z_i < 0$ ) and above ( $Z_i \geq 0$ ) the cutoff, respectively.<sup>8</sup> Intuitively speaking, the RDD compares outcomes between juveniles that scored slightly below and those marginally above the cutoff. Conditional on  $f$  and  $g$  (i.e., accounting for the correlation between the point score  $Z_i$  and the outcome variable) the discontinuous jump in the chance of entering IP at the threshold then yields the reduced form estimate  $\tau$  of the program’s impact on an outcome.

In contrast to the RCT, which allows us to estimate an average treatment effect (ATE) for all program eligible offenders in our sample, the reduced form coefficient  $\tau$  captures a local average treatment effect (LATE): the RD estimates is local, as it is identified from offenders with a point score  $Z_i$  around the eligibility cutoff. Put differently, the RD estimates will reflect the program’s impact for less severe offenders, who are nevertheless severe enough to bring them close to program eligibility (as measured by the assignment score  $Z_i$ ).

Note further that the coefficient  $\tau$  must be interpreted in intention-to-treat (ITT) terms: the reduced form estimates do not account for the fact that not every case above the eligibility cutoff enters IP. To provide LATE estimates for a treatment effect on the treated (TOT), we use the discontinuity at the cutoff as an instrument. In particular, we will run two-stage least squares regressions (2SLS). We first estimate

$$IP_i = a + b D_i + f'(Z_i) + g'(Z_i) + e'_i, \quad (2)$$

where  $IP_i$  is a dummy indicating that a case entered the program. The coefficient  $b$  then measures the discontinuity in the chance of entering the treatment at the cutoff. (The

<sup>7</sup> The fuzziness of the discontinuity is not due to non-compliance with the eligibility rule, but rather because, exactly because of the randomized control trial, treatment for those above the cutoff is only probabilistic. This point is also documented in Figure A1 in the Appendix.

<sup>8</sup> The specification allows for correlation between  $Z_i$  and  $Y_i$  to differ on either side of the cutoff (as captured by the two different functions  $f$  and  $g$ ).

functions  $f'$  and  $g'$  indicate again different functions that absorb the correlation between the point score  $Z_i$  and the left hand side variable.) Based on the first-stage, we can then estimate

$$Y_i = \alpha + \beta \widehat{IP}_i + \rho(Z_i) + \varphi(Z_i) + \varepsilon'_i, \quad (3)$$

where  $\widehat{IP}_i$  is the instrumented indicator for program participation (and  $\rho$  and  $\varphi$  are again flexible functions of  $Z_i$ ). The 2SLS estimate of  $\beta$  from this equation indicates the TOT effect of the program. The validity of the RDD is discussed in section 4.

### 3.3 Survey among Probation Officers

The last element of our research design consisted of a survey among probation officers. This survey collected the officers' subjective evaluations of the convicted offenders at the start of the probation period and six month later. This allows us to observe within-case (and within probation officer) changes in the subjective evaluation of a case.

We have asked officers to evaluate convicts on nine dimensions mirroring those from the Judges' scorecards: their family background, their housing situation, school or apprenticeship, their social environment, alcohol and drug consumption, the ability to structure their day and to fulfil their daily duties, as well as their aggression level (for detail see Appendix 5). As subscales differ for aggregation we normalize each subscale to the unit interval. A higher score indicates a higher degree of the respective social problem. For each convict we generate an aggregated score that averages over the nine normalized subscales, separately for the beginning and the end of the first six months of probation (RP or IP).

## 4. Data and Samples

Our analysis exploits data from multiple sources. First, we use information from the comprehensive scorecards discussed above. These data were augmented with case and offender specific information from the court's database. Second, we exploit data from the e-documentation platform used by Cologne's probation office. We mainly use these data to descriptively analyze contact frequencies between offenders and probation officers (see Section 2). Third, we collected subjective evaluations among probation officers (see Section 3.3).

Our key outcome variables on recidivism are based on new criminal convictions after a convict has been put on probation. This information was obtained from the Federal Crime Register (the German *Bundeszentralregister*), which is highly protected by law.<sup>9</sup> The data allow us to observe the exact time of a crime that resulted in a conviction (before Dec 31, 2015). If there is an entry in the crime register, we also know the crime(s) for which the person has been

<sup>9</sup> The authority keeping the register (*Bundesamt für Justiz*) has given us permission to receive this data. Permission was obtained after successful consultation of the authority with the Data Protection Commissioner of the Federal Republic of Germany (Ordinance of the *Bundesamt für Justiz* of May 30, 2014).

convicted, and the sanction(s). Based on these data, we compute different recidivism measures that cover up to three years after the last convict started a probation period. The data allow us to distinguish between reconvictions for violent, property and other crimes.

Overall we collected data on 209 cases (see Table1). During our main study period (the universe of probation cases decided between 2011/01 and 2012/06), we observed 171 cases. Among these, 57 cases were treatment eligible, i.e., cases with a point score above the cutoff and no exclusion criterion. These cases were randomly assigned to RP or IP.

**Table 1 – Structure of Sample and Data availability**

|   | All Cases | Cases with information from ... |                |
|---|-----------|---------------------------------|----------------|
|   |           | e-documentation                 | officer survey |
| <b>Randomization Period</b>                           | 171       | 152                             | 46             |
| RCT Sample  | 57        | 49                              | 46             |
| IP ("treated")  | 30        | 26                              | 25             |
| RP ("control")  | 27        | 23                              | 21             |
| Non-Qualified<br>(below cutoff or exclusion criteria) | 111       | 101                             |                |
| Ad-hoc assigned to IP<br>(non-randomized)             | 3         | 2                               |                |
| <b>Post-Randomization Period</b>                      | 38        | -                               |                |
| <b>Total Sample</b>                                   | 209       | -                               |                |

Note: The table illustrates the structure of the sample and data availability. The RCT sample is based on the 57 cases with randomized assignment to IP and RP. The RDD will explore the entire sample from the main study period (171 cases).

111 cases were not treatment eligible and thus excluded from the randomization. These convicts either had a point score below the assignment cutoff and/or there were one or multiple reasons for exclusion (see above). In addition, there were 3 cases that were program eligible but ad-hoc assigned to IP by the judges. As noted above (see fn. 6), these were exceptional cases where the respective judge would not have accepted a regular probation outcome. Our analysis of the RCT excludes these three cases. The RDD analysis, which exploits variation around the eligibility cutoff (rather than the actual treatment assignment), makes use of all 171 cases from the main study period.

For all 171 cases we have detailed data on recidivism. For 86% from our core RCT sample (49 out of 57 cases), we observe interaction frequencies from the e-documentation system. These

data served as the basis for Figure 1. For 81% of the RCT sample, we also obtained two data points (at the start and after-6-months of probation) from the subjective evaluation survey.<sup>10</sup>

Finally, we also collected some basic data for a four-month period after the end of the randomization period. In this “post-study period”, we merely asked judges to continue filling out the scorecards. We will briefly discuss these data below.

#### 4.1 Randomization Checks

Balancing checks for the 57 eligible cases are presented in **Fehler! Verweisquelle konnte nicht gefunden werden..** For none of the variables do we find a significant difference between those assigned to IP and RP. The average age at the time of the randomization is around 18 years (with 90% of the data in a range between 16 and 21). The sample is almost exclusively male, with the two female convicts ending up in the control group.

**Table 2 – Summary Statistics and Balancing Checks**

| <i>Variable:</i>  | RP<br>("control") | IP<br>("treated") | p-value |
|-------------------|-------------------|-------------------|---------|
| Age               | 18.272            | 18.401            | 0.803   |
| Male              | 0.926             | 1.000             | 0.134   |
| Score             | 17.630            | 17.567            | 0.946   |
| Problematic Peers | 0.333             | 0.300             | 0.792   |
| Alcohol           | 0.222             | 0.367             | 0.242   |
| Drugs             | 0.370             | 0.200             | 0.158   |
| Agression-mid     | 0.481             | 0.367             | 0.390   |
| Agression-high    | 0.185             | 0.300             | 0.323   |
| §27 JGG           | 0.481             | 0.367             | 0.390   |
| §57 JGG           | 0.148             | 0.100             | 0.588   |
| Property Crime*   | 0.250             | 0.308             | 0.658   |
| Violent Crime*    | 0.708             | 0.577             | 0.344   |

*Note:* The table presents the sample mean among treatment and control group for different variables. The third column includes the p-values from two sided t-tests. Age is the age at the randomization date; Score is the overall point score from the scoreboard; the next variables – subcategories of the score card – indicate problematic peers, alcohol or drug problems, respectively; intermediate or high aggression levels (3-4 or 5-6 points in this subcategory of the scorecard), respectively; § 27 JGG and § 57 JGG (*Jugendgerichtsgesetz*, the German juvenile courts law) empower the juvenile court to be more flexible. According to § 27 JGG, the court may for the time being only declare that the defendant has violated the law, and define a period within which the defendant may be sent to prison, should later behavior call for that. According to § 57 JGG, the court may impose a prison sentence, but refrain from enforcing it for a defined period of time, and conditional on the convict not misbehaving. Sample is N = 57, except for the two crime category variables with N = 50.

<sup>10</sup> Probation officers sometimes failed to deliver an assessment within a reasonable time-window around the end of the 6-month period. More generally, compliance with the survey protocol was lower in the RP sample. RAs were therefore instructed to focus on reminding/encouraging probation offers with RP cases from the RCT sample. While this resulted in balanced return rates between treatment and control groups, it implied a very low return rate for cases beyond the RCT sample. Below we will therefore focus on the RCT sample.

The average in the overall score from the judges' scorecards (ranging from 13 to 28) is nearly identical between the two groups, with only minor differences in subcategories (e.g., alcohol or drug problems, or elevated aggression levels). Judges have used flexible tools for avoiding that the defendant goes to jail (according to §§ 27 and 57 JGG (*Jugendgerichtsgesetz*), the German juvenile courts law) in comparable fractions. In terms of crime categories, we observe a higher share of convicts that had committed violent crimes and fewer cases with property crimes in the control group. However, neither difference is statistically significant. Overall, the observable characteristics are consistent with random assignment of convicts to IP (treatment) and RP (control).

## 4.2 Validity of the RDD

The RDD provides a valid identification strategy as long as possible confounders (i.e., observed or unobserved individual characteristics that shape recidivism) change smoothly around the eligibility cutoff. In our context, one might be worried that this assumption could be violated. As all judges knew about the threshold, they could strategically score juveniles to place them either below or above the cutoff. In this case, ending up above or below the cutoff would not be as good as random but selected by judges, conditional on factors that are unobservable to the research team.

Given the high demand for IP slots from the pre-experimental period, we were mainly concerned about strategic *overrating* (i.e., selection into eligibility). In contrast, we expected that strategic *underrating* of convicts would be no issue, because judges could simply tick a box to indicate an exclusion criterion.<sup>11</sup> Despite this institutional feature, we detect some evidence suggesting that strategic underrating could nevertheless be an issue.

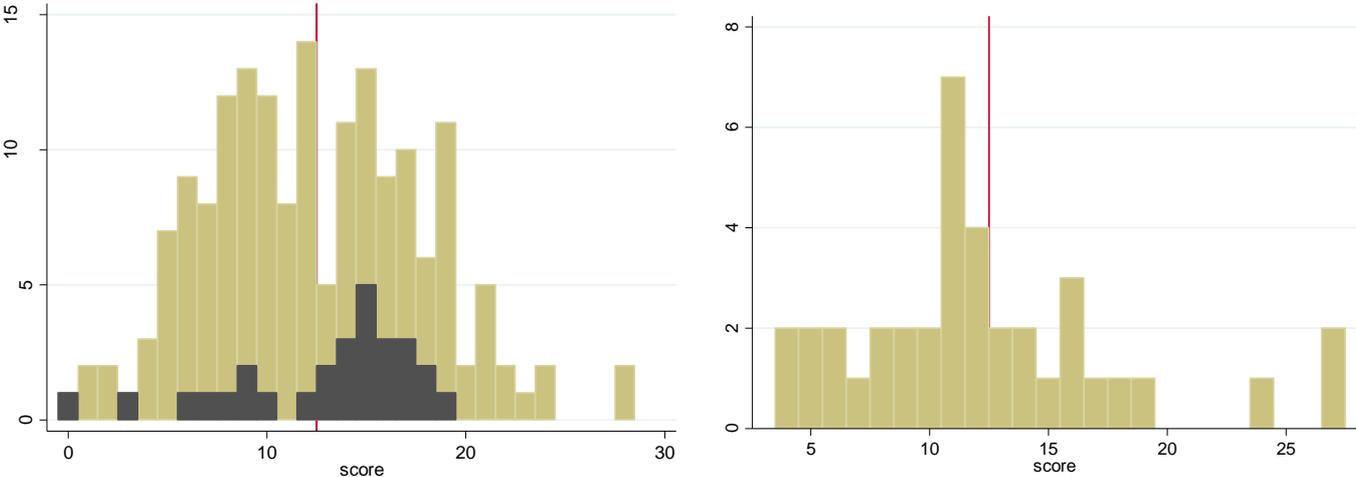
The left panel of Figure 2 illustrates the distribution of scorecard points for the 171 convicts during the 1.5 year randomization period. The figure shows some "heaping" below the cutoff: 14 convicts had exactly 12 points, whereas only 5 cases had 13 points. The dark-grey shade bars, which indicate cases where an exclusion criterion was ticked, suggest that exclusion occurred on either side of the cutoff.

One interpretation of this pattern is indeed a strategic underrating of some convicts (who would have otherwise scored just above the cutoff and would have thus been eligible for IP). However, the evidence does not coherently support this interpretation. First, we ran placebo estimates that explore whether any observable characteristics discontinuously change around the threshold. The tests, which are reported in the Appendix (see Table A.1) do not indicate

<sup>11</sup> Recall from above that judges would only have to tick one of the exclusion indicators in the scorecard to assure that a convict is excluded from the randomized program assignment (see Appendix 4). Note further that these exclusion criteria would not alter the overall score.

any discontinuities in observables. Hence, this exercise does not provide any evidence on strategic scoring.<sup>12</sup>

**Figure 2 – Distribution of Scorecard Points**



*Note:* Left panel: sample from the main study period (N = 171); the dark grey shaded bars indicate cases with an exclusion criterion being ticked; Right panel: post-randomization period (N = 39).

Second, we examined the point distribution from scorecards filled out by judges after the RCT ended. In this post-randomization period, judges continued using the scorecards. The score, however, was no longer used to assign cases to randomization. Hence, there was no strategic reason to target a score just below 12 points. The right panel of Figure 2 nevertheless indicates heaping below the cutoff (with a seemingly above-normal number of cases with 11 and 12 points).<sup>13</sup>

A different interpretation of the “excess mass” below the cutoff in the post-randomization data is that the heaping pattern is, at least partially, driven by the mere design of the scorecards. The overall point score is the sum of 10 sub-scores. In most of these 10 dimensions, the modal score used by the judges was around 1 point, such that ending up with an overall score of 11 or 12 points just turned out to be very likely. While this offers a possible alternative explanation, we ultimately cannot rule out strategic scoring. In our empirical analysis we will therefore complement our RD estimates with so called “donut estimates”. The latter exclude the range just around the cutoff from the RDD (Barreca, Guldi et al. 2011).

<sup>12</sup> Obviously, such tests (which are in the spirit of the balancing checks for the RCT from above) can never rule out strategic scoring based on unobservables (i.e., information only available to a judge). However, to the extent that unobservables are correlated with some observable variables, the tests are at least indicative. Note further that the use of background information obtained from the scorecards is problematic, as the different sub-scores must increase at the cutoff, by assumption. This is why Table A.1 mainly focus on other characteristics.

<sup>13</sup> It is also worth noting that the histogram does not indicate any clear missing mass on the right hand side of the cutoff (see right panel of Figure 2).

# 5. Results

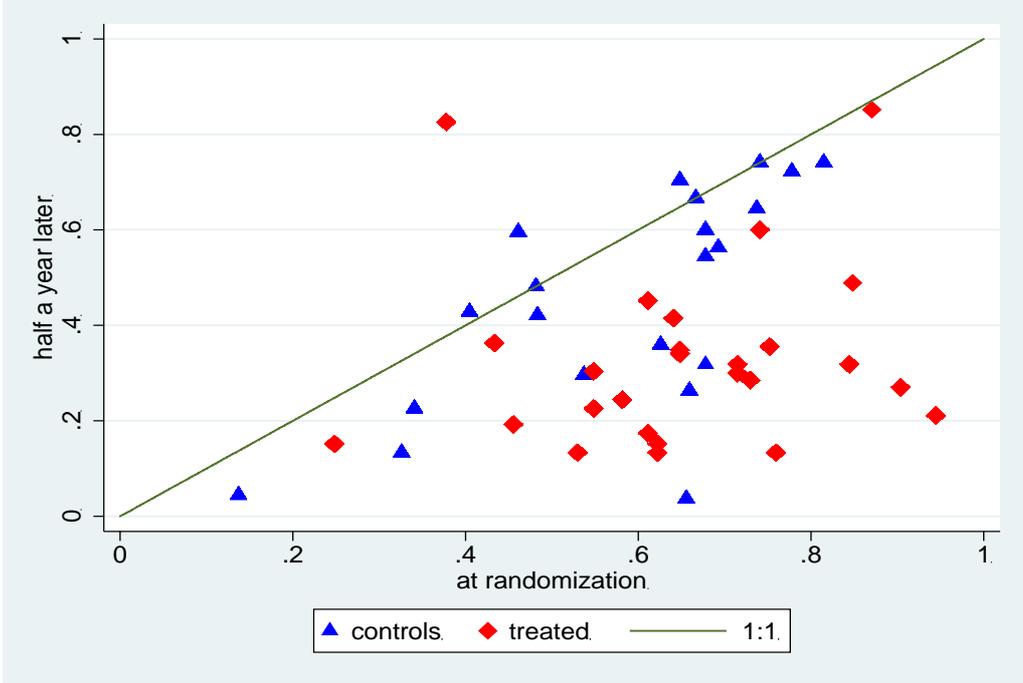
This section first presents the results from the randomized assignment to IP. Thereafter we turn to the RDD.

## 5.1 Randomized Treatment Assignment

### 5.1.1 Subjective Assessment by Probation Officers

We first consider the subjective assessment by the probation officers at the time of randomization and half a year later. Figure 3 presents these two scores. Within the control group, the average score improved from 0.58 when put on probation to 0.45 six months later.<sup>14</sup> According to the probation officer’s score, only three cases on RP deteriorated during this time period. Yet the officers see more progress among convicts in the IP program. Among the treatment group, the average score drops from 0.65 to 0.32 six months later. The difference in differences is highly significant (Mann Whitney,  $N = 46$ ,  $p < 0.001$ ). Recall, however, that all IP cases are handled by four probation officers. The pattern could therefore be driven by these officers being overly optimistic about the impact of their work. We thus turn to more objective data on recidivism.

**Figure 3 – Subjective Assessment by Probation Officers.**



*Note:* The figure plots the probation officers evaluation score at the beginning of the probation period and six months later. The score is normalized to unit interval (with a higher the score indicating a more problematic condition).

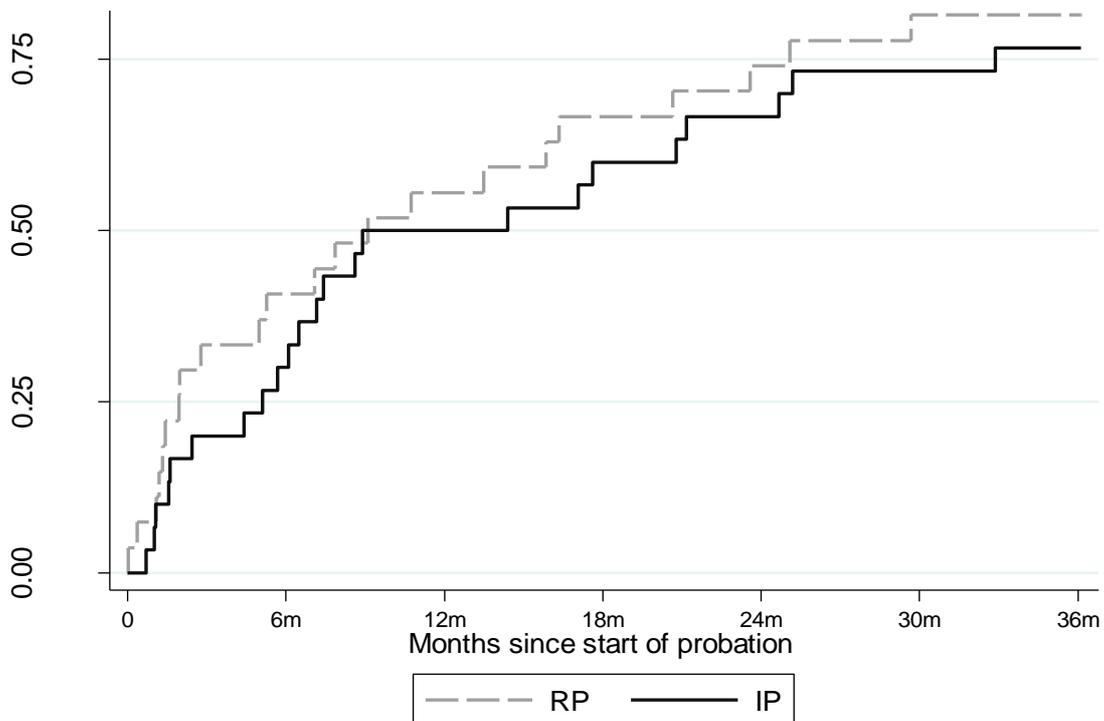
<sup>14</sup> Recall that a lower score represents a “better”, less problematic outcome (see Section 3.3).

### 5.1.2 Recidivism

Figure 4 compares cumulative recidivism rates between the treatment (IP) and the control (RP) group. Consistently with the program’s focus on the most problematic among young offenders, the figure documents very high recidivism rates. Within 10 months, every second convict committed another crime. After three years, this rate raises to more than 75%. However, the figure also suggests that IP has indeed a positive effect in terms of reducing recidivism.

During the first month there is no noticeable difference. Between the second and the sixth month (the end of “intensive” part of the probation period), recidivism rates in the IP group are between 10pp and 13pp below the rates observed for RP. In relative terms, this corresponds to a 20-30% decline. However, the differences are statistically insignificant (with two-sided tests yielding p-values in the range of 0.250, N = 57).

**Figure 4 – Recidivism over Time.**



*Note:* The figure plots the recidivism rates for the treatment (intensive probation) and control group (regular probation). N = 57.

After the end of IP, in particular, between months six to ten, the treatment gap closes again and becomes virtually zero. The evidence therefore suggests that IP seems to have a positive, stabilizing effect during the treatment period, but that the effect vanishes fairly quickly. The patterns in the second and third year, however, indicate again lower recidivism rates for IP (with a treatment difference in a range between 5pp and 10pp). Hence, conditional on not having re-committed a crime within the first year, the program might provide some beneficial mid-run effects, too. This pattern is also reflected in estimates that consider recidivism within intervals ranging from one to 36 months are time periods (see Figure A.2).

Parametric estimates from duration models, which support our interpretation from above, are reported in Appendix Table A.2. Considering re-offenses observed during the entire 3 year outcome window, the estimated hazard ratio is between 0.73 and 0.82 (Table A.2, Col. 1 and 2), suggesting a roughly 20 percent lower hazard (i.e., probability of re-offending conditional on not having done so before) in IP as compared to RP. When we allow for time varying hazards, we observe – consistently with Figure 4 – a stronger effect during the first six months (ratios between 0.50 and 0.67) with an opposing trend during the next six months (positive hazard ratios of 1.26 and 1.16; see Col. 5 and 6, respectively). During the second year, however, hazard rates are consistently between 0.73 and 0.81. (In the third year, hazard rates are very close to unity.) While none of these estimates is statistically significant, the effect sizes are meaningful and, once more, point to both a short-run (during the six months of IP) and mid-run (during the second year after probation) effect from IP.

**Table 3 – LPM Estimates: Recidivism Rates I**

|                    | (1)               | (2)                | (3)               | (4)                | (5)               | (6)               |
|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|-------------------|
| <i>Panel A</i>     |                   |                    |                   |                    |                   |                   |
| Recidivism         | 3 months          |                    | 6 months          |                    | 12 months         |                   |
| IP                 | -0.133<br>(0.119) | -0.259*<br>(0.144) | -0.107<br>(0.129) | -0.207<br>(0.197)  | -0.056<br>(0.135) | -0.077<br>(0.192) |
| Control variables: | N                 | Y                  | N                 | Y                  | N                 | Y                 |
| RP mean:           | 0.333             | 0.333              | 0.407             | 0.407              | 0.556             | 0.556             |
| <i>Panel B</i>     |                   |                    |                   |                    |                   |                   |
| Recidivism         | 1.5 years         |                    | 2 years           |                    | 3 years           |                   |
| IP                 | -0.067<br>(0.130) | -0.259*<br>(0.144) | -0.074<br>(0.123) | -0.292*<br>(0.162) | -0.048<br>(0.109) | -0.154<br>(0.159) |
| Control variables: | N                 | Y                  | N                 | Y                  | N                 | Y                 |
| RP mean:           | 0.667             | 0.667              | 0.741             | 0.741              | 0.815             | 0.815             |

*Note:* The table presents estimated treatment effects on recidivism (binary outcome), considering time frames between 3 months and 3 years. All estimates are based on linear probability models, with a sample of N = 57. Robust standard errors are in parenthesis. RP mean presents the average recidivism rate in the control group with regular probation. Control variables in specifications (2), (4) and (6) include age, gender, dummies for the start of the probation period as well as indicators based on the different dimensions in the judges' scorecards (e.g., alcohol or drug addiction; intermediate or high aggression levels; highly problematic peers). \* indicates significance at the 10%-level.

A complementary way to capture these time-varying effects is presented in Table 3. Here we use linear probability models to estimate treatment effects on a binary recidivism indicator for time windows ranging from 3 months to three years. All estimates indicate a negative impact (a lower recidivism rate) for IP. Both unconditional and conditional treatment effects (without and with controls) are, in absolute terms, declining within the first year. During the

second year, the absolute treatment difference raises again. For both, the short-run and mid-run recidivism, we detect some weakly significant estimates.

In a next step, we replicate the analysis distinguishing between recidivism related to a violent crime or a property crime. The estimation results from Table 4 provide some indication of differential treatment effects on different crime types. For violent crimes, we observe a similar pattern as above: a relatively large effect of IP during the first six months (see Table 4, Panel A, Columns 1 and 2) which declines thereafter but survives throughout years two and three. For property crime, in contrast, there is no indication of any impact from IP. Both the short- and the mid-run effects on recidivism tend to be very close to zero (see Table 4, Panel B). This provides suggestive evidence that IP mainly works via preventing (or postponing) violent re-offenses.

**Table 4 – LPM Estimates: Recidivism Rates II (Violent and Property Crimes)**

|                                 | (1)               | (2)               | (3)               | (4)               | (5)               | (6)               | (7)               | (8)               |
|---------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| <i>Panel A: Violent Crimes</i>  |                   |                   |                   |                   |                   |                   |                   |                   |
| Recidivism                      | 6 months          |                   | 1 year            |                   | 2 years           |                   | 3 years           |                   |
| IP                              | -0.156<br>(0.103) | -0.165<br>(0.106) | -0.093<br>(0.110) | -0.195<br>(0.122) | -0.100<br>(0.121) | -0.150<br>(0.158) | -0.107<br>(0.129) | -0.039<br>(0.189) |
| Controls:                       | N                 | Y                 | N                 | Y                 | N                 | Y                 | N                 | Y                 |
| RP mean:                        | 0.222             | 0.222             | 0.259             | 0.259             | 0.333             | 0.333             | 0.407             | 0.407             |
| <i>Panel B: Property Crimes</i> |                   |                   |                   |                   |                   |                   |                   |                   |
| Recidivism                      | 6 months          |                   | 1 year            |                   | 2 years           |                   | 3 years           |                   |
| IP                              | 0.011<br>(0.113)  | -0.056<br>(0.171) | 0.033<br>(0.129)  | 0.061<br>(0.165)  | 0.056<br>(0.135)  | -0.023<br>(0.191) | -0.026<br>(0.133) | -0.042<br>(0.179) |
| Controls:                       | N                 | Y                 | N                 | Y                 | N                 | Y                 | N                 | Y                 |
| RP mean:                        | 0.222             | 0.222             | 0.333             | 0.333             | 0.444             | 0.444             | 0.593             | 0.593             |

Note: The table presents estimated treatment effects on crime-specific recidivism indicators (binary outcome), i.e., for violent (Panel A) and property crimes/re-offenses (Panel B), distinguishing a time frames between 6 months and 3 years. All estimates are based on linear probability models, with a sample of N = 57. Robust standard errors are in parenthesis. RP mean presents the average violent-crime or property-crime recidivism rate in the control group with regular probation. Control variables in specifications (2), (4), (6) and (8) include dummies for the start of the probation period as well as indicators based on the different dimensions in the judges' scorecards (e.g., alcohol or drug addiction; intermediate or high aggression levels; highly problematic peers). \* indicates significance at the 10%-level.

The results from above offer weak evidence suggesting that IP lowers the chances of reoffending. To examine whether treatment effects at the extensive margin (i.e., reconviction: yes or no) are mirrored at the intensive margin, we studied count variables that measure the number of crimes for which the individual has been convicted during different time windows.

The estimates, which are reported in Appendix Table A.3, are all negative (see Panel A), indicating a relatively small, statistically insignificant decline in the number of crimes.<sup>15</sup> The point estimates are not too different from the extensive margin drop in recidivism reported in Table 3 above. A similar picture – i.e., small and insignificant estimates – emerges when we consider the severity of re-offenses (as captured by the imposed legal sanction; estimates not reported). Overall, the data on the number and severity of re-convictions provide no compelling evidence on intensive margin responses to IP. If at all, the program seems to alter crime outcomes mainly at the extensive margin.

## 5.2 RDD Results

The results from the randomized program assignment provide weak evidence suggesting that IP reduced recidivism rates. However, the main limitation of the evidence from above is its restricted power associated with the small sample size. To assess whether we find similar results when we explore a slightly larger sample, we now turn to the RDD. We assess if the discontinuity in treatment rates yields findings that are consistent with the results from the previous sub-section. Before doing so, however, it is important to recall that Section 5.1 reported average treatment effects (ATEs). The RDD, in contrast, will yield local average treatment effects (LATEs), for cases that are on the edge to be program eligible. Put differently, the RDD effects are identified from “less severe” convicts – those with a lower point score on the scorecard. With this important caveat in mind, let us first provide some graphical evidence.

Figure 5 visualizes our basic, reduced-form RD estimates (using simple, linear slopes for  $f$  and  $g$  from equation 1). Note first, that the linear fits indicate an intuitive, positive correlation between point score and recidivism: more problematic offenders (with a higher point score) are more likely to re-offend within a one or three year time period, respectively. Second, there seems to be a discontinuous drop in recidivism rates at the eligibility cutoff. Those marginally above the cutoff – who have an approximately 50% chance of entering intensive probation – display lower rates of recidivism (both, within a one and a three-year time period).

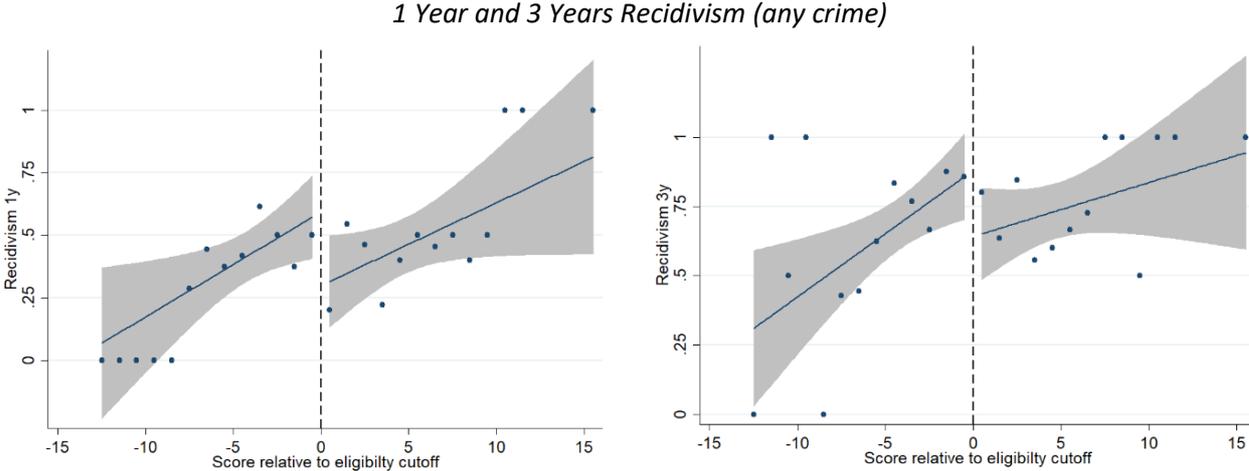
The estimates from Table 5 confirm this discontinuity, indicating that the observed drops in recidivism are statistically significant. The coefficients suggest that reoffending declines between 10pp (6months) and around 30pp (1 - 3 years period) once the IP eligibility cutoff is passed. The results further indicate that the point estimates hardly change when we add control variables. This is reassuring and, together with the smoothness of covariates around the cutoff (see Table A.1), provides support for the validity of the RDD.

The estimates suggest that the IPs’ crime reducing effect builds up during the first year and remains roughly constant thereafter. This picture is confirmed in Figure 6, which offers a more detailed impression of the dynamics of the reduced form effects. The figure plots point

<sup>15</sup> Very similar results are obtained when we estimate count data models (e.g., Poisson regressions).

estimates and confidence intervals of 36 RD estimations of equation (1) with binary dependent variables  $Y_m$ , indicating a re-offense within  $m$ -months and  $m = \{1, \dots, 36\}$ . The figure suggests that the effect builds up during the first year. For any period after 10 months, we detect a significantly negative effect. After the 12<sup>th</sup> month, the effect is fairly stable throughout the three-year period. Hence, the RD estimates do not indicate any decay in the LATE.<sup>16</sup>

**Figure 5 – Discontinuity in Recidivism at the IP-eligibility cutoff.**



Notes: The figure presents estimated discontinuities in 1- (left) and 3-year recidivism rates (right sub-figure) at the IP eligibility cutoff (linear fits with 95%-confidence intervals). The binned data present the average recidivism rate among convicts with a given point score (relative to the eligibility cutoff). N = 171.

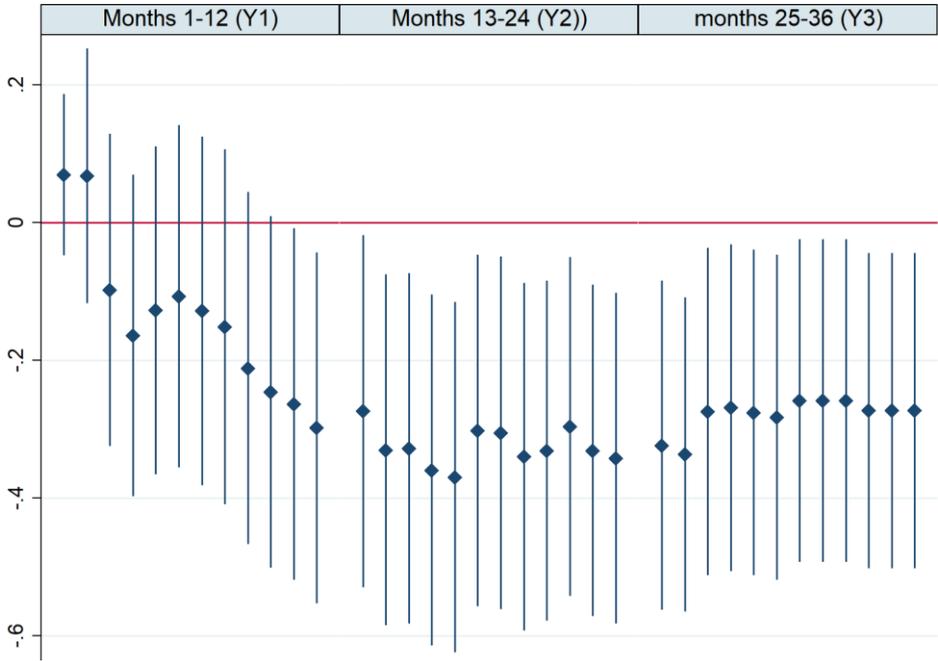
**Table 5 – RDD Estimates of Equation (1)**

|             | (1)               | (2)               | (3)                 | (4)               | (5)                  | (6)                 | (7)                 | (8)                 |
|-------------|-------------------|-------------------|---------------------|-------------------|----------------------|---------------------|---------------------|---------------------|
| Recidivism  | 6 months          |                   | 1 year              |                   | 2 years              |                     | 3 years             |                     |
| Eligibility | -0.107<br>(0.126) | -0.069<br>(0.141) | -0.298**<br>(0.129) | -0.224<br>(0.146) | -0.343***<br>(0.122) | -0.324**<br>(0.127) | -0.273**<br>(0.116) | -0.267**<br>(0.119) |
| Controls:   | N                 | Y                 | N                   | Y                 | N                    | Y                   | N                   | Y                   |

Note: The table presents reduced form RD estimates at the IP-eligibility cutoff. All specifications control linearly for the correlation between point-score and outcomes (differentiating for the range below and above the cutoff, see equation 1). The dependent variables are recidivism binary indicators for different time periods. Specifications (2), (4), (6) and (8) include controls (time period fixed effects for the start of the probation period as well as indicators for alcohol or drug addiction; intermediate or high aggression levels; highly problematic peers). Sample: N = 171. Robust standard errors are in parenthesis. \*\*\*/\*\*/\* indicates significance at the 1%-/5%-/10%-level.

<sup>16</sup> The corresponding graph for the RCT estimates – Figure A.2 in the Appendix – is characterizes by much larger confidence intervals. It is nevertheless worth noting that the LATE seems to follow a slightly different trend: relative to the ATE, the effect seems to emerge less quickly during the six months of the core period of IP.

**Figure 6 – Reduced Form RD Estimates over Time.**



*Notes:* The figure presents the estimated coefficients and 95% confidence intervals from 36 different reduced form RD estimates (in the spirit of Tables 5, Panel A). Dependent variables are dummies indicating recidivism within  $m$ -months, with  $m = \{1, \dots, 36\}$ .  $N = 171$ .

As noted above, the reduced form estimates must be interpreted as local, intention to treat (ITT) effect. To turn from an ITT to a TOT effects, Table 6 presents 2SLS estimates of equation (3). Consistently with the roughly 50% discontinuity in the treatment propensity, the point estimates from the 2SLS in Panel A are roughly twice as large as those from the reduced form from Table 5.<sup>17</sup> While some of these coefficients appear very large, note that (a) the estimates are relatively imprecise and the 95%-confidence intervals typically overlap with the ATEs observed in the RCT. Alternatively, (b) one the large point estimates could suggests that the program has a particularly pronounced impact on less severe offenders that are close to the eligibility cutoff: “less problematic” cases could benefit much more from IP.<sup>18</sup>

Table 6 further examines recidivism separately for violent and property crimes (see Panel B). We find statistically insignificant results for both of the two types of recidivism. For violent crimes, the point estimates meander around zero. For property crimes, the estimates are consistently negative. Note that this contrasts to the evidence from the RCT sample, where there

<sup>17</sup> Figure A.1 provides evidence on the treatment discontinuity (i.e., the first stage). Consistently with random treatment assignment, we observe a jump in the treatment rate of roughly 50 percent. In order to get to TOT effects, one therefore has to deflate our reduced form (ITT) estimates by 0.5.

<sup>18</sup> Consistently with this interpretation, we find larger average treatment effects if we split our RCT sample into low (vs high) point-score cases. Due to the limited sample size, however, this heterogeneity analysis comes with very large standard errors.

**Table 6 – 2SLS RD Estimates of Equation (3)**

|                                  | (1)                   | (2)               | (3)                   | (4)               | (5)                    | (6)                 | (7)                    | (8)                |
|----------------------------------|-----------------------|-------------------|-----------------------|-------------------|------------------------|---------------------|------------------------|--------------------|
| <i>Panel A: Any Crime</i>        |                       |                   |                       |                   |                        |                     |                        |                    |
| Recidivism                       | 6 months              |                   | 1 year                |                   | 2 years                |                     | 3 years                |                    |
| IP<br>(instrumented)             | -0.152<br>(0.602)     | -0.093<br>(0.789) | -0.603*<br>(0.078)    | -0.511<br>(0.205) | -0.726**<br>(0.033)    | -0.769**<br>(0.040) | -0.510*<br>(0.096)     | -0.560*<br>(0.093) |
| <i>Panel B: By Crime Type</i>    |                       |                   |                       |                   |                        |                     |                        |                    |
| Recidivism                       | <i>Violent Crimes</i> |                   | <i>Violent Crimes</i> |                   | <i>Property Crimes</i> |                     | <i>Property Crimes</i> |                    |
|                                  | 1 year                |                   | 3 years               |                   | 1 year                 |                     | 3 years                |                    |
| IP<br>(instrumented)             | 0.138<br>(0.577)      | 0.059<br>(0.824)  | 0.009<br>(0.976)      | -0.101<br>(0.756) | -0.197<br>(0.480)      | -0.210<br>(0.537)   | -0.199<br>(0.537)      | -0.246<br>(0.506)  |
| <i>Panel C: Number of Crimes</i> |                       |                   |                       |                   |                        |                     |                        |                    |
| Count                            | 6 months              |                   | 1 year                |                   | 2 years                |                     | 3 years                |                    |
| IP<br>(instrumented)             | -0.165<br>(0.687)     | -0.130<br>(0.794) | 0.114<br>(0.853)      | 0.298<br>(0.685)  | -0.614<br>(0.446)      | -0.542<br>(0.544)   | -0.507<br>(0.631)      | -0.542<br>(0.648)  |
| Controls:                        | N                     | Y                 | N                     | Y                 | N                      | Y                   | N                      | Y                  |
| 1 <sup>st</sup> stage F-Stat.    | 19.745                | 19.125            | 19.745                | 19.125            | 19.745                 | 19.125              | 19.745                 | 19.125             |

Note: The table presents 2SLS RD estimates, using the IP-eligibility cutoff as instrument. Every second specification includes a vector control variables. Kleibergen-Paap F-statistics from the first stage regressions (see Equation 2, Section 3) are provided at the bottom of the table. Note that the first stage is independent of the outcome variable and only varies with the inclusion of controls. The dependent variables in Panel A and B are recidivism indicators (binary outcomes) for different time periods. Panel A considers any recidivism, Panel B distinguishes between violent and property crimes/re-offenses. Panel C uses a count for (any) crimes as outcome variables. Sample: N = 171. Robust standard errors are in parenthesis. \*\*\*/\*\*/\* indicates significance at the 1%-/5%-/10%-level.

were some indications on a decline in violent crimes. For the RDD, the drop in recidivism seems to stem from property crimes and minor (non-violent and non-property) crimes. This difference again highlights that the LATE is identified for relatively less severe offenders (as compared to the ATE estimated from the RCT).

We also explored crime at the intensive margin (Panel C). The estimated discontinuities for the number of crimes tend to be negative, but are all statistically insignificant. For the crime count after two and three years, the estimates are quantitatively very similar to the estimates reported in Panel A. The latter observation suggests that the crime reduction is again driven by extensive rather than intensive margin responses.

One concern with the RD analysis relates to the potential heaping of cases below the eligibility cutoff (see Section 4.2). As pointed out above, any strategic sorting of cases would question the validity of the RDD. To assess the robustness of our results, we ran so called “donut” RD estimates, which exclude a range around the cutoff (in particular, convicts with one point below and above the eligibility cutoff). Reduce form donut estimates, which are reported in Table A.4, confirm the findings from above. In fact, the point estimates document a significantly negative drop in property crimes.<sup>19</sup>

In further robustness exercises, we worked with a slightly larger set of control variables (that comes at the cost of a smaller sample due to numerous missings). Results were hardly affected. One should note, however, that the results are sensitive to the linearity assumption applied above: if one accounts for the link between the point score and outcomes using quadratic or higher order polynomials, one obtains very different estimates. A graphical analysis suggests that the non-linear estimates are mainly driven by data points far away from the cutoff. In fact, if we restrict the sample to cases with, e.g., 7 score-points around the cutoff, the linear and non-linear estimates yield again very similar results.

## 6. Discussions

### 6.1 Mechanisms and Measurement

As discussed in Section 2, the IP program involves many different dimensions. In general, probation officers take over new cases more swiftly and can then devote more time for personal meetings and monitoring. Our data do now allow us to distinguish which program feature is most relevant in shaping the results reported above.

One concern might be that a higher contact intensity also implies a stricter level of control and supervision in IP. This program feature could mechanically increase the chance of detecting further crimes or violations of probation conditions. In turn, this could increase the measured recidivism rates among the IP group, both at the extensive and intensive margin. There are at least three reasons why we do not think that this is an issue. First, there is a growing body of evidence suggesting that increased level of supervision for probationers and parolees has no impact on recidivism (Georgiou 2014, Hyatt and Barnes 2017). This speaks against the relevance of this concern. Second, note that both the RCT and the RDD estimates point to persistent effects that remain stable during the second and third year after the start of IP, i.e., long after the end of the period of intensive supervision. Finally, if the mechanism would nevertheless play a role, it would bias our results against finding a recidivism reducing program effect. Our estimates would then be lower bounds of ‘true’ treatment effects.

<sup>19</sup> Similar (more imprecise) results are obtained in 2SLS donut estimates as well as when we impose a larger “donut hole” (with +/-2 points around the cutoff). In the latter case, however, the sample size shrinks substantially and standard errors increase accordingly.

## 6.2 Hawthorne Effect

It was not possible to implement the RCT without the consent of probation officers and judges. Probation officers were thus aware of the study. While officers did neither know about the RD design nor about who is in the relevant evaluation sample, one might nevertheless worry about a Hawthorne effect (Landsberger 1958, Adair 1984, McCambridge, Witton et al. 2014). It could be that some probation officers work extra hard as they know that they are evaluated. This could lead to either an over- or and under-estimation of the treatment effect (if either IP or RP officers put in relatively more effort after learning about the evaluation).

To assess whether the findings from our RCT are confounded by such a Hawthorne effect, we exploit the data on the scorecards for the post-randomization period. Recidivism rates (during a 6-, 12- or 24-month period) for the 38 cases observed in this period are not statistically different from the rates in our RCT sample. Among the 38 filled scorecards 14 cases would have qualified for the IP program. Recidivism rates in this group are again statistically indistinguishable from our IP or our RP group (with p-values from Fisher's exact tests in the range between 0.690 and 0.863). Similar null results are obtained for the severity of later convictions, the number of days between the first and the next conviction, or the number of later convictions for violent or for property crime. While these null-results do not rule out the presence of a Hawthorne effect, the analysis at least suggests that there has been no major structural break after the communicated end of our evaluation period.

## 6.3 Power

As noted above, one of the main limitations of our study is the limited sample size of the RCT. We had to live with the fact that the probation office did not have more manpower, and that (fortunately) the large district of the regional Court of Cologne did not produce more eligible cases. As the evaluation was placing some administrative burden on the court (and the team of research assistants), we could not extend the evaluation period. The limited sample size obviously impedes our ability to precisely identify small effects. Independently of the policy relevance of small effects, it is reassuring that the RDD finds a meaningful, positive effect of the program.

## 6.4 Cost-Benefit Analyses

Intensive probation reduces the total amount of cases a probation officer handles. Therefore, it is more expensive than regular probation. To see whether the potential benefits (in terms of lower recidivism rates) outweigh the cost we performed a simple back-of-the-envelope cost benefit analysis. Details of our calculations, which use our recidivism estimates and proxies for the direct victimization costs, are provided in Appendix 3.

For our RCT-Sample we estimate that the additional resource costs are higher than the reduction in victimization costs (both within one and within three years after the program). However, as the total social costs of recidivism are plausibly larger than the mere victimization

costs (see Appendix 3), the social benefits should compensate the costs. By contrast, the results from the RDD point to much larger social benefits. In fact, for the RDD sample the reduced victimization costs alone are roughly twice as large as the resource costs of the program. Given our small sample size, the results from this simple cost-benefit analysis should be treated with caution.<sup>20</sup>

Yet, it is reassuring that we can identify some positive effects which are probably underestimated as the program focuses on juveniles for which the successful prevention of criminal careers yields much higher returns in the long run (Cohen and Piquero 2009).

## 7. Concluding Summary

Against a widely shared pessimism of “nothing works” in reducing recidivism, our study provided experimental and quasi-experimental evidence that points to the effectiveness of an intensive probation program from Cologne, Germany. Data from an RCT and an RDD suggest that the program, which significantly increases the personal support that young probationers receive over a six month program, tends to reduce recidivism in the short- and the mid-run. The crime reducing effect seems to operate at the extensive rather than the intensive margin. The RDD, which documents a larger drop in recidivism, indicates that the decline in recidivism is more pronounced among less severe offenders. It is up to future work to isolate the specific mechanism that shapes this decline in crime.

## References

- ADAIR, JOHN G (1984). "The Hawthorne Effect. A Reconsideration of the Methodological Artifact." Journal of Applied Psychology **69**(2): 334-345.
- ASSCHER, JESSICA J, MAJA DEKOVIĆ, WILLEKE MANDERS, PETER H VAN DER LAAN, PIER JM PRINS, SANDER VAN ARUM AND DUTCH MST COST-EFFECTIVENESS STUDY GROUP (2014). "Sustainability of the Effects of Multisystemic Therapy for Juvenile Delinquents in The Netherlands. Effects on Delinquency and Recidivism." Journal of Experimental Criminology **10**(2): 227-243.
- AUSTIN, JAMES, KAREN JOE, BARRY KRISBERG AND PA STEELE (1990). "The Impact of Juvenile Court Sanctions. A Court that Works." Focus: The National Council on Crime and Delinquency: 1-7.
- BARRECA, ALAN I, MELANIE GULDI, JASON M LINDO AND GLEN R WADDELL (2011). "Saving Babies? Revisiting the Effect of Very Low Birth Weight Classification." Quarterly Journal of Economics **126**(4): 2117-2123.

<sup>20</sup> The cost-benefit analysis also neglects general equilibrium effects: if IP is perceived as the most likely “punishment” for those who are on the edge to imprisonment, this might imply lower deterrence.

- BAYER, PATRICK, RANDI HJALMARSSON AND DAVID POZEN (2009). "Building Criminal Capital Behind Bars. Peer Effects in Juvenile Corrections." Quarterly Journal of Economics **124**(1): 105-147.
- BERG, IAN, ROY HULLIN, RALPH MCGUIRE AND STEPHEN TYRER (1977). "Truancy and the Courts. Research Note." Journal of Child Psychology and Psychiatry **18**(4): 359-365.
- BHULLER, MANUDEEP, GORDON B DAHL, KATRINE V LØKEN AND MAGNE MOGSTAD (2020). "Incarceration, Recidivism, and Employment." Journal of Political Economy **128**(4): 1269-1324.
- BRANK, EVE, JODI LANE, SUSAN TURNER, TERRY FAIN AND AMBER SEHGAL (2008). "An Experimental Juvenile Probation Program. Effects on Parent and Peer Relationships." Crime & Delinquency **54**(2): 193-224.
- COHEN, MARK A AND ALEX R PIQUERO (2009). "New Evidence on the Monetary Value of Saving a High Risk Youth." Journal of Quantitative Criminology **25**(1): 25-49.
- COUNCIL, NATIONAL RESEARCH (2007). Parole, Desistance from Crime, and Community Integration, National Academies Press.
- CULLEN, FRANCIS T AND PAUL GENDREAU (2000). "Assessing Correctional Rehabilitation. Policy, Practice, and Prospects." Criminal Justice **3**(1): 299-370.
- DOLEAC, JENNIFER L (2019). Encouraging Desistance from Crime. [http://jenniferdoleac.com/wp-content/uploads/2019/02/Doleac\\_Desistance\\_Feb2019.pdf](http://jenniferdoleac.com/wp-content/uploads/2019/02/Doleac_Desistance_Feb2019.pdf).
- 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**.
- ENTORF, HORST (2014). Jenseits der Fallzahlen: Die Kriminalitätsentwicklung bei ökonomischer Bewertung der Schäden, IZA Standpunkte Nr. 73.
- ERWIN, BILLIE S (1986). "Turning Up the Heat on Probationers in Georgia." Federal Probation **50**: 17-24.
- FARABEE, DAVID, SHELDON X ZHANG AND BENJAMIN WRIGHT (2014). "An Experimental Evaluation of a Nationally Recognized Employment-focused Offender Reentry Program." Journal of Experimental Criminology **10**(3): 309-322.
- FOLKARD, M. STEVEN, ANTHONY J. FOWLES, BRENDA C. MCWILLIAMS, DAVID D. SMITH, DAVID E. SMITH AND G. ROY WALMSLEY (1974). Impact, Intensive Matched Probation and After-care Treatment, Home Office.
- FOLKARD, M. STEVEN, DAVID E. SMITH AND DAVID D. SMITH (1976). IMPACT: Intensive Matched Probation and After Care Treatment 2: The Results of an Experiment, Home Office, London.
- GEORGIU, GEORGIOS (2014). "Does Increased Post-release Supervision of Criminal Offenders Reduce Recidivism? Evidence from a Statewide Quasi-experiment." International Review of Law and Economics **37**: 221-243.
- GUYDISH, JOSEPH, MONICA CHAN, ALAN BOSTROM, MARTHA A JESSUP, THOMAS B DAVIS AND CHERYL MARSH (2011). "A Randomized Trial of Probation Case Management for Drug-involved Women Offenders." Crime & Delinquency **57**(2): 167-198.

- HJALMARSSON, RANDI (2009), "Crime and Expected Punishment: Changes in Perceptions at the Age of Criminal Majority." *American Law and Economics Review* 11(1): 209-248.
- HAWKEN, ANGELA AND MARK KLEIMAN (2009). Managing Drug Involved Probationers with Swift and Certain sanctions: Evaluating Hawaii's HOPE. <https://www.ncjrs.gov/App/Publications/abstract.aspx?ID=252477>.
- HUTTUNEN, KRISTIINA, SARI PEKKALA KERR AND VILLE MÄLKÖNEN (2014). The Effect of Rehabilitative Punishments on Juvenile Crime and Labor Market Outcomes. [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2492430](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2492430).
- HYATT, JORDAN M AND GEOFFREY C BARNES (2017). "An Experimental Evaluation of the Impact of Intensive Supervision on the Recidivism of High-risk Probationers." *Crime & Delinquency* 63(1): 3-38.
- LANDSBERGER, HENRY A (1958). Hawthorne Revisited: Management and the Worker, Its Critics, and Developments in Human Relations in Industry. Ithaca.
- LANE, JODI, SUSAN TURNER, TERRY FAIN AND AMBER SEHGAL (2005). "Evaluating an Experimental Intensive Juvenile Probation Program. Supervision and Official Outcomes." *Crime & Delinquency* 51(1): 26-52.
- LEE, DAVID S AND THOMAS LEMIEUX (2010). "Regression Discontinuity Designs in Economics." *Journal of Economic Literature* 48(2): 281-355.
- LIPSEY, MARK W AND DAVID B WILSON (1998). Effective Intervention for Serious Juvenile Offenders. A Synthesis of Research, Sage Publications, Inc.
- LIPSEY, MARK W. AND FRANCIS T. CULLEN (2007). "The Effectiveness of Correctional Rehabilitation. A Review of Systematic Reviews." *Annual Review of Law and Social Science* 3: 297-320.
- LOTTI, GIULIA (2020). "Tough on Young Offenders. Harmful or Helpful?" *Journal of Human Resources*, forthcoming.
- LOWENKAMP, CHRISTOPHER T, JENNIFER PALER, PAULA SMITH AND EDWARD J LATESSA (2006). "Adhering to the Risk and Need Principles. Does it Matter for Supervision-based Programs." *Federal Probation* 70: 3-8.
- MASTROBUONI, GIOVANNI AND DANIELE TERLIZZESE (2019). Leave the Door Open? Prison Conditions and Recidivism, Working Paper.
- MCCAMBRIDGE, JIM, JOHN WITTON AND DIANA R ELBOURNE (2014). "Systematic Review of the Hawthorne Effect. New Concepts are Needed to Study Research Participation Effects." *Journal of Clinical Epidemiology* 67(3): 267-277.
- PEARSON, FRANK S, DOUGLAS S LIPTON, CHARLES M CLELAND AND DORLINE S YEE (2002). "The Effects of Behavioral/Cognitive-behavioral Programs on Recidivism." *Crime & Delinquency* 48(3): 476-496.
- PETERSILIA, JOAN (1989). "Implementing Randomized Experiments. Lessons from BJA's Intensive Supervision Project." *Evaluation Review* 13(5): 435-458.

- PETERSILIA, JOAN AND SUSAN TURNER (1990a). "Comparing Intensive and Regular Supervision for High-risk Probationers. Early Results from an Experiment in California." Crime & Delinquency **36**(1): 87-111.
- PETERSILIA, JOAN AND SUSAN TURNER (1990b). Diverting Prisoners to Intensive Probation. Results of an Experiment in Oregon. Santa Monica, Rand.
- PETERSILIA, JOAN AND SUSAN TURNER (1990c). Intensive Supervision for High-Risk Probationers. Findings from Three California Experiments. Santa Monica, Rand.
- PETERSILIA, JOAN AND SUSAN TURNER (1991). "An Evaluation of Intensive Probation in California." Journal of Criminal Law and Criminology **82**: 610-658.
- PETERSILIA, JOAN AND SUSAN TURNER (1993). "Intensive Probation and Parole." Crime and Justice **17**: 281-335.
- PKS (2018). Police Crime Statistics, Federal Republic of Germany Report 2018. [https://www.bka.de/SharedDocs/Downloads/EN/Publications/PoliceCrimeStatistics/2018/pks2018\\_englisch.html?nn=113788](https://www.bka.de/SharedDocs/Downloads/EN/Publications/PoliceCrimeStatistics/2018/pks2018_englisch.html?nn=113788).
- RODRIGUEZ-PLANAS, NURIA (2012). "Longer-term impacts of Mentoring, Educational Services, and Learning Incentives. Evidence from a Randomized Trial in the United States." American Economic Journal: Applied Economics **4**(4): 121-139.
- SONTHEIMER, HENRY AND LYNNE GOODSTEIN (1993). "An Evaluation of Juvenile Intensive Aftercare Probation. Aftercare versus System Response Effects." Justice Quarterly **10**(2): 197-227.
- 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.
- TURNER, SUSAN AND JOAN PETERSILIA (1992). "Focusing on High-risk Parolees. An Experiment to Reduce Commitments to the Texas Department of Corrections." Journal of Research in Crime and Delinquency **29**(1): 34-61.
- 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.

## Appendix:

### Appendix 1: Additional Tables

**Table A.1 – Placebo Checks: Discontinuity in Observables.**

|               | (1)                  | (2)                | (3)                  | (4)               | (5)                |
|---------------|----------------------|--------------------|----------------------|-------------------|--------------------|
|               | §57 JGG              | §27 JGG            | Alcohol<br>Addiction | Drug<br>Addiction | Aggression<br>High |
| Discontinuity | 0.0112<br>(0.887)    | -0.0663<br>(0.613) | 0.0814<br>(0.494)    | 0.0813<br>(0.509) | -0.0002<br>(0.997) |
|               | (6)                  | (7)                | (8)                  | (9)               | (10)               |
|               | Problematic<br>Peers | Age                | Gender               | Violent<br>Crime  | Property<br>Crime  |
| Discontinuity | 0.0112<br>(0.887)    | -0.0663<br>(0.613) | 0.0814<br>(0.494)    | 0.0813<br>(0.509) | -0.0002<br>(0.997) |

*Note:* The table presents RDD estimates at the IP-eligibility cutoff considering observable characteristics. Each entry reports the discontinuity from a different estimation (i.e., a different outcome variable). All specifications control linearly for the correlation between point-score and outcomes (differentiating for the range below and above the cutoff). Sample: N = 171 in specifications (1) – (8) and N = 152 in (9) – (10). Robust standard errors are in parenthesis.

**Table A.2 – Duration Analysis: Time until first re-offense.**

|                 | (1)              | (2)              | (3)              | (4)              | (5)              | (6)              |
|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|
| IP              | 0.824<br>[0.514] | 0.729<br>[0.343] |                  |                  |                  |                  |
| IP x Year1      |                  |                  | 0.825<br>[0.594] | 0.664<br>[0.333] |                  |                  |
| IP x Month0--6  |                  |                  |                  |                  | 0.669<br>[0.365] | 0.493<br>[0.214] |
| IP x Month6--12 |                  |                  |                  |                  | 1.260<br>[0.712] | 1.154<br>[0.809] |
| IP x Year2      |                  |                  | 0.729<br>[0.607] | 0.806<br>[0.737] | 0.729<br>[0.607] | 0.814<br>[0.749] |
| IP x Year3      |                  |                  | 1.053<br>[0.952] | 0.988<br>[0.988] | 1.053<br>[0.952] | 0.990<br>[0.990] |
| Controls        | No               | Yes              | No               | Yes              | No               | Yes              |

*Note:* The table presents estimated hazard ratios from Cox proportional hazard models. Specifications (3)–(6) present time dependent hazard ratios. Specifications (2), (4) and (6) control for age, gender and include dummies for the start of the probation period as well as indicators based on the different dimensions in the judges' scorecards (e.g., alcohol or drug addiction; intermediate or high aggression levels; highly problematic peers). P-values, based on robust standard errors, are presented in brackets. N = 57.

**Table A.3 – Number of convicted crimes**

|  | (1)                   | (2)               | (3)                   | (4)               | (5)                    | (6)               | (7)                    | (8)               |
|--|-----------------------|-------------------|-----------------------|-------------------|------------------------|-------------------|------------------------|-------------------|
| <i>Panel A: All Crimes</i>                             |                       |                   |                       |                   |                        |                   |                        |                   |
| Number of Crimes                                       | 6 months              |                   | 1 year                |                   | 2 years                |                   | 3 years                |                   |
| IP   | -0.148<br>(0.159)     | -0.298<br>(0.254) | -0.115<br>(0.249)     | -0.178<br>(0.383) | -0.141<br>(0.309)      | -0.630<br>(0.483) | -0.104<br>(0.427)      | -0.581<br>(0.654) |
| Controls:  | N                     | Y1                | N                     | Y1                | N                      | Y1                | N                      | Y1                |
| RP mean:   | 0.481                 | 0.481             | 0.815                 | 0.815             | 1.407                  | 1.407             | 2.037                  | 2.037             |
| <i>Panel B: By Crime Type</i>                          |                       |                   |                       |                   |                        |                   |                        |                   |
| Number of Crimes                                       | <i>Violent Crimes</i> |                   | <i>Violent Crimes</i> |                   | <i>Property Crimes</i> |                   | <i>Property Crimes</i> |                   |
|  | 1 year                |                   | 3 years               |                   | 1 year                 |                   | 3 years                |                   |
| IP   | -0.096<br>(0.137)     | -0.223<br>(0.176) | -0.056<br>(0.238)     | -0.062<br>(0.367) | -0.011<br>(0.176)      | -0.025<br>(0.237) | -0.056<br>(0.244)      | -0.238<br>(0.342) |
| Controls:  | N                     | Y1                | N                     | Y1                | N                      | Y1                | N                      | Y1                |
| RP mean:   | 0.296                 | 0.296             | 0.630                 | 0.630             | 0.444                  | 0.444             | 0.852                  | 0.852             |
| <i>Panel C: Smaller Sample &amp; Extended Controls</i> |                       |                   |                       |                   |                        |                   |                        |                   |
| Number of Crimes                                       | <i>All Crimes</i>     |                   | <i>All Crime</i>      |                   | <i>Violent Crimes</i>  |                   | <i>Violent Crimes</i>  |                   |
|  | 1 year                |                   | 3 years               |                   | 1 year                 |                   | 3 years                |                   |
| IP   | -0.217<br>(0.276)     | -0.279<br>(0.261) | -0.060<br>(0.383)     | -0.211<br>(0.376) | -0.523<br>(0.722)      | -0.701<br>(0.702) | -0.196<br>(0.142)      | -0.257<br>(0.164) |
| Controls:  | Y1                    | Y2                | Y1                    | Y2                | Y1                     | Y2                | Y1                     | Y2                |
| RP mean:   | 0.913                 | 0.913             | 2.130                 | 2.130             | 0.304                  | 0.304             | 0.696                  | 0.696             |

*Note:* The table presents estimated treatment effects on the number of crimes during time windows between 6 months and 3 years. Panel A counts all crimes, Panel B and C distinguish between different types of crimes. All estimates are based on linear models. Panel A and B are based on the full sample (N = 57), Panel C explores a smaller sample for which the extended controls are available (N = 50). Robust standard errors are in parenthesis. RP mean presents the average number of crimes in the control group with regular probation. The basic control variables (Y1) include age, gender, dummies for the start of the probation period as well as indicators based on the different dimensions in the judges' scorecards (e.g., alcohol or drug addiction; intermediate or high aggression levels; highly problematic peers). The augmented set of controls (Y2) further include indicators for the type of crime resulting in the probation sentence.

**Table A.4 – “Donut” RD Estimates (Reduced Form)**

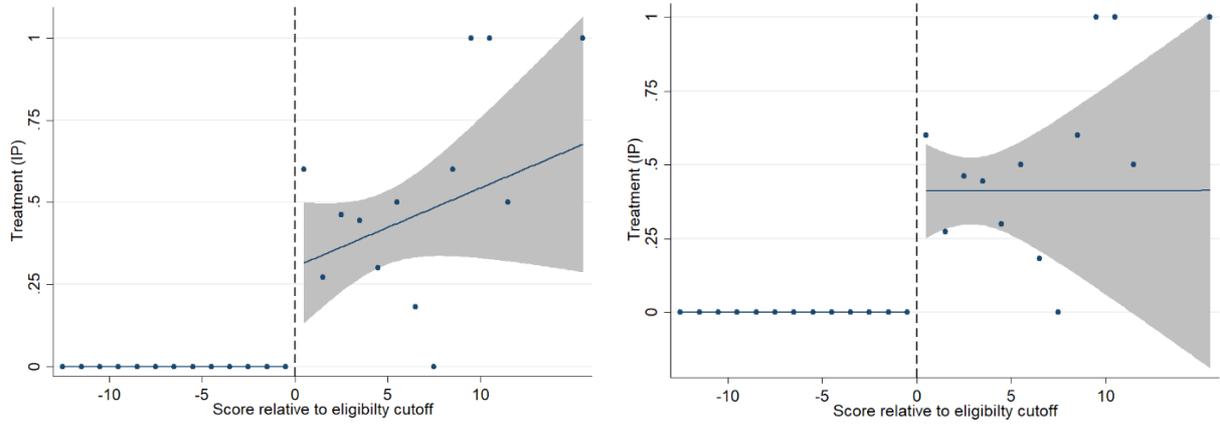
|                                  | (1)                             | (2)               | (3)                              | (4)                | (5)                              | (6)                 | (7)                               | (8)                |
|----------------------------------|---------------------------------|-------------------|----------------------------------|--------------------|----------------------------------|---------------------|-----------------------------------|--------------------|
| <i>Panel A: Any Crime</i>        |                                 |                   |                                  |                    |                                  |                     |                                   |                    |
| Recidivism                       | 6 months                        |                   | 1 year                           |                    | 2 years                          |                     | 3 years                           |                    |
| Eligibility                      | -0.181<br>(0.150)               | -0.160<br>(0.155) | -0.333**<br>(0.154)              | -0.304*<br>(0.167) | 0.440***<br>(0.150)              | 0.426***<br>(0.157) | -0.283*<br>(0.148)                | -0.280*<br>(0.161) |
| Controls:                        | N                               | Y                 | N                                | Y                  | N                                | Y                   | N                                 | Y                  |
| <i>Panel B: By Crime Type</i>    |                                 |                   |                                  |                    |                                  |                     |                                   |                    |
| Recidivism                       | <i>Violent Crimes</i><br>1 year |                   | <i>Violent Crimes</i><br>3 years |                    | <i>Property Crimes</i><br>1 year |                     | <i>Property Crimes</i><br>3 years |                    |
| Eligibility                      | 0.079<br>(0.112)                | 0.048<br>(0.116)  | 0.169<br>(0.134)                 | 0.138<br>(0.146)   | -0.296**<br>(0.147)              | -0.286*<br>(0.164)  | -0.025<br>(0.166)                 | -0.066<br>(0.180)  |
| Controls:                        | N                               | Y                 | N                                | Y                  | N                                | Y                   | N                                 | Y                  |
| <i>Panel C: Number of Crimes</i> |                                 |                   |                                  |                    |                                  |                     |                                   |                    |
| Count                            | 6 months                        |                   | 1 year                           |                    | 2 years                          |                     | 3 years                           |                    |
| Eligibility                      | -0.265<br>(0.192)               | -0.253<br>(0.211) | -0.220<br>(0.260)                | -0.217<br>(0.275)  | -0.521<br>(0.374)                | -0.605<br>(0.374)   | -0.641<br>(0.468)                 | -0.765<br>(0.477)  |
| Controls:                        | N                               | Y                 | N                                | Y                  | N                                | Y                   | N                                 | Y                  |

*Note:* The table presents reduced form “donut” RDD estimates at the IP-eligibility cutoff. Panel A replicates the estimates from Table 4, excluding observations with a score one point below and above the cutoff (i.e., the “donut hole”, 12 and 13 points on the scorecard). Sample size thus shrinks to N = 151. All specifications control linearly for the correlation between point-score and outcomes (differentiating for the range below and above the cutoff). The dependent variables in Panel A and B are recidivism indicators (binary outcomes) for different time periods. Panel A considers any recidivism, Panel B distinguishes between violent and property crimes/re-offenses. Panel C uses a count for (any) crimes as outcome variables. Specifications (2), (4), (6) and (8) add further controls (time period fixed effects for the start of the probation period as well as indicators for alcohol or drug addiction; intermediate or high aggression levels; highly problematic peers). Robust standard errors are in parenthesis. \*\*\*/\*\*/\* indicates significance at the 1%-/5%-/10%-level.

## Appendix 2: Additional Figures

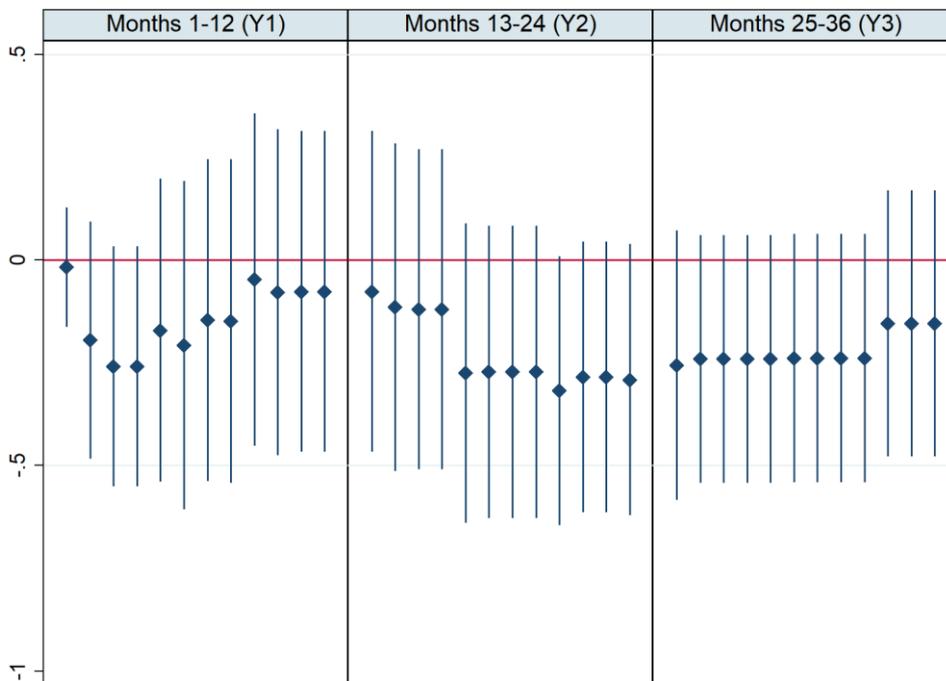
**Figure A.1 – Treatment Discontinuity at the IP-eligibility cutoff.**

*Treatment Rates : unweighted (left) and weighted fit (right panel)*



*Notes:* The figure presents estimated discontinuities in the treatment rates: the share of convicts which enter IP (linear fits with 95%-confidence intervals). The binned data present the average treatment rate among convicts with a given point score (relative to the eligibility cutoff). The estimate in the right panel is weighted by the number of observations at a given point score. N = 171.

**Figure A.2 – RCT: Estimated Treatment Effects on Recidivism over time (binary)**



*Notes:* The figure presents point estimates and 95% confidence intervals from 36 different estimates of treatment effects on recidivism in the spirit of Tables 3. The dependent variable is a dummy indicating a re-offense within  $m$ -months, with  $m = \{1, \dots, 36\}$ . N = 57.

### Appendix 3: Cost Benefit Analyses

Let us first turn to the costs of the Intensive Probation (IP) program. Probation officers in the IP program dedicate more time to the juvenile offenders, which reduces the total number of cases they administrate. The annual gross salary of probation officers is based on the tariff agreements for state employees (TV-L 10). For an officer with at least ten years of experience it is 58,505 Euro. The work load for an officer who is only active in RP is 60 cases and for a probation officer who is active in IP it is 5 IP plus 25 RP cases (at any given month). One IP cases is thus equivalent to 7 RP cases. Based on this conversion rate (and accounting for the fact that IP is limited to six months) we arrive at additional cost of 1 IP (over 1 RP) case of  $(6,825 - 975)/2 = \mathbf{2,925 \text{ Euro}}$ . Given that other administrative procedures (and costs) do not differ between IP and RP cases, this number gives us a good proxy for the marginal costs of offering one case of intensive rather than regular probation.

Next we consider the program's benefits in terms of reducing recidivism. Unfortunately, good estimates for the social costs of different crimes in Germany are not available. What is available, though, are reasonable estimates for the victimization costs, which are calculated based on the German Police Crime Statistics PKS (2018) and Entorf (2014). Some of these estimates are listed below:

|              |            |                 |             |
|--------------|------------|-----------------|-------------|
| Severe Theft | 2,500 Euro | Robbery         | 8,500 Euro  |
| Theft        | 500 Euro   | Aggrav. Assault | 31,500 Euro |
| Fraud        | 2,300 Euro | Rape            | 92,000 Euro |

Source: PKS (2018)

Source: Entorf (2014)

Note that studies on the social costs of crime indicate that victimization costs only account for between 33% and 75% of the total direct costs of crime (i.e., including costs for the justice system and offenders' productivity costs). In addition, the willingness-to-pay for crime reductions are typically much higher than the total direct costs of crime (Cohen and Piquero 2009). Considering only victimization costs, we therefore obtain a very conservative lower bound on the potential program benefits.

With these caveats in mind, we use the estimates from PKS (2018) and Entorf (2014) to compute the average victimization cost of re-offenses in the RCT and the RDD sample. In doing so, we account for the distribution of different types of crimes observed within a one- and a three-year interval. For the RCT sample we arrive at an *average* costs per re-offense (within one and three years) of 11,000 Euro and 12,300 Euro, respectively. In our RDD sample, these costs are smaller with 10,400 Euro and 11,900 Euro, respectively.<sup>25</sup> Based on these numbers, we now use the estimated program impact on recidivism after one year and three years to approximate the gains from lower victimization costs.

<sup>25</sup> For the RCT sample, the victimization cost of an average violent crime is roughly 24,500 Euro and the average cost of an average property crime is roughly 1,800 Euros. In our RDD-Sample the corresponding numbers are 26,200 Euros for a violent crime and 2,400 Euros for a property crime.

**RCT Estimates:** The point estimates from Table 3 indicate that IP reduces recidivism by 7.7 pp within one and by 15.4pp within three years (Column 6, Panel A and B). Based on the proxies from above, these effects translate into a decline in victimization costs of 850 Euro within one year and roughly 1,900 Euro after three years. These numbers are clearly below the marginal costs of the program (2,925 Euro). However, if the total social costs of crime were at least 50% larger than the mere victimization costs (which seems plausible, see Cohen and Piquero 2009), the program's benefits after 3 years clearly outweigh the costs (given reasonable discount factors). Note further that Table 4 provides suggestive evidence indicating that the decline in recidivism is mainly driven by a lower risk of violent (rather than property) crimes – in particular, within the first year. This would again imply higher program benefits.

**RDD Estimates:** The point estimates from the RDD reported in Table 6, Column (4) and (8) indicate a 51.1pp and 56.0pp drop in recidivism within one and three years after the start of the probation period, respectively. This, in turn, yields a reduction in victimization costs of approximately 5,300 and 6,700 Euro, respectively. The estimated treatment effects thus indicate that the program benefits clearly outweigh its costs, with net benefits of around 2,400 Euro after one and 3,700 Euro after three years. Note, again, that the social benefits would be larger as we only consider the decline in direct victimization costs.

## Appendix 4: Judges' Scorecard

### 1. General structural deficiencies in the living environment: Family

|  |  |  |  |   |
|--|--|--|--|---|
| No reliable family relationship  |  |  |  | 3 |
| Participation in family life limited to eating and sleeping                  |  |  |  | 2 |
| Participation in family life in family with deficient educational competence |  |  |  | 1 |
| Reliable family relationship   |  |  |  | 0 |

### 2. General structural deficiencies in the living environment: housing

|                             |   |   |   |   |
|-----------------------------|---|---|---|---|
| Lives in an facility        | 3 | 2 | 1 | 0 |
| Lives in personal apartment | 3 | 2 | 1 | 0 |
| Lives in hotel              | 3 | 2 | 1 | 0 |
| Homeless                    | 3 | 2 | 1 | 0 |

### 3. General structural deficiencies in the living environment: school/education

|   |   |   |
|---|---|---|
| No participation in school / apprenticeship / training/therapy        | 3 |   |
| Deficient participation in school / apprenticeship / training/therapy | 2 | 1 |
| Regular participation in school / apprenticeship / training/therapy   | 0 |   |

### 4. Personal deficiencies: structured day

|  |   |   |
|--|---|---|
| Not maintaining a structured day             | 3 |   |
| Limited ability to maintain a structured day | 2 | 1 |
| Maintaining a well structured day            | 0 |   |

### 5. Personal deficiencies: fulfillment of duties

|                                 |   |  |
|---------------------------------|---|--|
| Deficient fulfillment of duties | 2 |  |
| Limited fulfillment of duties   | 1 |  |
| Good fulfillment of duties      | 0 |  |

### 6. Peers & Social Contact:

|  |   |   |   |   |
|--|---|---|---|---|
| Exclusively problematic contacts       | 5 | 4 | 3 | 2 |
| Problematic and unproblematic contacts | 3 |   | 2 | 1 |
| Exclusively unproblematic contacts     |   |   |   | 0 |

### 7. Addiction problems: alcohol

|                     |   |   |   |   |
|---------------------|---|---|---|---|
| Alcohol consumption | 3 | 2 | 1 | 0 |
|---------------------|---|---|---|---|

### 8. Addiction problems: drugs

|                  |   |   |   |   |
|------------------|---|---|---|---|
| Drug consumption | 3 | 2 | 1 | 0 |
|------------------|---|---|---|---|

### 9. Aggression

|                     |   |   |   |   |   |   |   |
|---------------------|---|---|---|---|---|---|---|
| Level of aggression | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------------------|---|---|---|---|---|---|---|

### 10. Willingness to actively participate in program

|     |   |
|-----|---|
| No  | 1 |
| Yes | 0 |

### Exclusion rules

#### Deficiencies and obstacles with regard to understanding and susceptibility

Every single criterion leads to exclusion

|  | yes | no |
|--|-----|----|
| 1. Proband speaks no German  |     |    |
| 2. Substantial intellectual deficiency, resulting in a significant reduction in the ability to follow instructions |     |    |
| 3. Mental illness (medical diagnosis)  |     |    |
| 4. Excessive use of hard drugs (junkie)  |     |    |
| 5. Lack of problem awareness regarding own delinquency   |     |    |
| 6. Lack of intention to change   |     |    |
| 7. Current involvement in at least two active interventions (over-intervention)                                    |     |    |

## Appendix 5: Probation Officers' Scorecard

### 1. General structural deficiencies in the living environment: Family

(Please tick only once per time)

|   | Beginning of probation     | After 6 months             |
|---|----------------------------|----------------------------|
| No reliable family relationship                               | 3 <input type="checkbox"/> | 3 <input type="checkbox"/> |
| Participation in family life limited to eating and sleeping   | 2 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| Participation in family life with deficient family competence | 1 <input type="checkbox"/> | 1 <input type="checkbox"/> |
| Reliable family relationship                                  | 0 <input type="checkbox"/> | 0 <input type="checkbox"/> |

### 2. General structural deficiencies in the living environment: housing

|                             | Beginning of probation  | After 6 months  |
|-----------------------------|---|---|
| Lives in facility           | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> 0 <input type="checkbox"/> | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> 0 <input type="checkbox"/> |
| Lives in personal apartment | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> 0 <input type="checkbox"/> | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> 0 <input type="checkbox"/> |
| Lives in hotel              | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> 0 <input type="checkbox"/> | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> 0 <input type="checkbox"/> |
| Homeless                    | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> 0 <input type="checkbox"/> | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> 0 <input type="checkbox"/> |

### 3. General structural deficiencies in the living environment: Education

|   | Beginning of probation                                | After 6 months  |
|---|---|---|
| No participation in school/apprenticeship/training/therapy        | 3 <input type="checkbox"/>                            | 3 <input type="checkbox"/>                            |
| Deficient participation in school/apprenticeship/training/therapy | 2 <input type="checkbox"/> 1 <input type="checkbox"/> | 2 <input type="checkbox"/> 1 <input type="checkbox"/> |
| Regular participation in school/apprenticeship/training/therapy   | 0 <input type="checkbox"/>                            | 0 <input type="checkbox"/>                            |

### 4. Personal competence deficiencies: Structured day

|  | Beginning of probation                                | After 6 months  |
|--|---|---|
| No structured day                            | 3 <input type="checkbox"/>                            | 3 <input type="checkbox"/>                            |
| Limited ability to maintain a structured day | 2 <input type="checkbox"/> 1 <input type="checkbox"/> | 2 <input type="checkbox"/> 1 <input type="checkbox"/> |
| Well-structured day                          | 0 <input type="checkbox"/>                            | 0 <input type="checkbox"/>                            |

**5. Personal competence deficiencies: Fulfillment of duties**

|                                 | Beginning of probation     | After 6 months             |
|---------------------------------|----------------------------|----------------------------|
| Deficient fulfillment of duties | 2 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| Limited fulfillment of duties   | 1 <input type="checkbox"/> | 1 <input type="checkbox"/> |
| Good fulfillment of duties      | 0 <input type="checkbox"/> | 0 <input type="checkbox"/> |

**6. Peers and social contacts:**

|  | Beginning of probation  | After 6 months  |
|--|---|---|
| Exclusively problematic contacts       | 5 <input type="checkbox"/> 4 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> | 5 <input type="checkbox"/> 4 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> |
| Problematic and unproblematic contacts | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/>                            | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/>                            |
| Exclusively unproblematic contacts     | 0 <input type="checkbox"/>  | 0 <input type="checkbox"/>  |

**7. Addiction problems: Alcohol**

|                     | Beginning of probation  | After 6 months  |
|---------------------|---|---|
| Alcohol consumption | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> 0 <input type="checkbox"/> | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> 0 <input type="checkbox"/> |

**8. Addiction problems: Drugs**

|                  | Beginning of probation  | After 6 months  |
|------------------|---|---|
| Drug consumption | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> 0 <input type="checkbox"/> | 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> 0 <input type="checkbox"/> |

**9. Aggression:**

|                     | Beginning of probation  | After 6 months  |
|---------------------|---|---|
| Level of aggression | 6 <input type="checkbox"/> 5 <input type="checkbox"/> 4 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/><br>0 <input type="checkbox"/> | 6 <input type="checkbox"/> 5 <input type="checkbox"/> 4 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/><br>1 <input type="checkbox"/> 0 <input type="checkbox"/> |

**10. Cooperation and willingness to accept support:**

| Beginning of probation                 | After 6 months                         |
|--|--|
| (fairly) good <input type="checkbox"/> | (fairly) good <input type="checkbox"/> |
| (fairly) bad <input type="checkbox"/>  | (fairly) bad <input type="checkbox"/>  |