Under Pressure? Performance Evaluation of Police Officers as an Incentive to Cheat: Evidence from Drug Crimes in Russia*

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Abstract

This paper investigates the use of high-powered incentives for civil servants in the public sector by analyzing possible manipulations of seized drug amounts by Russian police. First, using a bunching estimator, I document a significant excess mass of heroin cases above the punishment threshold. Next, combining the bunching with an event study framework, I study the incentives for police officers to manipulate and find evidence consistent with the motivation arising from the officers' performance evaluation. Further negative consequences of the inappropriate incentives are inequality in the enforcement of law and prolonged sentences. Thus, I determine that police officers are more likely to manipulate the drug amounts seized from repeat offenders. The overall effect of manipulation on the sentence length of drug users is an additional year of incarceration, which is a 67% increase on the average sentence length without manipulation.

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Keywords: Drug Crimes, Police Discretion, Performance Evaluation, Incentives.

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1 Introduction

For decades, scholars have been investigating the relationship between incentives and effort. Nevertheless, there is still no clear understanding of how to effectively motivate civil servants in a non-market environment. While weak incentives are mostly inefficient, high-powered performance-related incentives could be inappropriate in some government jobs resulting in negative effects. As was highlighted in the seminal paper by Holmstrom and Milgrom (1991), many civil servant's jobs are characterized by multitasking. At the same time, some objectives that civil servants have to attend to are more easily measured than others. In such a situation, strong incentives could detract attention away from tasks that are not easily measured, or even induce fraudulent behavior.

Nevertheless, the use of high-powered incentives tailored to easily measurable and quantifiable indicators is a common practice across bureaucracies in many countries. Thus, for example, the distorting effect of these incentives is documented for teachers (Jacob and Levitt 2003, Jacob 2005), doctors (Alexander 2020), government officials (Fisman and Wang 2017) and law enforcers (Mas 2006, Ash and MacLeod 2015, Makowsky et al. 2019, Acemoglu et al. 2020). In this paper, I study the effect of strong incentives on the behavior of police officers resulting in substantial manipulations of the amounts of drugs seized from offenders in Russia in the 2013-2014 period.

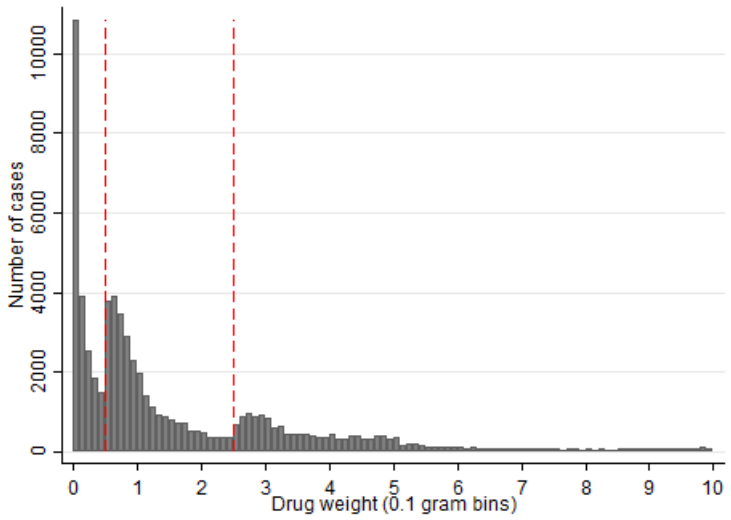
Russia, a notable example in this context, provides a natural laboratory for investigating the use of incentives in the public sector. Figure 1, obtained from Knorre (2017), shows the distribution of heroin cases across drug quantities seized in Russia during the 2013-2014 period. Two dashed lines indicate the threshold drug amounts that define three classes of the severity of the drug possession offences, and accordingly the punishment[1]. The Figure reveals a striking pattern suggesting that, at the moment of arrest, many people possess a drug amount just above a threshold beyond which they will be convicted of a more serious offence. In addition, there is a missing mass of cases just below the thresholds. This phenomenon is suggestive of manipulations of the drug quantities seized by the police, moving offenders from below to above the thresholds.

In the paper, I discuss why the observed discontinuities are rather due to manipulations with drug amounts than due to the self-selection of offenders or differential enforcement by the police around the cutoff. In addition, I present anecdotal evidence that these manipulations were more likely in the form of increasing the actual drug weights, not merely changing the numbers in documents (Section 4.1). While the paper's results and conclusions do not depend on the exact method of manipulating, knowing that planting drugs on offenders may occur and may be relatively costless is important for further policy making.

To study the incentives for possible manipulations, I exploit the specific feature of

[1]There is also a third threshold (at 500 grams for heroin) that is not depicted on the graph.

Figure 1: Distribution of cases across quantities of heroin seized in Russia during 2013-2014



Note: The baseline sample consists of all heroin related cases registered in Russia during 2013-2014. The thresholds (dashed lines) determine the scale of seizure (less than significant, significant and large drug amounts), the severity of crime and punishment. This graph replicates Figure 5 in Knorre (2017).

the Russian institutional context, namely, the existence of two drug control agencies, which were similar in many aspects but had different performance evaluation approaches. Thus, in order to set incentives, one of the agencies compared the performance of its officers within each station over time so that the most recent performance would not be worse than previously. Therefore, the target - the number of severe cases that should be reported by the end of the year - was always known to officers, thus making incentives to manipulate clearer and stronger. In contrast, the other agency used the performance comparison across stations, and officers could only forecast the target that they should reach based on their performance and that of other officers in previous years. Using a standard bunching estimator and an event study approach and comparing two agencies, I show that the observed patterns in the distribution of drug related cases and in the behavior of police officers over the year are consistent with them being driven by the performance evaluation systems[2].

In the second part of the paper, I identify further negative consequences of the inappropriate incentives: inequality in the enforcement of law and prolonged sentences. Adopting the novel bunching technique from Diamond and Persson (2016), I investigate the characteristics of victims of manipulations of seized drug amounts and estimate the effect of the manipulation on sentence length. The results suggest that while the demographics and socio-economic status of offenders do not have a significant effect on a

[2]It is worth noting that bribery may be another motive for police officers to manipulate the drug amounts, or to threaten offenders with possible manipulation. This is discussed in more detail in Section 4.2.

police officer's decision to manipulate, having a criminal history increases the probability of becoming a victim of such manipulation. In contrast, Volkov (2016) analyzes all felony cases processed by Russian federal district courts during the 2009-2013 period and finds a significant bias in judges' decisions against entrepreneurs and offenders of low socio-economic status. Kurmangaliyeva (2017) determines that the Russian judicial system is more lenient towards wealthier defendants.

The estimation results suggest that there were around 3000 offenders who were moved above the threshold as a result of manipulation during the 2013-2014 period. The overall estimated effect of the manipulation on the sentence length of drug users (who constitute almost 70% of all manipulated offenders) is around one additional year of incarceration. This is an almost 67% increase on the average sentence length (1.5 years) without manipulation. The magnitude of this effect is not dependent on a guilty plea. These estimates allow me to discuss the total social cost of applying the inappropriate incentive structure in the public sector. Although this cost is difficult to calculate precisely, the welfare loss from prolonged sentences and inequality in the enforcement of the law likely outweigh any benefits from keeping drug users off the streets.

This paper adds to the still scarce but growing literature on performance evaluations and incentive schemes in the public sector. In law enforcement, studying the effect of various policies on the behavior of agents is particularly important because occasionally it becomes a matter of life and death. For example, Acemoglu et al. (2020) investigate the use of high-powered incentives for the military in Colombia and find that rewarding army members for killing guerillas (left-wing insurgents) significantly increases the number of false positives when innocent civilians are killed and misrepresented as guerillas. This is an extreme example of an adverse response to poorly designed incentives in a highly consequential setting, similar to drug manipulations in Russia investigated in my paper. Nevertheless, these studies broaden the empirical evidence and also provide general insights useful for policy making in other settings.

The manipulation of the drug quantities seized by the Russian police is widely discussed in various media reports[3]. There are also some descriptive studies (Paneyakh 2014, Knorre 2017) and more quantitative analysis of the distribution of drug related cases (Skougarevskiy 2017, Knorre 2020). However, these papers do not test for the possibility that the incentive structure used by law enforcement agencies induces the fraudulent behavior. Thus, this study addresses this gap by presenting a rigorous analysis of possible drug manipulation and the mechanism behind it. Using Russia as an example, it raises a concern about the ever-increasing use of performance-related incentives in the public sector by showing their distorting effect in an environment where manipulations are ex ante less expected.

[3]For example, see Nadezhdin and Matveeva (2019), Merzlikin (2019), Antonov (2019).

Among studies on incentives in law enforcement, there is a range of papers that focus on incentives arising from various punishment thresholds. The response to these thresholds may come from two sides: offenders who might strategically bunch below the thresholds (Traxler et al. 2018, Lepage 2020), and law enforcers who might want to adjust the punishment for some offenders around the thresholds (Anbarci and Lee 2014, Goncalves and Mello 2017, Bjerk 2005, Ulmer et al. 2007, Rehavi and Starr 2014, Bjerk 2017). I focus on the latter case and, in contrast to most existing studies, analyze a setting in which law enforcers behave in a more repressive way, intentionally increasing, instead of decreasing, the penalty for the offender[4].

Similar to this study, Tuttle (2019) also finds the bunching of drug offenders above the punishment threshold. However, using U.S. data he comes to a different conclusion as to why the bunching occurs, which highlights my results in an interesting way. Thus, in contrast to my paper, Tuttle (2019) documents that the observed excess mass of drug offenders is due to prosecutorial discretion: prosecutors may use legal tools to move offenders above the threshold if they believe these offenders deserve a harsher punishment. Additionally, Tuttle (2019) finds bunching only for crack-cocaine traffickers, whereas I document bunching for both heroin users and sellers. In general, the main focus of his paper is on racial discrimination, while this study adds to the scarce literature on the negative consequences of strong incentives in the public sector of countries where race and ethnicity play a lesser role in defining social status.

The rest of this paper is organized as follows. Section 2 describes the institutional context and data. In Section 3, I provide the empirical strategy, and in Section 4, I present the results. Section 5 contains concluding remarks.

2 Institutional Context and Data

This section briefly discusses the institutional background, providing information on Russian anti-drug laws and the system of performance evaluation for police officers. Additionally, it describes the dataset used for the empirical analysis.

[4]Anbarci and Lee (2014) and Goncalves and Mello (2017) use U.S. data on speeding tickets and find an excess mass at speeds just below the first threshold, above which the fine increases. They take this bunching as evidence of manipulation by police officers, who may wish to avoid onerous punishment for drivers. Bjerk (2005), Ulmer et al. (2007) and Rehavi and Starr (2014) find that some prosecutors are more likely to charge offenders who were initially arrested for crimes under a mandatory minimum sentencing law with a lesser crime not covered by this law. Bjerk (2017) focuses on drug crimes in the US and finds that first-time drug offenders are likely to avoid prosecution under a mandatory minimum law.

2.1 Institutional Context

The first independent Russian anti-drug agency was established in 2002. Since then it has been reorganized multiple times, and in 2004 was renamed the Russian Federal Service for Drug Control (FSKN)[5], also known as the "Drug Police". The responsibilities of this agency included the control of legal, and combat of illicit drug trafficking, and prevention of drug abuse. The FSKN shared jurisdiction with the Public Security Service (Police) of the Ministry of Internal Affairs (MVD)[6], but was solely responsible for coordinating and pursuing Russian drug investigations abroad (The Ministry of Internal Affairs of the Russian Federation, n.d.). While the main focus of the FSKN was on larger cases (drug trafficking, organized crime, large drug amounts), the MVD mostly dealt with routine low-profile cases, such as drug use and small-quantity drug sales. Almost two thirds of all drug related cases registered during 2013-2014 were initiated by the MVD. At the same time, the MVD provided many other public security functions, and drug control was not its only responsibility.

Even though the MVD and FSKN were supposed to have different drug control strategies, in practice, their efforts were duplicative. Thus, the FSKN seized large drug amounts very rarely, and median seizure sizes for the two agencies in the case of heroin were around 1-2 grams. In addition, all drug trafficking cases were almost evenly split between the MVD and FSKN, and the compositions of drugs seized by the agencies were similar (Knorre and Skougarevskiy 2015). However, around 76% of all possessions for personal use were registered by the MVD. In 2016, the FSKN was dissolved, and its functions were transferred to the MVD.

Anti-drug legislation. 95% of all drug crimes registered in Russia in 2013-2014 were prosecuted under articles 228 and 228.1 of its Criminal Code. The severity of a penalty under these articles depends on the type of drug offence (drug use or drug sale) and on the amounts of drugs seized, which are classified via threshold amounts as "significant", "large" or "especially large" (Appendix, Tables B1 and B2). According to the law, the drug quantity seized is determined not by the weight of the pure drug substance but by the weight of the entire mixture. Therefore, if a police officer seizes, for example, one gram of heroin mixed with two grams of sugar, it will be considered as three grams of heroin.

Punishment for drug possession of a "significant" amount, with no intention to sell, is imprisonment for up to three years. For "large" and "especially large" amounts, the punishment is imprisonment for three to ten and ten to fifteen years, respectively. In the case of voluntary surrender of drugs to a police officer and active assistance during the investigation, an offender is exempted from criminal liability. If the amount of drug seized

[5]Federal'naya sluzhba Rossiiskoi Federacii po kontrolyu za oborotom narkotikov, FSKN.
[6]Ministerstvo vnutrennih del Rossiiskoi Federacii, MVD.

is less than significant, the person can only be brought to administrative responsibility punished with a fine up to $142[7] or administrative arrest for up to fifteen days.

Drug sale is punishable by imprisonment for four to eight years if the amount is less than "significant", eight to fifteen years for a "significant" amount, and ten to twenty years for a "large" amount. "Especially large" amounts carry a fifteen to twenty years, or life, sentence. In this case, the crime is serious if the amount of drug seized is less than "significant", and most serious if the amount is "significant" or higher.

The practice of plea bargaining was introduced in 2001. During 2013-2014 around 60% of all cases, and 30% of drug related offences, were adjudicated based on plea bargaining. Pleading guilty significantly simplifies the procedure: a conviction is pronounced without the actual examination of evidence at a court hearing. In addition, a person that accepts a plea bargain waives the right to appeal. In return, by pleading guilty the offender lowers the upper bound of the sentencing range by one third.

The performance evaluation of anti-drug agency personnel. During the 2013-2014 period, when both the FSKN and the MVD were responsible for enforcing drug laws, each had their own officers' performance evaluation system. The system used by the FSKN was based on performance indicators that, among others, included the number of serious and most serious drug crimes solved (per 100 officers). For each indicator, the FSKN regional offices received a position in cross-region ratings. The final evaluation was determined by the overall rank of the office in relation to other offices based on these ratings.

On the other hand, the system of performance evaluation of the MVD was based on an overall score for each regional office. Among the highest weighted parameters that entered the score was again the number of serious and most serious crimes solved (per 100 officers). Crucially, in contrast to the FSKN, the MVD stations compared performance with their own evaluation in the previous year[8] (Novikova 2014).

If the officer met or surpassed the targets, he might receive a monetary bonus to his monthly salary or promotion (for high-profile cases). While there was no guarantee that the officer would be rewarded for good performance, he certainly was reprimanded, warned or even fired in the case of unsatisfactory performance. In addition, the officer could be deprived of monthly bonuses, in addition to the fixed salary, if he did not fulfill the plan.

Thus, the system of performance evaluation presented strong incentives for police officers to show the required level of cases and prosecutions in an environment where the manipulation of drug amounts, mainly in the form of planting drugs, was (and still is)

[7]All amounts are expressed in U.S. dollars using the average 2013-2014 exchange rate (RUB/USD = 35.158).

[8]Formally, after the reforms in 2011, the MVD offices had to compare their performance across units rather than relative to the previous period. However, locally this did not work due to the complexity of the system.

relatively costless for police officers due to the specific rules applied to weighing the drugs seized. Even more, in Russia, police officers are rarely punished for the falsification of evidence[9] (Nikonov 2020) because the law enforcement system does not want these cases of police misconduct to be made public and thus harm its reputation.

In addition, not only police officers were evaluated based on easily measurable and quantifiable indicators, but also prosecutors and judges. The evaluation of the prosecutors was linked to the number of convictions, while acquittals were considered "lost" cases and negatively affected the evaluation. Judges were evaluated by the number of appeals and by the "confirmation rate" of their decisions at the higher-instance courts (Schultz et al. 2014). This system incentivizes prosecutors and judges to behave in a repressive way[10] and created an enabling environment for fabricating cases at the lower level.

Meanwhile, even though the FSKN's performance evaluation system was more transparent, it was more difficult for the FSKN stations to set the "necessary" amount of manipulations, since it had to take into account the performance of other stations in the current period. In contrast, the MVD officers always knew what numbers they should reach. These institutional features could significantly contribute to the difference in the magnitudes of manipulation by these two agencies, which I investigate in more detail in Section 4.2.

2.2 Data

This paper uses a database provided by the Institute for the Rule of Law at the European University at St. Petersburg, Russia[11]. It contains information on almost 300,000 drug crimes reported in Russia during 2013-2014. The information is based on five forms that are created at the different stages of the investigation of a specific case and include the following data:

form 1: identified crime and investigation results;

form 2: socio-economic characteristics of offender;

form 3: criminal proceedings;

form 4: reparation for damages and the seizure of crime objects;

form 6: trial results[12].

[9]For example, during the 2013-2014 period, only 72 police officers were convicted of the falsification of evidence. 14 of them were released from punishment (Nikonov 2020)

[10]In 2018, the rate of acquittal reached its historic minimum in post-Soviet Russia - 0.24% compared to 0.3-0.4% in the 1990s (Sokolov 2019).

[11]Initial data was compiled and prepared at the Institute for the Rule of Law at the European University at St. Petersburg with support from the Russian Science Foundation grant 17-18-01618.

[12]Form 1 is completed by an investigator when he or she decides to initiate criminal proceedings that should be approved by a prosecutor. During the investigation, forms 2, 3 and 4 are created. These forms have to be checked by the prosecutor's office before referring the case to the judicial authorities. Form 5 is not in the database since it should contain information on victims, while drug crimes are victimless. Form 6 is filled in by a judge. After closing the case, all forms should be converted from written to electronic form and submitted to an information center (Shklyaruk and Skougarevskiy 2015).

Knorre and Skougarevskiy (2015) and Skougarevskiy (2017) extracted and analyzed all information on primary drug types, weights of drugs seized, offenders' characteristics and court decisions from this database. I follow their approach. Both forms 1 and 4 contain information on weights of drugs seized, which coincide only for 92.8% of cases. However, the distributions of cases across drug amounts do not differ significantly. Form 1 quantities are determined by a police officer, who has to weight the drug seized, while form 4 is created at a later stage after the prosecutor's approval of case initiation and contains drug amounts measured in the laboratory. Therefore, to estimate the magnitude of possible manipulation, and to investigate to what extent it varies by drug type, article and agency, I use data from form 1. In order to identify characteristics of victims of manipulation, I merge data from forms 1 and 2. For the investigation of manipulation consequences, I turn to combined data from forms 1, 2 and 6, merged with drug weights from form 4. Weights from both forms are needed for estimating LATE of manipulation on sentence length in accordance with the Diamond and Persson (2016) approach. I restrict the sample to cases related only to drug use for two reasons. First, separation by article is needed due to the existing specifics of determining the length of imprisonment for different types of crime. Second, the drug dealers sample from merged dataset based on forms 1, 2, 6 and 4 contains an insufficient number of observations for bunching techniques.

The initial dataset based on form 1 contained data on 518,979 drug crimes including 89,152 heroin cases. 14% of cases related to heroin were excluded from the sample because the amount of drug seized was missing[13]. Missing values are likely to be caused either by inaccurate completion of forms by police officers or by mistakes during the conversion of the forms into electronic files. Additionally, under some circumstances, a case can be initiated without drug seizure. See Table B3 in the Appendix for more information on the samples discussed in this paper and missing values. While differences in means of the working sample and the set of observations with missing weights are statistically significant for almost all factors, their values themselves are small in most cases. As expected, the documents are more complete for more serious crimes (with longer sentences), when there is conclusive evidence (being arrested under the influence of drug) or in the case of refusing to plead guilty, which leads to a full investigation, compared to the simplified procedure under the plea bargain.

[13]The form 4 dataset included information on 236,989 drug crimes out of which 50,782 were related to heroin. Due to missing drug weight, 8% of heroin related cases were also excluded from the analysis.

3 Empirical Strategy

3.1 Detecting Manipulation of Seized Drug Amounts

To study the magnitudes of possible manipulation in the data, I apply the standard bunching estimator (Saez 2010, Chetty et al. 2011, Kleven and Waseem 2013). This method allows to construct a measure of excess mass of offenders above a threshold by comparing actual and counterfactual distributions around this threshold. The counterfactual density of seized drug amounts is estimated by fitting a high-order polynomial to the observed distribution, excluding the manipulation region (see Appendix C for further details).

In this study, I focus solely on the second threshold for several reasons. I do not study the first threshold because data on offences below the threshold could be incomplete due to police officers' reluctance to deal with cases that do not affect their performance evaluation significantly. Moreover, some officers might show leniency towards minor offences and not register them. In addition, the number of weight bins that could be defined below the first threshold is insufficient for estimating the counterfactual distribution. At the third threshold (500 grams for heroin), which is not presented in graphs, bunching is not observed, probably due to weak incentives and (or) insufficient number of observations. Therefore, I do not explore the police officers' responses to this threshold, and even exclude the long tail from the analysis, since it does not affect the counterfactual distribution around the relevant (second) cut-off and estimates.

The observed discontinuity in the distribution of heroin cases around the second threshold is most likely due to manipulations with drug amounts seized from offenders. While it is quite difficult to completely rule out the alternative story of differential treatment by police officers around the threshold, there are some arguments supporting the hypothesis of manipulation. First, there is anecdotal evidence, various media reports and personal stories posted on online forums[14] document that planting drugs is a widely-used method in Russia to fabricate evidence. Second, there are no incentives for police officers to focus particularly on offenders who are just above the second threshold and ignore those, who are further to the right. The same logic applies to the hole in the distribution directly below the threshold: the offenders just below the second threshold are as "valuable" to the police as other offenders who are further to the left (but above the first threshold). In addition, the performance evaluation of police officers also depends on the total number of all criminal cases solved during the year, not only serious and most serious ones. Therefore, police officers are motivated to "keep" every offender above the first threshold for further evaluation.

If we assume that offenders are rational agents we could expect a counterfactual

[14]For example, see Nadezhdin and Matveeva (2019), Merzlikin (2019), Antonov (2019).

distribution with humps just below the thresholds. In this case, the bunching estimator yields a lower bound of the extent of manipulation. However, the voluntary bunching of offenders below the threshold is more likely to be observed if punishment increases discontinuously for any amount exceeding the limit (Traxler et al. 2018, Lepage 2020). By Russian anti-drug law, in the counterfactual world without manipulation, the punishment should increase smoothly without shifts at the thresholds in the case of drug use or overlap in the case of drug sale. Therefore, I make the assumption of the counterfactual distribution with a smoothly decreasing shape[15].

Using the bunching estimator, I estimate the magnitude of manipulation in the full sample with the drug weights from form 1. To check that the results are insensitive to the choice of estimation parameters, I repeat the procedure described in Appendix C, using different polynomial orders, values of upper bounds, or starting points after the exclusion of the area around the first threshold. I also vary the upper point for drug weight where I cut the sample since the long tail with few observations does not contain much information. Next, I compare magnitudes of manipulation across different samples, geographical areas, types of offence and drug control agencies.

Additionally, in order to analyze the effect of performance requirements on the behavior of police officers in more detail, I use an event study approach. The identification strategy exploits the variation in the timing of reaching the previous year's number of serious and most serious crimes for a given station. This approach restricts the sample to those police stations that during the study period (2014) surpassed their 2013 "benchmark" (conditional on it not being zero). For each station i, I calculate the total number of serious and most serious drug crimes per month and, comparing these values with the 2013 level, determine when the station reached this level. This allows me to define a set of event study dummies with index t in [-6, 6] indicating the number of months before/after the event - the reaching of the "benchmark". In total, I have 13 dummies: 1 for the event month, 6 for pre- and 6 for post-periods, since, on average, stations reach the level needed after 6 months. The logarithm of monthly number of serious and most serious drug crimes Y_{ir} is my main outcome, which I regress on event study dummies and station and month fixed effects:

$$Y_{ir} = \sum_{t=-6}^{6} \alpha_t \mathbb{1}[T_{ir} = t] + \gamma_i + \delta_r + \varepsilon_{ir}. \tag{1}$$

I then test for whether there is a significant difference in the effects of reaching the previous year level for two drug control agencies separately and by the period of reaching (during the first, second or third 4 months of the year).

[15]Indirect evidence in support of a smoothly decreasing shape comes from the distributions of cases related to the other types of drugs (Appendix, Figure A1), which do not have bunching (at least around the second threshold).

3.2 Identifying Victims of Manipulation

In order to recover the characteristics of those who were manipulated by the police, I adopt the technique designed by Diamond and Persson (2016).

First, I estimate the counterfactual expected values of observable characteristic Y at any drug quantity bin R inside the manipulation area if there was no manipulation, using cases outside of this area:

$$Y_j = \sum_{k=0}^{p} \beta_k R_j^k + \varepsilon_j, \tag{2}$$

where $R_j < \overline{D} - r_l$ or $R_j > \overline{D} + r_u$. Then I can calculate the observed average values of characteristic Y for offenders inside the manipulation region below ($\overline{Y}^{never}$) and above ($\overline{Y}^{up}$) the threshold $\overline{D}$:

$$\overline{Y}^{never} = \frac{1}{N^{never}} \sum_i Y_i, \text{ where } \overline{D} - r_l \leq r_i < \overline{D}, \tag{3}$$

$$\overline{Y}^{up} = \frac{1}{N^{up}} \sum_i tY_i, \text{ where } \overline{D} \leq r_i \leq \overline{D} - r_u. \tag{4}$$

Here $\overline{Y}^{never}$ is the average characteristic of those offenders who were arrested with the amount of drug just below the threshold and were not selected for manipulation ("never-takers"):

$$\overline{Y}^{never} = \frac{N^{down}}{N^{down} - N^{compliers}} \overline{Y}^{down} - \frac{N^{compliers}}{N^{down} - N^{compliers}} \overline{Y}^{compliers}. \tag{5}$$

Accordingly, $\overline{Y}^{up}$ is the average characteristic of all those offenders who were manipulated ("compliers") and who actually were arrested with a drug amount just above the threshold ("always-takers"):

$$\overline{Y}^{up} = \frac{N^{always}}{N^{always} - N^{compliers}} \overline{Y}^{always} - \frac{N^{compliers}}{N^{always} - N^{compliers}} \overline{Y}^{compliers}. \tag{6}$$

Using the estimates of the counterfactual values of observable characteristic $\hat{Y}$ and distribution of cases $\hat{C}$, I can obtain values of $\overline{Y}^{down}$ and $\overline{Y}^{always}$ in the following way:

$$\overline{Y}^{down} = \frac{\int_{\overline{D}-r_l}^{\overline{D}-\sigma} \hat{Y}_j{}^R \hat{C}_j{}^R dR}{N^{down}} \tag{7}$$

$$\overline{Y}^{always} = \frac{\int_{\overline{D}}^{\overline{D}+r_u} \hat{Y}_j{}^R \hat{C}_j{}^R dR}{N^{always}}. \tag{8}$$

The number of offenders in each part of the manipulation region can be calculated as:

$$N^{never} = N^{down} - N^{compliers}, \text{ where } N^{down} = \int_{\overline{D}-r_l}^{\overline{D}-\sigma} \hat{C}_j{}^R dR, \tag{9}$$

$$N^{up} = N^{always} + N^{compliers}, \text{ where } N^{always} = \int_{\overline{D}}^{\overline{D}+r_u} \hat{C}_j{}^R dR. \tag{10}$$

Plugging these into (5) and (6) and using estimates from (3), (4), (7) and (8), I solve for the compliers' average value of characteristic Y:

$$\begin{aligned}\overline{Y}^{compliers} = 0.5(&\frac{N^{never}}{N^{never} - N^{down}}\overline{Y}^{never} - \frac{N^{down}}{N^{never} - N^{down}}\overline{Y}^{down})+ \\ &+ 0.5(\frac{N^{up}}{N^{up} - N^{always}}\overline{Y}^{up} - \frac{N^{always}}{N^{up} - N^{always}}\overline{Y^{always}}).\end{aligned} \tag{11}$$

Finally, I can compare the mean characteristics of those offenders who were manipulated by the police ("compliers") with the mean characteristics of all offenders who were "eligible" for manipulation but did not receive it ("never-takers"):

$$\Delta Y = \overline{Y}^{never} - \overline{Y}^{compliers}. \tag{12}$$

3.3 Estimating the Effect of Manipulation on Sentence Length

I identify the effect of manipulation of drug quantities on sentence length (and on the probability of pleading guilty) in two steps, following again Diamond and Persson (2016).

First, I estimate the relationship between sentence length S and the amount of drug seized from form 1:

$$S_j = \sum_{k=0}^{p} \beta_k R_j^k + \gamma_R * \mathbb{1}[R_j \geq \overline{D}] + \omega_j, \tag{13}$$

where $R_j < \overline{D} - r_l$ or $R_j > \overline{D} + r_u$. Equation (13) gives the expected length of sentence at each drug amount inside the manipulation region in the counterfactual world where no offender is manipulated.

Then, I calculate the counterfactual expected sentence length across the whole set of drug offenders inside the manipulation region:

$$\overline{S} = \int_{\overline{D}-r_l}^{\overline{D}+r_u} \hat{S}_j \frac{\hat{C}_j{}^R}{\int_{\overline{D}-r_l}^{\overline{D}+r_u} \hat{C}_j{}^R} dR. \tag{14}$$

Comparing observed and estimated counterfactual average sentence lengths, I obtain the "intent-to-treat" effect, which shows a change in the length of imprisonment due to the offender having been caught with the actual amount of drug that falls within the

manipulation region:

$$ITT = \frac{\sum_{i \in manip\, region} S_i}{N^{manip}} - \overline{S}, \tag{15}$$

where N^{manip} is the number of offenders in the manipulation area.

The procedure described above is repeated with drug quantities from form 4 instead of sentence length. This constitutes the effect of being manipulated on the amount of drug seized that is determined officially at the laboratory and then considered by judge at court. The ratio of ITT from (15) to this effect, in turn, identifies the local average treatment effect (LATE) of being manipulated on the length of imprisonment.

4 Results

4.1 Manipulation of Seized Drug Amounts

Among all drugs in my data, focusing on the second threshold, I find significant bunching only in the case of heroin. Graphs with distributions of other often seized drugs are in the Appendix, Figure A1, and do not show such discontinuities. An explanation for this could be that it is less costly for police officers to manipulate heroin amounts, given the small quantities needed to cross the threshold and the possibility to use any non-drug white powder for planting on an offender. In addition, heroin is one of the most dangerous and addictive drug, and a large share of heroin users are from the lowest socio-economic class, which makes the manipulation even easier for police officers.

For example, in an interview, one of former policemen (Nadezhdin and Matveeva 2019) describes the following scheme often used by the police officers. The police station receives a call from somebody reporting that at the hall of his building there are drug users, under the influence of drugs. The police arrives and finds unconscious people and an amount of, for example, heroin. If the drug quantity is below the threshold, the officers could add flour, sugar or any other white powder to arrest the users for a more severe crime[16]. This moves offenders from below to above the threshold adding points to police officers' performance evaluation.

The bunching estimator for all heroin cases from form 1 is 6.325 (Appendix, Figure A2). This means that the excess mass above the second threshold is almost six times greater than the average number of cases that would be in the manipulation window above this threshold in the counterfactual world without manipulation. The effect is slightly stronger in merged samples from forms 1 and 2 and forms 1, 2, 6, and 4 (Appendix, Figure A3), supporting the result observed in the initial dataset from form 1.

[16]This is possible because, according to the law, the drug quantity seized is determined not by the weight of the pure drug substance but by the weight of the entire mixture.

The result is robust to variations in the width of the manipulation window or the degree of the polynomial I use to fit the counterfactual distribution (Appendix, Table B4). To avoid the possible overstatement of the effect of manipulation, I choose the main specification yielding the results presented here that gives the smallest possible estimate of bunching.

Eyeballing the distributions of seized amounts of heroin in different Russian regions indicates that the magnitudes of manipulation vary across regions. However, formal test of differences in manipulations are infeasible, since splitting the sample into 83 subsamples (the number of regions) significantly reduces statistical power when estimating the region-specific extent of manipulation. Therefore, I divide all regions into only two groups: on, or away, from the main drug-trafficking routes[17]. Figure A4 in the Appendix shows that the magnitude of manipulation in regions along the routes is more than twice as high as that in regions away from the routes. This could be explained by the following factors. First, in regions which are on the drug-trafficking routes, the share of population that could potentially be manipulated (drug users, drug dealers) is greater. Second, police officers in these regions might be more experienced in dealing with drug related crimes.

The following subsection investigates the observed pattern in the distribution of heroin related cases and its potential cause in more detail.

4.2 Incentives for Manipulation of Seized Drug Amounts

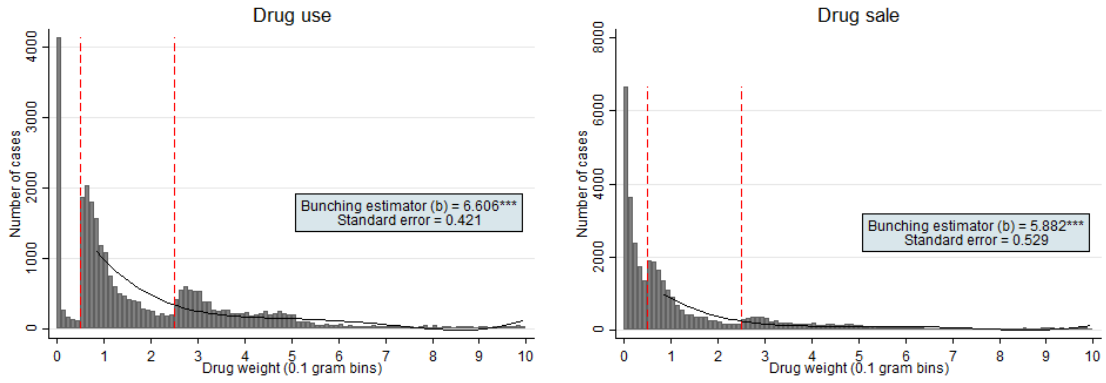
What causes the significant bunching above the threshold? According to, for example, Paneyakh (2014) and Knorre (2020), the main driving force for dishonest behavior is the system of performance evaluation of police officers. To test for this possibility, I exploit differences in the evaluation approaches of the two drug control agencies.

Combining the information on sanctions for drug related crimes and the systems of performance evaluation of police officers discussed in Section 2.1 suggests the following incentives for moving offenders from below the second threshold to above it. In the case of drug use, crossing the second threshold increases the severity of crime from least serious to serious, which in turn positively affects the evaluation. The incentive for moving offenders from below to above the threshold in the case of drug sale is ambiguous, since manipulation does not directly contribute to performance indicators. However, it could be explained by police officers' concern about losing "points" if a drug sale case is requalified to a drug use case (for example, storage without the purpose of sale). At the same time, if the drug amount seized is large (above the second threshold), a requalification only decreases the severity of the crime (from most serious to serious). However, that does not change the number of serious and most serious (drug) crimes solved by the police and,

[17]Information on drug-trafficking routes is taken from the website of Russia's international news agency https://ria.ru/20100603/242406939.html. Accessed on December 1, 2018.

hence, does not worsen the performance statistics. Figure 2 presents a sharper graph and slightly higher bunching estimate for drug users (left) than for drug dealers (right), which could be explained by different incentives at the threshold. In addition, drug users are the significantly larger group of drug offenders, as well as much easier to locate and, hence, manipulate.

Figure 2: Distributions of cases related to drug use (left) and drug sale (right) across quantities of heroin seized



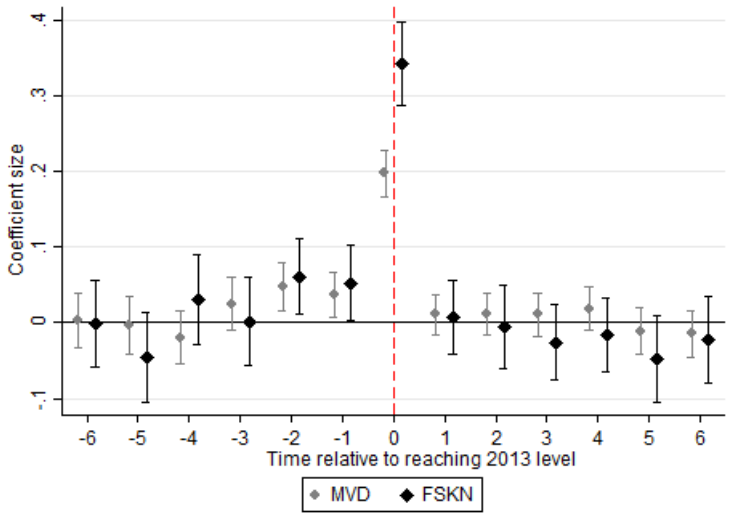
Note: The baseline sample consists of all heroin related cases from form 1 registered in Russia during 2013-2014. The series shown in bars is a histogram of the observed distribution of cases. The solid line is a fourth-degree polynomial fitted to the empirical distribution. The thresholds (dashed lines) determine the scale of seizure (less than significant, significant and large drug amounts), the severity of crime and punishment.

Moving offenders from below the threshold to above it increases the number of serious and most serious drug crimes solved, which improves the chances of police officers meeting the requirements. Since previous year's performance presents a direct target in the case of the MVD or more noisy "benchmark" in the case of the FSKN, reaching this level could significantly affect the behavior of the police during the current year. In order to analyze the possible influence, I use an event study framework. The regression results are shown in Figure 3 and Table B5 in the Appendix.

The results suggest a common pattern for two agencies: a significant increase of the number of serious and most serious drug crimes registered in the month when the station reaches the 2013 "benchmark" and two months before it. After the "event", number of cases returns to its average level before the jump. This is consistent with the idea that manipulation is risky, and when the target is still far away, it is unclear whether benefits from manipulation will overweight its costs. However, the closer the target, the clearer the gain from manipulating drug amounts is. Once the target is reached, police officers stop manipulating, also because they do not want to ratchet up the target for the next year.

The greater jump in estimates of the event month effect for the FSKN could be explained by the difference in the evaluation approaches of the two agencies. The FSKN's

Figure 3: The effect of reaching 2013 level on the number of serious and most serious drug crimes registered 2014



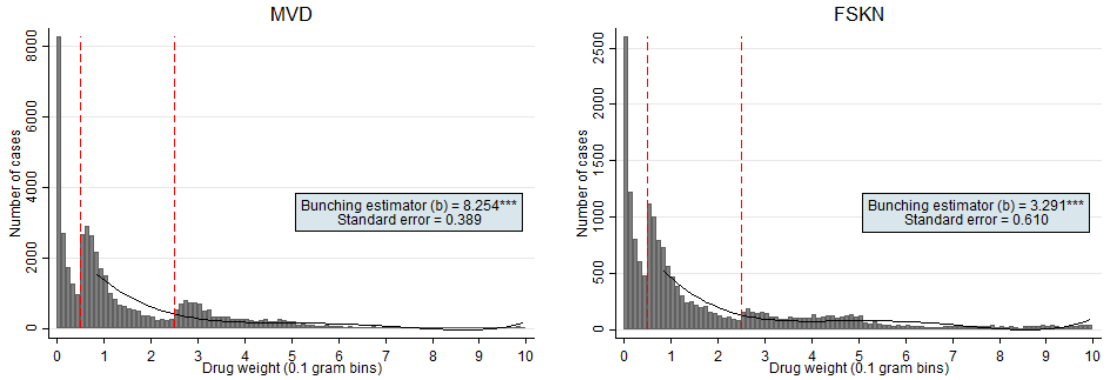
Note: The samples include all MVD's and all FSKN's stations that reached the total 2013 number of serious and most serious drug crimes during the period studied (January - December 2014). The regression results are reported in the Appendix, Table B5. Standard errors are clustered by station.

offices use their previous year's performance only for some guidance while competing with each other. In contrast, the MVD's stations follow exactly the target being, at the same time, more constrained by a possible ratchet effect. Figure A5 and Table B6 in the Appendix support this idea: the MVD's stations "follow" their previous year's numbers of severe cases, which are higher for stations that reached these numbers later in the year. However, there is no such a pattern for the FSKN.

As the event study results suggest (Tables B5 and B6 in the Appendix), the performance requirements can differently affect the behavior of officers in the two agencies during a year. However, this specification shows the difference in the numbers of all serious and most serious drug crimes and does not tell us how the magnitude of manipulation (the number of cases above the threshold) varies across agencies and over time. To explore the effect of differences in the systems of performance evaluation, I break all heroin related cases into two groups: those initiated by the MVD and those initiated by the FSKN (Figure 4). The estimation determines a difference in the values of the bunching estimator, significant at the 1% level. The bunching estimate for the MVD cases is 8.254, while for the FSKN cases it is only 3.291. This can be explained by the difference in the two systems of performance evaluation. In the case of the FSKN, final crime statistics are compared with the performance of other police stations and, eventually, other regions. The FSKN officers do not know the exact level that should be reached in order to obtain a satisfactory performance evaluation. Therefore, the incentives to manipulate in the case of the FSKN are weaker. In turn, the MVD offices compare results with their own

performance in the previous period, which is well known to them. Given that the most recent performance should not be worse than previously, the performance evaluation system may incentivize some police officers to behave dishonestly, manipulating drug amounts seized in order to improve their statistics.

Figure 4: Distributions of cases initiated by the MVD (left) and the FSKN (right) across quantities of heroin seized



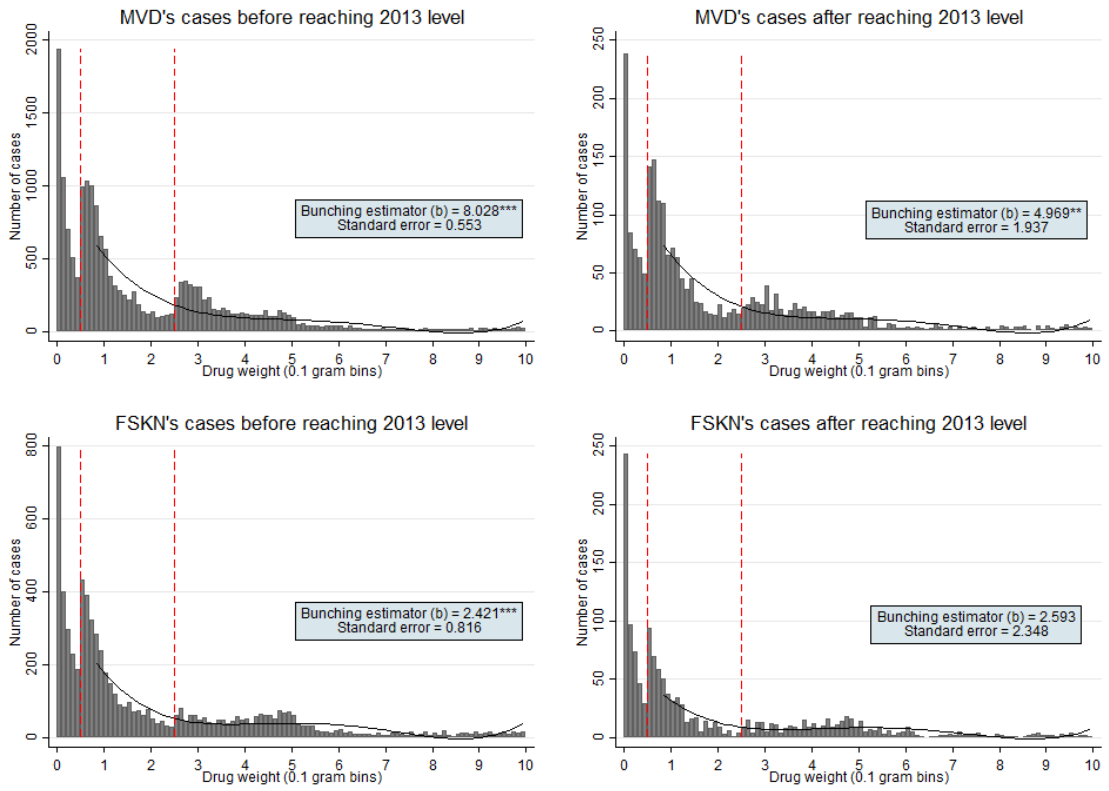
Note: The baseline sample consists of all heroin related cases from form 1 registered in Russia during 2013-2014. The series shown in bars is a histogram of the observed distribution of cases. The solid line is a fourth-degree polynomial fitted to the empirical distribution. The thresholds (dashed lines) determine the scale of seizure (less than significant, significant and large drug amounts), the severity of crime and punishment.

The final step is to test whether reaching the target differently affects the magnitudes of manipulation in two agencies. For the performance evaluation, the number of serious and most serious drug crimes is calculated per 100 officers. I do not have information on the size of each regional office, and therefore I cannot exploit the FSKN's cross-region comparison scheme[18]. Instead, assuming that the number of officers at each station is fixed during the 2013-2014 period, I determine the total absolute number of serious and most serious drug crimes solved by each station in 2013. Then, I divide all cases initiated in 2014 (by agency) into two groups: before and after achieving each station's 2013 level. Finally, I check whether the bunching varies between these four groups. As expected, the estimation shows that in the case of the MVD, the magnitude of manipulation is higher when the station had not yet met its previous year's performance level, and that the difference is statistically significant at the 10% level. At the same time, the magnitude of manipulation by the FSKN police stations does not significantly depend on reaching, or not reaching the "benchmark" (Figure 5). Thus, these results support the hypothesis

[18]I conducted an exploratory analysis of the effect of the cross-region comparison scheme, assuming the number of officers to be proportional to the total number of drug crimes solved by each station during each year. First, I identified the FSKN's and MVD's stations with the highest relative number of serious and most serious drug crimes solved in 2013. Second, for each agency, I split all 2014 cases into two groups: before and after reaching the "best" level of 2013 (established by either the FSKN's or MVD's station). Finally, I calculated the bunching estimate for four groups of cases. The difference in magnitudes appeared to be insignificant.

that the driving force for manipulation of drug amounts is the performance evaluation system.

Figure 5: Distributions of cases across quantities of heroin seized during 2014 by the MVD's and FSKN's police stations before (left) and after (right) reaching the total number of serious and most serious drug crimes solved in 2013



Note: The baseline sample consists of all heroin related cases from form 1 registered in Russia during 2013-2014. The series shown in bars is a histogram of the observed distribution of cases. The solid line is a fourth-degree polynomial fitted to the empirical distribution. The thresholds (dashed lines) determine the scale of seizure (less than significant, significant and large drug amounts), the severity of crime and punishment.

It is worth noting that bribery might be another motive for police officers to manipulate the drug amounts, or to threaten offenders with possible manipulation. However, the significant probability to lose the job due to reporting insufficient numbers of arrests and convictions in annual performance reviews could be a strong incentive for police officers to "keep" offenders. This likely outweighs the benefits from receiving a small bribe from a drug user or micro-trafficker, who are usually people of low socio-economic status. At the same time, according to an investigation based on anonymous surveys of 571 victims of extortion from being caught with drugs (Litavrin et al. 2017), if an offender decides and is able to pay a bribe, in most of the cases he does it to buy himself out of prison, not just to decrease the sentence. This means that those individuals are most likely not in the database at all and these bribery cases are undetectable. In addition, the study suggests that the amount paid in bribes is increasing with the drug

quantity; however, it does not find any evidence of the bribe cases bunching at some particular amounts.

4.3 Mean Characteristics of Possible Victims of Manipulation

There are a number of criteria that a police officer can use to select which offenders to push above the threshold. My analysis begins by calculating summary statistics for the whole population of heroin offenders and for those who fall into the manipulation region. Table B7 in the Appendix shows that means are similar across these two samples, suggesting the absence of self-selection into the area around the second threshold. To determine the mean characteristics of victims of manipulation, I use the technique described in Section 3.2 and present results in Table 1.

Table 1: Mean characteristics of possible victims of manipulation

	Eligible for manipulation	Manipulated	Difference	s.e.
Male	0.809	0.858	-0.049^{*}	0.025
Russian	0.856	0.869	-0.013	0.023
At least college	0.386	0.400	-0.014	0.029
Unemployed	0.761	0.756	0.005	0.018
Repeat offender	0.670	0.733	-0.063^{**}	0.030
Administrative offence[19]	0.076	0.059	0.017^{*}	0.010
Under the influence of drug	0.518	0.467	0.051	0.033
Under the influence of alcohol	0.013	0.016	-0.003	0.008

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The baseline sample consists of all heroin related cases from forms 1 and 2 registered in Russia during 2013-2014. Column 1 presents the predicted mean characteristic of all drug offenders who possessed an unmanipulated amount of drug that fell into the manipulation window below the threshold. Column 2 presents the predicted mean characteristic among the compliers, i.e., the offenders who were actually moved above the threshold. Column 3 tests the difference. To obtain the estimates, I apply the method described in detail in Section 3.2.

First of all, I check whether such demographics as gender and nationality affect a police officer's decision to manipulate the seized drug amounts. I find a difference in the mean shares of men among those who were eligible for manipulation but did not receive the "treatment", and those who were pushed above the threshold. However, this difference is only marginally significant. At the same time, there is no effect related to the offender being Russian.

Turning to the indicators of offender's socio-economic status, such as employment status or education level, I do not find that drug amounts of low class individuals are

[19] A wrongful, guilty action (omission) of a natural person or legal entity which is administratively punishable under The Code of Administrative Offences of The Russian Federation. This violation of the law is not serious enough to be considered criminal.

more likely to be manipulated. This could be due to the homogeneity of the whole group of drug offenders, which consists mostly of unemployed and poorly educated individuals. As the analysis shows, there is also no significant effect related to an offender being under the influence of drugs or alcohol at the moment of arrest, which, in general, should make this group of offenders a more vulnerable target. The only factor that is significant is the offender's previous criminal history: repeat offenders are more likely to be pushed above the threshold. This could be explained by it being easier to manipulate a person whose socio-economic characteristics are known.

4.4 The Effect of Manipulation on Sentence Length

A case by case comparison of heroin weights from forms 1 and 4 shows that they coincide in 92.8% of the full sample[20]. Significant deviations seem suspicious and might be the consequence of mistakes made when filling in the card or converting it into an electronic form. At the same time, observations with large discrepancies in weights are randomly distributed and, therefore, could be excluded from the analysis. Table 2 presents the results of an estimation conducted for full and restricted samples, which includes observations with absolute weight differences of less than 14 grams; this being the 95th percentile among absolute nonzero deviations.

Table 2: The effect of manipulation on sentence length and probability of pleading guilty

	Absolute difference ≤ 14		Full sample	
	Coefficient	s.e.	Coefficient	s.e.
	Panel A. Sentence length			
First stage	1.071***	0.009	0.366	2.461
ITT	1.089***	0.052	1.091***	0.054
LATE(sentence)	1.016***	0.217	2.978***	0.695
	Panel B. Pleading guilty			
LATE(plea)	−0.167	0.818	−0.484	0.430
LATE(sentence)^{plead}	0.942***	0.060	0.942***	0.065
LATE(sentence)$^{not\ plead}$	0.924***	0.131	−0.780	1.104

* p < 0.10, ** p < 0.05, *** p < 0.01

Note: The baseline sample consists of all heroin use related cases from forms 1, 2, 6 and 4 registered in Russia during 2013-2014. See the text for further details defining the subsample of observations with absolute difference in weights of less than 14 grams. Panel A presents estimates of the impact of drug weights from form 1 on drug weights from form 4 (First stage), as well as ITT effect of manipulation on the sentence length of all individuals in the manipulation region, and LATE of manipulation on the sentence length of compliers only. Panel B presents LATE of manipulation on the probability of pleading guilty and on the sentence length of those drug offenders who did and did not plea guilty. To obtain the estimates, I apply the method described in detail in Section 3.3.

[20]Average nonzero weight difference is −1.231 gram.

The first stage effect of manipulation of heroin amounts registered by police officers in form 1 on heroin weights recorded in form 4 after the expertise is significant and shows the 1.1 grams increase of drug seized amount for individuals in the manipulation area. This implies that police officers work and manipulate in collaboration with laboratory experts. There is also a significant effect of being in the manipulation window on sentence length (ITT). However, in order to see the impact of manipulation on compliers' years of imprisonment, I divide ITT by the first stage effect and obtain LATE(sentence), which suggests a one year increase in sentence length for individuals who were pushed above the threshold[21].

Turning to the possible heterogeneity of the effect of manipulation, I estimate LATE for those who pleaded guilty and who did not accept a plea bargain. According to Titaev and Pozdnyakov (2012), in general, pleading guilty in Russia does not reduce the sentence significantly and even worsens the offender's situation in some cases. Nevertheless in 2013-2014, almost 60% of all cases (30% of drug related offences) were processed under a plea agreement. This quite large share could be explained by the legal illiteracy of offenders who simply do not know how the plea bargain may influence their legal situation. Additionally, police officers could offer the agreement more forcefully if the credibility of evidence collected is in doubt as in the case of, for example, manipulation of drug amounts. In turn, a plea bargain leads to a conviction without the actual examination of evidence at a court hearing. However, my analysis shows that crossing the threshold does not increase the probability of pleading guilty (LATE(plea) in Table 2). At the same time, the difference in the effects of manipulation on the sentence length of those who accepted the plea bargain and those who did not plead guilty (LATE(sentence)^{plead} and LATE(sentence)$^{not\ plead}$) is statistically insignificant. The reason could be the quite common practice of pinning the unsolved crime on a person who is already convicted of something, and then to push this person to plead guilty to both crimes.

4.5 Social cost

The total social cost of drug manipulation triggered by inappropriate incentive scheme is difficult to calculate precisely. According to the estimation results from Section 4, there were around 3000 offenders, 4% of all heroin offenders in the database, who were moved above the threshold as a result of manipulation during the 2013-2014 period. Around 2000 of them were convicted of drug possession without the purpose of sale and sentenced

[21]This estimate is close to that obtained in Skougarevskiy (2017). Applying regression discontinuity design methods to the data on cannabis and heroin cases from Russia, he finds that the length of unconditional incarceration increases by 0.84 years when the drug weight crosses the threshold. My estimate could be higher because I focus solely on heroin cases, which might be considered to be more serious offences than cannabis related crimes. In addition, I estimate the effect for compliers, while Skougarevskiy (2017) shows the discontinuity taking into account all offenders in the window above the threshold.

to an additional year in prison than they would otherwise have been. This is huge impact since it is almost 70% increase on what these offenders would get without manipulation.

Even though each year the government spends the enormous amount of money on the Penitentiary Service[22], drug addicts do not receive any treatment during incarceration. After release, most of them start taking drugs again and could be convicted for another time. Those who decide to go back to normal life face significant difficulties: longer incarceration exacerbates their situation, strengthening barriers to reintegration and sometimes even increasing the probability to commit another crime due to longer exposure to criminal peers (Bayer et al. 2009, Green and Winik 2010, Aizer and Doyle Jr 2015).

Therefore, the welfare loss from prolonged sentences and inequality in the enforcement of the law likely exceeds any benefits from keeping drug users off the streets. Even more importantly, multiple manipulations widely discussed in the media lower public trust in the police increasing the level of perceived insecurity. This, in turn, decreases the effectiveness of law enforcement and the efficiency of budget expenditures.

5 Conclusion

The tradeoff between motivating civil servants and distorting their behavior has always been a central issue of incentives design. Increasingly, the literature documents a negative effect of high-powered performance-related incentives in the public sector. Nevertheless, their use is still a common practice across bureaucracies in many countries. A particularly notable example of such countries is Russia. A recently published report on drug crimes (Knorre 2017) illuminates revealing statistics on the distribution of criminal cases across quantities of heroin seized. These statistics suggest the bunching of offenders who were arrested with an amount of drugs just above the threshold sufficient to be convicted of a more serious crime. At the same time, there is a missing mass of cases just below the threshold. This might be evidence of manipulation of drugs quantities seized by the police, which so far has only been alleged by various media reports.

This paper provides an empirical analysis of the mechanism that drives the possible manipulation of amounts of drugs seized using a unique dataset that contains rich information on drug crimes reported in Russia during 2013-2014. Exploiting the specific features of the Russian institutional context, I show how inappropriate incentives from performance evaluation could trigger the misbehavior of police officers. Additionally, the results suggest that individuals with a criminal history are more likely to have their drug amounts manipulated by the police. The overall effect of this manipulation on sentence length is an additional year of incarceration, which is not dependent on a guilty plea.

[22]The annual budget of the Penitentiary Service of Russia was constantly growing since the establishment and reached $5 billion in 2015 that is comparable with the budget of some European countries: for example, Albania ($4.5 billion) or Moldavia ($2 billion).

The paper shows the inefficiency of the existing performance evaluation system and raises a question about optimal incentive structure. Forecasting expected results itself is a common practice in many public organizations; this provides guidance for the upcoming period. However, the way in which it is implemented could become an issue (Rasul and Rogger 2018, Banerjee et al. 2021), as in the case of drug control in Russia. Therefore, a comprehensive approach is required in order to improve the situation. The first step on the way to efficiency could be decentralizing the performance evaluation system and enabling regional offices to take into account local specifics affecting their performance. In turn, evaluating police officers based on local trends in criminal statistics will smooth the incentives arising from performance indicators. Additionally, the cost of misconduct to police officers should be increased significantly. Ultimately, performance systems need to be carefully designed and implemented, or discarded when they do more harm than good.

References

Acemoglu, D., L. Fergusson, J. Robinson, D. Romero, and J. F. Vargas (2020). The Perils of High-Powered Incentives: Evidence from Colombia's False Positives. *American Economic Journal: Economic Policy 12*, 1–43.

Aizer, A. and J. J. Doyle Jr (2015). Juvenile Incarceration, Human Capital, and Future Crime: Evidence from Randomly Assigned Judges. *The Quarterly Journal of Economics 130*, 759–803.

Alexander, D. (2020). How do Doctors Respond to Incentives? Unintended Consequences of Paying Doctors to Reduce Costs. *Journal of Political Economy 128*, 4046–4096.

Anbarci, N. and J. Lee (2014). Detecting Racial Bias in Speed Discounting: Evidence from Speeding Tickets in Boston. *International Review of Law and Economics 38*, 11–24.

Antonov, E. (2019). *Kak Peterburzhcy Dokazyvayut, Chto im Podbrosili Narkotiki? Tri Istorii o Zaderzhaniyah, Sudah i Problemah Zakonodatel'stva* . `https://paperpaper.ru/photos/kak-peterburzhcy-dokazyvayut-chto-im-pod/`. Accessed June 28, 2019.

Ash, E. and W. B. MacLeod (2015). Intrinsic Motivation in Public Service: Theory and Evidence from State Supreme Courts. *The Journal of Law and Economics 58*, 863–913.

Banerjee, A., R. Chattopadhyay, E. Duflo, D. Keniston, and N. Singh (2021). Improving Police Performance in Rajasthan, India: Experimental Evidence on Incentives, Managerial Autonomy, and Training. *American Economic Journal: Economic Policy 13*, 36–66.

Bayer, P., R. Hjalmarsson, and D. Pozen (2009). Building criminal capital behind bars: Peer effects in juvenile corrections. *The Quarterly Journal of Economics 124*, 105–147.

Bjerk, D. (2005). Making the Crime Fit the Penalty: The Role of Prosecutorial Discretion Under Mandatory Minimum Sentencing. *Journal of Law and Economics 48*, 591–627.

Bjerk, D. (2017). Mandatory Minimums and the Sentencing of Federal Drug Crimes. IZA Discussion Paper 10544.

Chetty, R., J. N. Friedman, T. Olsen, and L. Pistaferri (2011). Adjustment Costs, Firm Responses, and Micro vs. Macro Labor Supply Elasticities: Evidence from Danish Tax Records. *Quarterly Journal of Economics 126*, 749–804.

Diamond, R. and P. Persson (2016). The Long-Term Consequences of Teacher Discretion in Grading of High-Stakes Tests. National Bureau of Economic Research Working Paper 22207.

Fisman, R. and Y. Wang (2017). The Distortionary Effects of Incentives in Government: Evidence from China's "Death Ceiling" Program. *American Economic Journal: Applied Economics 9*, 202–218.

Goncalves, F. and S. Mello (2017). A Few Bad Apples? Racial Bias in Policing. Princeton University Working Paper 608.

Green, D. P. and D. Winik (2010). Using Random Judge Assignments to Estimate the Effects of Incarceration and Probation on Recidivism Among Drug Offenders. *Criminology 48*, 357–387.

Holmstrom, B. and P. Milgrom (1991). Multitask Principal-Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design. *Journal of Law, Economics, & Organization 7*, 24.

Jacob, B. A. (2005). Accountability, Incentives and Behavior: The Impact of High-Stakes Testing in the Chicago Public Schools. *Journal of Public Economics 89*, 761–796.

Jacob, B. A. and S. D. Levitt (2003). Rotten Apples: An Investigation of the Prevalence and Predictors of Teacher Cheating. *The Quarterly Journal of Economics 118*, 843–877.

Kleven, H. J. and M. Waseem (2013). Using Notches to Uncover Optimization Frictions and Structural Elasticities: Theory and Evidence from Pakistan. *Quarterly Journal of Economics 128*, 669–723.

Knorre, A. (2017). *Narkoprestupleniya v Rossii: Analiz Sudebnoi i Kriminal'noi Statistiki*. Technical report, The Institute for the Rule of Law at the European University at St. Petersburg. `http://enforce.spb.ru/images/Knorre_Drug_crimes_in_Russia.pdf`. Accessed October 1, 2017.

Knorre, A. (2020). Do Russian Police Fabricate Drug Offenses? Evidence From Seized Heroin's Weight Distribution. *Journal of Drug Issues*, 0022042620918951.

Knorre, A. and D. Skougarevskiy (2015). *Kak MVD i FSKN Borjutsja s Narkotikami: Sravnitel'nyj Analiz Rezul'tativnosti Dvuh Vedomstv*. Technical report, The Institute for the Rule of Law at the European University at St. Petersburg. `http://enforce.spb.ru/images/analit_zapiski/FSKN_MVD_memo_2015_web.pdf`. Accessed October 1, 2017.

Kurmangaliyeva, M. (2017). Criminal Justice and Wealth Inequality: How Much Freedom Can Money Buy in Russia? Available at SSRN https://ssrn.com/abstract=2816363. Accessed October 1, 2017.

Lepage, L.-P. (2020). Are Criminals Strategic? Offender Responses to Drug Sentencing Cutoffs. *Labour Economics 66*, 101906.

Litavrin, M., A. Sarang, and A. Knorre (2017). *Skol'ko Stoyat Veshchestva, Esli vy — Policejskij. Issledovanie o Vzyatkah za Narkotiki v Rossii*. https://openrussia.org/notes/715620/. Accessed February 2, 2019.

Makowsky, M. D., T. Stratmann, and A. Tabarrok (2019). To Serve and Collect: the Fiscal and Racial Determinants of Law Enforcement. *The Journal of Legal Studies 48*, 189–216.

Mas, A. (2006). Pay, Reference Points, and Police Performance. *The Quarterly Journal of Economics 121*(3), 783–821.

Merzlikin, P. (2019). *My Znaem, Chto Pravoohranitel'naya Sistema v Rossii Prognila. No Kak Eto Proizoshlo i Chto s Etim Delat'?* https://meduza.io/articles. Accessed June 28, 2019.

Nadezhdin, I. and A. Matveeva (2019). *Oni Tol'ko i Sposobny, Chto Dur' Podkinut'*. https://lenta.ru/articles/2019/06/13/drugs/. Accessed June 28, 2019.

Nikonov, M. (2020). *Fal'sifikaciya Dokazatel'stv. Policeyskie Metody*. https://zonaprava.com/download.php?file=6178. Accessed February 10, 2021.

Novikova, A. (2014). Sistema Ocenki Policii. Moscow. Public Verdict Foundation. Paper presented at International conference "Human rights and law enforcement agencies". http://publicverdict.org/articles_images/12001_60506_reform_police.pdf. Accessed October 1, 2017.

Paneyakh, E. (2014). Faking Performance Together: Systems of Performance Evaluation in Russian Enforcement Agencies and Production of Bias and Privilege. *Post-Soviet Affairs 30*(2-3), 115–136.

Rasul, I. and D. Rogger (2018). Management of Bureaucrats and Public Service Delivery: Evidence from the Nigerian Civil Service. *The Economic Journal 128*, 413–446.

Rehavi, M. M. and S. B. Starr (2014). Racial Disparity in Federal Criminal Charging and its Sentencing Consequences. *Journal of Political Economy 6*, 1320–1354.

Saez, E. (2010). Do Taxpayers Bunch at Kink Points? *American Economic Journal: Economic Policy 2*, 180–212.

Schultz, A., V. Kozlov, and A. Libman (2014). Judicial Alignment and Criminal Justice: Evidence From Russian Courts. *Post-Soviet Affairs 30*, 137–170.

Shklyaruk, M. and D. Skougarevskiy (2015). *Kriminal'naya Statistika: Mehanizmy Formirovaniya, Prichiny Iskazheniya, Puti Reformirovaniya.* Technical report, The Institute for the Rule of Law at the European University at St. Petersburg. `http://enforce.spb.ru/images/Products/Crimestat_report_2015_IRL_KGI_web.pdf`. Accessed October 1, 2017.

Skougarevskiy, D. (2017). *What Do Graduated Sanctions Tell Us About the Functions of the Law: A case of Drug Crimes.* Ph. D. thesis, Graduate Institute of International and Development Studies.

Sokolov, A. (2019). *Goskorporaciya "Pravosudie". Chast' Pervaya. Issledovanie o Tom, Mozhno li Dokazat' Nevinovnost' v Rossiiskom Sude.* `https://www.proekt.media/research/opravdatelny-prigovor/`. Accessed May 21, 2019.

The Ministry of Internal Affairs of the Russian Federation (n.d.). *The History of the Ministry of Internal Affairs of the Russian Federation.* `https://xn--b1aew.xn--p1ai/history`. Accessed October 1, 2017.

Titaev, K. and M. Pozdnyakov (2012). *Poryadok Osobyi - Prigovor Obychnyi: Praktika Primeneniya Osobogo Poryadka Sudebnogo Razbiratel'stva (gl. 40 UPK RF) v Rossiiskih Sudah.* Technical report, The Institute for the Rule of Law at the European University at St. Petersburg. `http://www.enforce.spb.ru/images/analit_zapiski/pm_gl_40_UPK_fin.pdf`. Accessed January 30, 2019.

Traxler, C., F. G. Westermaier, and A. Wohlschlegel (2018). Bunching on the Autobahn? Speeding Responses to a "Notched" Penalty Scheme. *Journal of Public Economics 157*, 78–94.

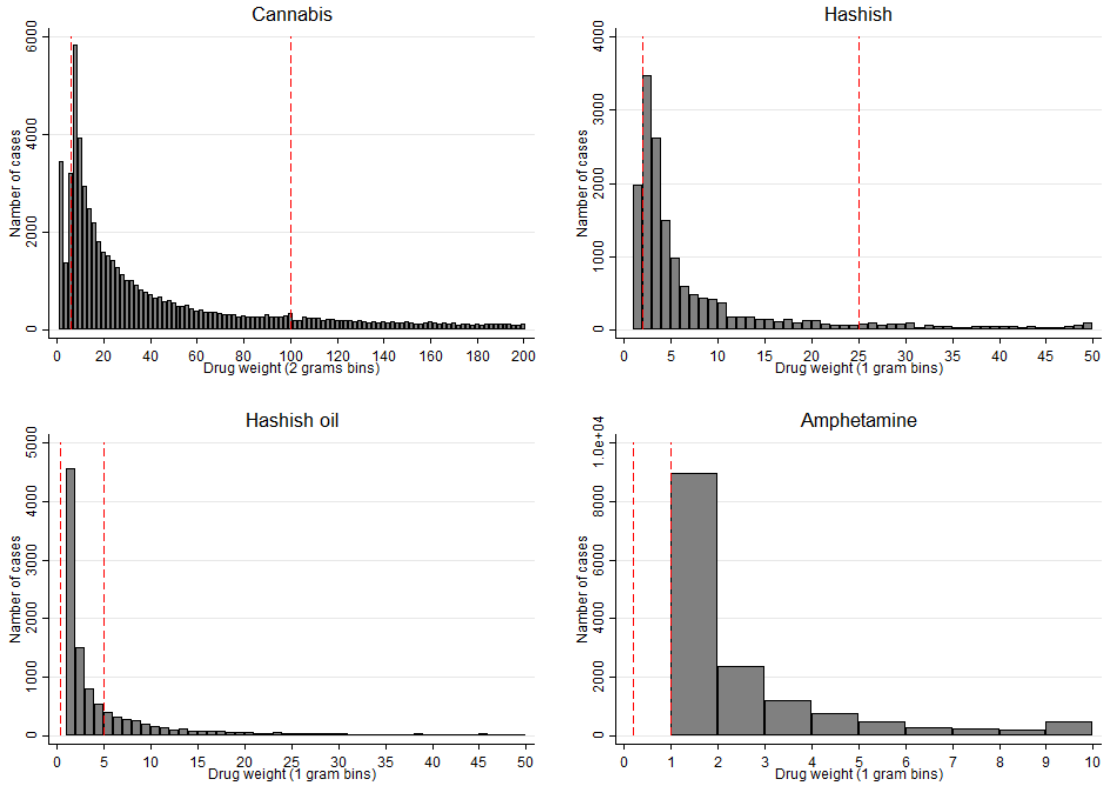
Tuttle, C. (2019). Racial Disparities in Federal Sentencing: Evidence from Drug Mandatory Minimums. *Available at SSRN https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3080463. Accessed November 1, 2019.*

Ulmer, J. T., M. C. Kurlychek, and J. H. Kramer (2007). Prosecutorial Discretion and the Imposition of Mandatory Minimum Sentences. *Journal of Research in Crime and Delinquency 44*, 427–458.

Volkov, V. (2016). Legal and Extralegal Origins of Sentencing Disparities: Evidence from Russia's Criminal Courts. *Journal of Empirical Legal Studies 13*, 637–665.

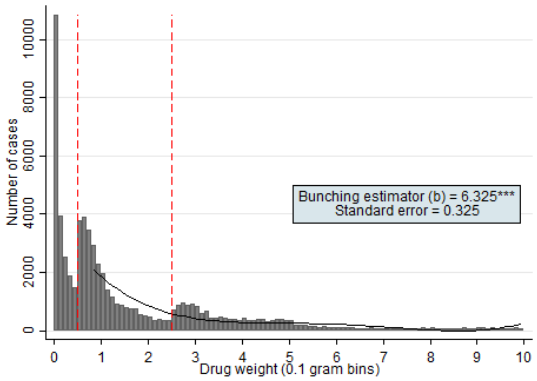
A Supplemental Figures

Figure A1: Distributions of cases across quantities of drugs seized by drug type



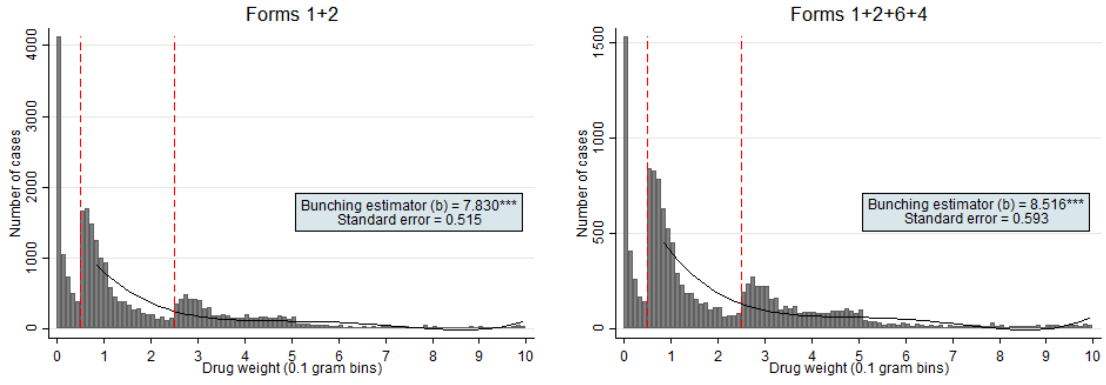
Note: The baseline sample consists of all drug related cases from form 1 registered in Russia during 2013-2014. The thresholds (dashed lines) determine the scale of seizure (less than significant, significant and large drug amounts), the severity of crime and punishment.

Figure A2: Distribution of cases across quantities of heroin seized



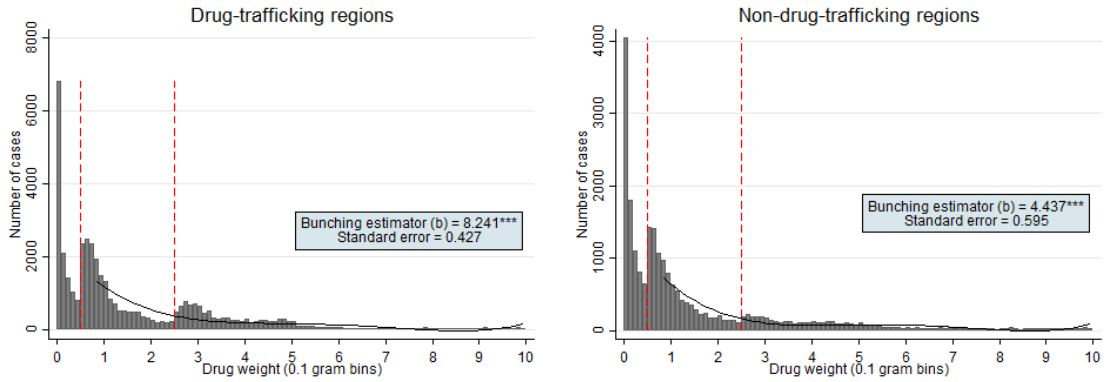
Note: The baseline sample consists of all heroin related cases from form 1 registered in Russia during 2013-2014. The series shown in bars is a histogram of the observed distribution of cases. The solid line is a fourth-degree polynomial fitted to the empirical distribution. The thresholds (dashed lines) determine the scale of seizure (less than significant, significant and large drug amounts), the severity of crime and punishment.

Figure A3: Distributions of cases from forms 1, 2 (left) and forms 1, 2, 6, 4 (right) across quantities of heroin seized in Russia during 2013-2014



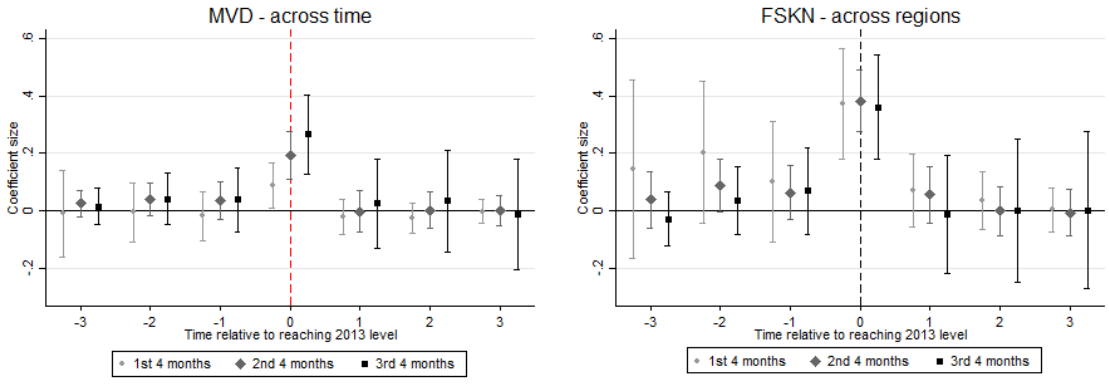
Note: The series shown in bars is a histogram of the observed distribution of cases. The solid line is a fourth-degree polynomial fitted to the empirical distribution. The thresholds (dashed lines) determine the scale of seizure (less than significant, significant and large drug amounts), the severity of crime and punishment.

Figure A4: Distributions of cases across quantities of heroin seized in regions which are along (left) or away from (right) the main drug-trafficking routes



Note: The baseline sample consists of all heroin related cases from form 1 registered in Russia during 2013-2014. The series shown in bars is a histogram of the observed distribution of cases. The solid line is a fourth-degree polynomial fitted to the empirical distribution. The thresholds (dashed lines) determine the scale of seizure (less than significant, significant and large drug amounts), the severity of crime and punishment.

Figure A5: The effect of reaching 2013 level on the number of serious and most serious drug crimes registered in 2014, by agency and the period of reaching



Note: The samples include all MVD's and all FSKN's stations that reached the total 2013 number of serious and most serious drug crimes during the period studied (January - December 2014) split by the period of reaching this number. The regression results are reported in the Appendix, Table B5. Standard errors are clustered by station.

B Supplemental Tables

Table B1: Amounts of drugs (grams above) for purposes of articles 228, 228.1 of the Criminal Code of Russian Federation

	Significant	Large	Especially large
Cannabis	6	100	100000
Heroin	0.5	2.5	500
Amphetamine	0.2	1	200
Papaver	20	500	100000
Desomorphine	0.05	0.25	10
Hashish	2	25	10000
Cocaine	0.5	5	1500

Table B2: The severity of offence and sanctions according to articles 228, 228.1 of the Criminal Code of Russian Federation

Drug amount	Article 228 (use)		Article 228.1 (sale)	
	Severity	Sentence (years)	Severity	Sentence (years)
Less than significant	Administrative offence	Fine/15 days	Serious	4-8
Significant	Least serious	0-3	Most serious	8-15
Large	Serious	3-10	Most serious	10-20
Especially large	Most serious	10-15	Most serious	15-20

Table B3: The comparison of means within the missing values analysis

	Form 1			Form 4			Forms 1+2			Forms 1+2+6+4		
	(1)	(0)	(1) - (0)	(1)	(0)	(1) - (0)	(1)	(0)	(1) - (0)	(1)	(0)	(1) - (0)
Initiated by the MVD	0.682	0.643	0.039***	0.749	0.796	−0.047***	0.753	0.817	−0.064***	0.794	0.942	−0.148***
Initiated by the FSKN	0.314	0.355	−0.040***	0.250	0.204	0.046***	0.245	0.182	0.063***	0.205	0.058	0.147***
Article 228 (use)	0.447	0.364	0.083***	0.530	0.440	0.090***	0.727	0.670	0.057***	0.837	0.793	0.045***
Article 228.1 (sale)	0.550	0.592	−0.042***	0.467	0.537	−0.070***	0.269	0.291	−0.022***	0.160	0.187	−0.027***
Male							0.814	0.837	−0.023***	0.822	0.844	−0.022**
Russian							0.851	0.895	−0.044***	0.876	0.920	−0.045***
At least college							0.381	0.350	0.031***	0.392	0.325	0.068***
Unemployed							0.784	0.810	−0.026***	0.772	0.828	−0.056***
Student							0.0001	0.0005	-0.0004	0.0001	0.0007	−0.0006*
Worker							0.182	0.150	0.032***	0.196	0.133	0.063***
White collar							0.014	0.010	0.004*	0.015	0.014	0.001
Repeat offender							0.672	0.584	0.088***	0.669	0.565	0.103***
Administrative offence							0.067	0.025	0.042***	0.070	0.026	0.045***
Under the influence of drug							0.509	0.354	0.155***	0.536	0.358	0.178***
Under the influence of alcohol							0.014	0.014	0.000	0.016	0.016	0.000
Sentence length										3.009	2.417	0.592***
Pleaded guilty										0.346	0.604	−0.258***
Observations	76,735	12,417		46,593	4,189		30,728	4,268		14,350	1,516	

* p < 0.10, ** p < 0.05, *** p < 0.01

Note: The table compares means in four samples used in the analysis: from form 1, form 4, forms 1 and 2, and forms 1, 2 and 6 merged with weights from form 4. The samples consist of all heroin related cases registered in Russia during 2013-2014. Columns (1) present means in the subsamples without observations with missing drug weight, columns (0) present means in the subsamples of observations with missing drug weight, columns (1) - (0) shows differences in means.

Table B4: Robustness check

Starting point	Polynomial degree k	Manipulation window		Bunching estimator b	s.e.
		Lower bound r_l	Upper bound r_u		
0.7	4	1.5	3.3	7.463***	0.305
0.7	4	1.5	3.4	8.879***	0.377
0.7	4	1.5	3.5	10.828***	0.526
0.7	5	1.1	3.3	7.057***	0.415
0.7	5	1.1	3.4	8.123***	0.509
0.7	5	1.1	3.5	9.515***	0.691
0.8	**4**	**1.6**	**3.3**	**6.325*** **	**0.325**
0.8	4	1.6	3.4	7.256***	0.319
0.8	4	1.6	3.5	8.453***	0.398
0.8	5	1.2	3.3	7.885***	0.579
0.8	5	1.2	3.4	9.165***	0.766
0.8	5	1.2	3.5	10.851***	0.956
0.9	4	1.7	3.3	6.398***	0.246
0.9	4	1.7	3.4	6.787***	0.277
0.9	4	1.7	3.5	7.421***	0.309
0.9	4	1.3	3.3	7.459***	0.473
0.9	4	1.3	3.4	8.466***	0.537
0.9	4	1.3	3.5	9.751***	0.572

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The baseline sample from form 1 consists of all heroin related cases registered in Russia during 2013-2014. To obtain the estimates of bunching, I apply the method described in detail in Appendix C.

Table B5: The effect of reaching 2013 level on the number of serious and most serious drug crimes registered in 2014

	(1) Both agencies	(2) MVD	(3) FSKN
t=-6	0.0003	0.003	−0.002
	(0.015)	(0.018)	(0.029)
t=-5	−0.018	−0.004	−0.046
	(0.016)	(0.019)	(0.030)
t=-4	−0.008	−0.020	0.030
	(0.015)	(0.018)	(0.030)
t=-3	0.015	0.025	0.002
	(0.015)	(0.018)	(0.029)
t=-2	0.047***	0.047***	0.061**
	(0.014)	(0.016)	(0.025)
t=-1	0.038***	0.037**	0.052**
	(0.013)	(0.015)	(0.026)
t=0	0.232***	0.197***	0.342***
	(0.014)	(0.015)	(0.028)
t=1	0.006	0.010	0.007
	(0.012)	(0.014)	(0.025)
t=2	0.004	0.011	−0.006
	(0.013)	(0.014)	(0.028)
t=3	−0.0007	0.011	−0.026
	(0.013)	(0.014)	(0.025)
t=4	0.008	0.018	−0.016
	(0.013)	(0.015)	(0.025)
t=5	−0.020	−0.011	−0.049*
	(0.014)	(0.016)	(0.029)
t=6	−0.015	−0.014	−0.022
	(0.014)	(0.016)	(0.030)
constant	0.298	0.269	0.376
	0.011	0.013	0.023
Month fixed effects	✓	✓	✓
Station fixed effects	✓	✓	✓
Observations	24,060	17,748	6,312
R-squared	0.649	0.650	0.651

Clustered standard errors in parentheses

* p < 0.10, ** p < 0.05, *** p < 0.01

Note: Column (1) presents estimates for both drug control agencies, column (2) - for the MVD, column (3) - for the FSKN. The samples include all stations that reached the total 2013 number of serious and most serious drug crimes during the period studied (January - December 2014). The dependent variable is the logarithm of the number of serious and most serious drug crimes per month calculated based on the sample of all drug related cases from form 1. Standard errors are clustered by station.

Table B6: The effect of reaching 2013 level on the number of serious and most serious drug crimes registered in 2014, by agency and the period of reaching

	MVD			FSKN		
	(1)	(2)	(3)	(1)	(2)	(3)
	1st 4 months	2nd 4 months	3rd 4 months	1st 4 months	2nd 4 months	3rd 4 months
t=-3	-0.010	0.025	0.014	0.145	0.037	-0.030
	(0.076)	(0.024)	(0.032)	(0.157)	(0.050)	(0.047)
t=-2	-0.007	0.038	0.041	0.202	0.088*	0.035
	(0.053)	(0.029)	(0.046)	(0.125)	(0.047)	(0.059)
t=-1	-0.020	0.036	0.038	0.101	0.063	0.069
	(0.043)	(0.034)	(0.057)	(0.106)	(0.048)	(0.077)
t=0	0.086**	0.193***	0.266***	0.373***	0.382***	0.361***
	(0.040)	(0.042)	(0.070)	(0.097)	(0.054)	(0.092)
t=1	-0.022	-0.003	0.024	0.070	0.055	-0.015
	(0.032)	(0.037)	(0.078)	(0.063)	(0.051)	(0.105)
t=2	-0.026	0.002	0.034	0.036	-0.001	0.000
	(0.027)	(0.033)	(0.090)	(0.051)	(0.044)	(0.127)
t=3	-0.003	0.002	-0.014	0.002	-0.007	0.001
	(0.021)	(0.027)	(0.098)	(0.038)	(0.041)	(0.138)
constant	0.147***	0.249***	0.461***	0.007	0.329***	0.562***
	(0.048)	(0.018)	(0.021)	(0.114)	(0.033)	(0.034)
Month fixed effects	✓	✓	✓	✓	✓	✓
Station fixed effects	✓	✓	✓	✓	✓	✓
Observations	5664.000	6048.000	6036.000	1488.000	2064.000	2760.000
R-squared	0.501	0.607	0.677	0.415	0.539	0.700

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Columns (1) present estimates for the first 4 months of the years, columns (2) - for the second 4 months, columns (3) - for the third 4 months. The samples include all stations that reached the total 2013 number of serious and most serious drug crimes during the period studied (January - December 2014). The dependent variable is the logarithm of the number of serious and most serious drug crimes per month calculated based on the sample of all drug related cases from form 1. Standard errors are clustered by station.

Table B7: Summary statistics

	Overall	Manipulation region
Male	0.814	0.826
Russian	0.851	0.859
At least college	0.381	0.400
Unemployed	0.784	0.748
Student	0.0001	0.000
Worker	0.182	0.210
White-collar	0.014	0.019
Repeat offender	0.672	0.713
Administrative offence	0.067	0.060
Under the influence of drugs	0.509	0.541
Under the influence of alcohol	0.014	0.017
Observations	30,728	5,026

Note: The baseline sample from forms 1 and 2 consists of all heroin related cases registered in Russia during 2013-2014. See the text for further details defining the subsample around the threshold.

C Estimation Details

To estimate the magnitude of the response of police officers around the crime severity threshold, I adapt the standard method from the bunching literature (Saez 2010, Chetty et al. 2011, Kleven and Waseem 2013).

To obtain the bunching estimator, I estimate the counterfactual density of seized drug amounts by fitting a high-order polynomial to the observed distribution, excluding the region$[r_l, r_u]$ around the threshold $\overline{D}$:

$$C_j = \sum_{k=0}^{p} \beta_k R_j^k + \sum_{r=r_l}^{r_u} \gamma_r * \mathbb{1}[R_j = r] + \nu_j, \tag{1}$$

where C_j is the number of cases in bin j, p is the order of the polynomial, R_j is the midpoint of bin j. For heroin related cases, bin size is set to 0.1 gram, which is approximately the smallest dose that can be bought. To obtain the counterfactual distribution I estimate the predicted values from (1), omitting the γ_r shifters for smoothing the density around the threshold:

$$\hat{C}_j = \sum_{k=0}^{p} \hat{\beta}_k R_j^k. \tag{2}$$

Key assumption for the bunching estimator, as well as for any other bunching methodology, is that without manipulation the actual distribution of outcomes in the bunching window would follow the polynomial estimated outside this window.

Comparing the counterfactual and observed distributions, I can estimate the missing mass to the left of the threshold, and the excess bunching mass to the right of the threshold:

$$\hat{M} = \sum_{j=r_l}^{\overline{D}} (\hat{C}_j - C_j) \text{ and } \hat{B} = \sum_{j=\overline{D}}^{r_u} (C_j - \hat{C}_j). \tag{3}$$

To determine the lower and upper bounds of the excluded interval, I follow Kleven and Waseem (2013). Because the excess bunching above the threshold is quite sharp (compared to the missing mass), the upper bound can be determined visually. With r_u fixed I set the lower bound r_l such that $\hat{B} = \hat{M}$.

Finally, I can obtain a bunching estimate for the magnitude of manipulation, calculating the ratio of excess mass to the average height of the counterfactual density above the threshold:

$$\hat{b} = \frac{\hat{B}}{\sum_{j=\overline{D}}^{r_u} \hat{C}_j / N}, \tag{4}$$

where N is the number of bins in the interval $[\overline{D},\ r_u]$.

Since the paper studies the rational response of the police only around the second threshold, I exclude the area around first threshold from estimation.