Distortion of Justice: How the Inability to Pay Bail Affects Case Outcomes

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This article uses a natural experiment to analyze whether incarceration during the pretrial period affects case outcomes. In Philadelphia, defendants randomly receive bail magistrates who differ widely in their propensity to set bail at affordable levels. Using magistrate leniency as an instrument, I find that pretrial detention leads to a 13% increase in the likelihood of being convicted, an effect largely explained by an increase in guilty pleas among defendants who otherwise would have been acquitted or had their charges dropped. I find also that pretrial detention leads to a 42% increase in the length of the incarceration sentence and a 41% increase in the amount of nonbail court fees owed. This latter finding contributes to a growing literature on fines-and-fees in criminal justice, and suggests that the use of money bail contributes to a "poverty-trap": those who are unable to pay bail wind up accruing more court debt. (*JEL* K14)

> I have had the "you can wait it out or take the deal and get out" conversation with way too many clients.
> —a public defender, Philadelphia

1. Introduction

There are currently 434,000 people awaiting trial in jail in the United States (Minton and Zeng 2016). In fact, there are more people in jail awaiting trial than are incarcerated due to a drug sentence.[1] This number is particularly striking considering that our criminal justice system is founded on a presumption of innocence, where, at least in theory, "liberty is the norm, and detention prior to trial or without trial is the carefully limited exception."[2] According to the Bureau of Justice Statistics, five out of six people detained before trial on a felony charge are held on money bail (Cohen and Reaves 2007). Some of these defendants

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1. The number of state and federal prisoners whose most serious offense was drug-related is found in Minton and Zeng (2015). The most recent information on the percentage of convicted jail inmates with a drug sentence is from James (2004).

2. Chief Justice Rehnquist in *United States v. Salerno*, 481 U.S. 739 (1987).

are facing very serious charges, and accordingly have very high bail. But many have bail set at amounts that would be affordable for the middle or upper-middle class but are simply beyond the reach of the poor. In Philadelphia, the site of this study, more than half of pretrial detainees would be able to secure their release by paying a deposit of $1000 or less, most of which would be reimbursed if they appear at all court dates. Many defendants remain incarcerated even at extremely low amounts of bail, where the deposit necessary to secure release is only $50 or $100. Nor are the charges faced by many pretrial detainees particularly serious: 60% of those held for more than three days were charged with nonviolent crimes and 28% were charged only with a misdemeanor.

It has long been argued that pretrial detention puts a defendant at a disadvantage in their case (Ares et al. 1963; Rankin 1964; Goldkamp 1980; Williams 2003; Phillips 2007, 2008; Tartaro and Sedelmaier 2009; Sacks and Ackerman 2012; Lowenkamp et al. 2013; Oleson et al. 2014). A detained defendant may plead guilty to get out of jail, or accept an overly punitive plea deal because detention impaired her ability to gather evidence or meet with her lawyer. She may be less motivated to fight the charges when the fixed costs of incarceration have already been paid: stigma, loss of employment, housing or child custody, etc. Furthermore, the use of money bail to determine custody status suggests that pretrial detention may form a type of poverty trap, where defendants who are too poor to pay for pretrial release suffer economic consequences downstream. Such consequences include the stigma of a criminal record, the destabilization of incarceration, or the burdens of probation compliance. More directly, defendants who are too poor to pay for pretrial release may accrue more debt, owing hundreds or thousands of dollars to the courts through fees and fines.

This article contributes to a series of concurrent articles providing quasi-experimental evidence on the impacts of pretrial detention (Gupta et al. 2016; Heaton et al. 2017; Leslie and Pope 2017; Dobbie et al. 2018).[3] The research design takes advantage of the fact that defendants randomly receive bail magistrates who vary widely in their propensity to set bail at affordable levels. Those who receive a strict magistrate are statistically identical to those who receive a more lenient magistrate except in their likelihood of being detained pretrial. If those who receive a strict magistrate are also more likely to be convicted or receive unfavorable sentences, we can infer that this is due to differences in detention rates and not some other unseen difference in defendant or case characteristics.

Using web-scraped data from Philadelphia court records and the relative leniency of the bail magistrate as an instrument, I find that pretrial detention leads to a 13% increase in the likelihood of being convicted on at least one charge. The effect on conviction is largely explained by an

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3. All five papers in the recent literature on the impacts of pretrial detention were developed in parallel and released publicly between May and August of 2016. A draft of this article was first released on May 2, 2016.

increase in the likelihood of pleading guilty among those who would otherwise have been acquitted, diverted, or had their charges dropped. These results are qualitatively consistent with the other recent papers, but the estimated effect sizes are significantly lower. This is particularly striking given that one of the other studies, Dobbie et al. (2018), is also largely based on Philadelphia data during a similar time period. (Gupta et al. (2016) also uses Philadelphia data but with a different independent variable: money bail instead of pretrial detention.) While some of this discrepancy may be due to cross jurisdictional differences, it may also be partly due to nonmonotonicity bias in specifications that assume that a magistrate's relative leniency does not vary across case or defendant characteristics.

I also find that pretrial detention leads to a 42% increase in the incarceration sentence, an effect that is only partially explained by release on time-served. This suggests that the impacts of pretrial detention extend beyond the classic example of defendants pleading guilty in order to get out of jail. Furthermore, it shows that the role pretrial detention plays in mass incarceration is bigger than its direct effects. Pretrial detainees constitute one in five of the total incarcerated population, but pretrial detention also contributes indirectly to mass incarceration through increased post-conviction sentences.[4]

Among the concurrent literature, only Heaton et al. (2017) (Harris County, Texas) and Leslie and Pope (2017) (New York City) find that pretrial detention increases the sentence length. Sentence outcomes were not evaluated in the other two recent Philadelphia-based papers. Compared to other settings, where the source of identifying variation is less clearly exogenous, the natural experiment in Philadelphia is particularly clean. There is one centralized bail hearing room for the entire city, and magistrates work a rotating schedule that creates random variation in which magistrate is on duty. Over time, each magistrate will work an equal number of night shifts, weekend shifts, etc. Furthermore, the duties of the bail magistrate are very limited and there are few plausible alternative channels through which they could affect case outcomes.

Finally, I find that pretrial detention has direct economic consequences: a 41% increase in courtroom debt. Since most people who are detained pretrial are detained due to an inability to pay bail, this provides support for poverty-trap theories of criminal justice. While the median defendant must pay only $250 to secure release, those who are convicted are expected to pay an average of $611 in court fees. The monetary bail system acts as a sort of regressive taxation: those who cannot afford to pay for pretrial release are required to pay a larger portion of the court's expenses.

This is the first study to evaluate pretrial detention's impacts on court fees, and contributes to a still-small literature on fines and fees in criminal

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4. At any point in time there are 434,000 people detained pretrial (Minton and Zeng 2016) and 2.172 million people incarcerated in total (Kaeble and Cowhig 2018).

justice. Although monetary punishments have historically received little attention in academic literature, the "Ferguson report" put out by the Department of Justice has led to renewed interest (DOJ 2015). This report found that the revenue-generating practices of Ferguson Police Department imposed "a particular hardship upon Ferguson's most vulnerable residents, especially upon those living in or near poverty." Such a statement has resonance in Philadelphia as well.

In Section 2 I give a brief overview of the pretrial process, in Section 3 I describe the natural experiment, and in Section 4 I discuss the data and provide descriptive statistics and graphs. Section 5 discusses the empirical strategy for identifying the impacts of pretrial detention and provides evidence that magistrate assignment is as-good-as-random. Section 6 presents the results and provides several robustness checks. Section 7 concludes.

2. The Pretrial Process

Pretrial detention is the act of keeping a defendant confined during the period between arrest and disposition for the purposes of ensuring their appearance in court and/or preventing them from committing another crime. The vast majority of jurisdictions use a money bail system to govern whether or not a defendant is detained (PJI 2009). In such a system a judge or a magistrate determines the amount of the bail required for release and the defendant is only released if she pays that amount. In some cases the defendant will be released without having to pay anything, in others (usually only the most serious cases) she will be denied bail and must remain detained. While the defendant is liable for the full amount of the bail bond if she fails to appear at court or commits another crime during the pretrial period, she usually does not need to pay the full amount in order to secure release. In many jurisdictions she will borrow this sum from a bail bondsman, who charges a fee and holds cash or valuables as collateral (Cohen and Reaves 2007). In some jurisdictions, Philadelphia included, the courts act as a bail bondsman and will release the defendant after the payment of a deposit.

Bail hearings are generally quite brief—in Philadelphia most last only a minute or two—and often do not have any lawyers present.[5] After the bail hearing there are a series of pretrial court appearances that defendants must attend. Although the exact procedure varies across jurisdictions these usually include at least an arraignment (where formal charges are filed) and some sort of preliminary hearing or pretrial conference (where the case is discussed and plea deals can be negotiated). Plea bargaining

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5. PJI (2009) shows 40% of respondent districts do not have defense attorneys at bail hearings. While there is no systematic survey of the length of bail hearing, they are reported to be very short in many jurisdictions: three minutes long in North Dakota (VandeWalle 2013), less than two minutes in Cook County (Staff 2016) and only a couple minutes long in Harris County (Heaton et al. 2017).

usually begins around the time of arraignment and can continue throughout the criminal proceedings. In some jurisdictions, like New York City, the arraignment happens simultaneous to the bail hearing and it is not uncommon to strike a plea deal at this first appearance (Barry et al. 2012). In other jurisdictions, such as New Orleans, arraignments for felony defendants often do not happen until four months after the bail hearing and a defendant who is unable to make bail must wait until then to file a plea.[6] In Philadelphia, arraignments usually happen within a month of the bail hearing.

Plea negotiation is a process in which the defendant receives reduced charges or shorter sentences in return for pleading guilty and waiving her right to a trial. Since defendants often face severe sentences if found guilty at trial, the incentives to plead are strong. It is estimated that 90–95% of felony convictions are reached through a plea deal (Devers 2011). Philadelphia differs from many other jurisdictions in its wide use of bench trials on felony cases. Since sentencing tends to be more lenient in bench trials than jury trials, this reduces the incentive to plead guilty.[7] Only about 78% of felony convictions are reached through plea in Philadelphia. Trial by jury is not constitutionally required if the maximum incarceration sentence is less than six months, and the use of bench trials for misdemeanors, as is the custom in Philadelphia, is more common across jurisdictions.

There are a number of reasons why a detained defendant might be more likely to be convicted, or receive a more punitive sentence. Any plea deal that involves immediate release from jail would be very tempting, even if the deal involved onerous probation requirements, heavy fines, and negative impacts on future labor market prospects or access to public benefits (Bibas 2004). It may be that since some of the disruptions of incarceration have already occurred—loss of job/housing, the initial adjustment to life behind bars—the incentives to fight the charges are lower. Jail may affect optimism about the likelihood of winning the case, or, by changing the reference point, may affect risk preferences in such a way that the certainty of a plea deal seems preferable to the gamble of a trial. Detention also impairs the ability to gather exculpatory evidence, makes confidential communication with attorneys more difficult, and limits opportunities to impress the judge with gestures of remorse or improvement (taking an anger management course, entering rehab, etc.) (Goldkamp 1980). Detained defendants may attend pretrial court appearances in handcuffs and/or prison garb, creating superficial impressions of criminality. Furthermore, if a defendant must await trial behind bars he may be

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6. Based on discussions with former New Orleans Parish defenders.

7. In Philadelphia, a bench trial is the default for all but the most serious felonies. The right to a jury trial can be asserted upon request, but this is uncommon. Although there is no formal mechanism that ensures that a bench trial will lead to better outcomes for the defendant than a jury trial, all defense attorneys interviewed assured me that this was the case.

reluctant to employ legal strategies that involve delay. Although a released defendant may file continuances in the hopes that the prosecution's witnesses will fail to appear, memories will blur, or charges eventually get dropped, a detained defendant pays a much steeper price for such a strategy. More nefariously, those detained have less opportunity to coerce witnesses, destroy evidence or otherwise impede the investigation (Laudan and Allen 2010).

These different mechanisms through which pretrial detention could affect case outcomes are likely to vary in importance by defendant and according to the local characteristics of criminal procedure. Although there is little reason to believe that the results shown in this article are unique to Philadelphia, the magnitude of the effects may differ across jurisdictions.

3. The Natural Experiment

Immediately after arrest, arrestees are brought to one of seven police stations around the city. There, the arrestee will be interviewed via videoconference by Pretrial Services. Pretrial Services collects information about various risk factors as well as financial information to determine eligibility for public defense. Using risk factors and the current charge, Pretrial Services will determine the arrestee's place in a 4 by 10 grid of bail recommendations. Although these bail guidelines suggest a wide range of appropriate bail, they are only followed about 50% of the time (Shubik-Richards and Stemen 2010). Once Pretrial Services has entered the bail recommendation and the financial information into the arrest report the arrestee is ready for her bail hearing.

Once every four hours the magistrate will hold bail hearings (in Philadelphia these are called Preliminary Arraignments) for all arrestees who are ready. The bail hearing will be conducted over videoconference by the magistrate, with a representative from the district attorney's office, a representative from the Defender Association of Philadelphia (the local public defender), and a clerk also present. In general, none are attorneys. The magistrate makes the bail determination on the basis of information in the arrest report, the pretrial interview, criminal history, bail guidelines, and advocacy from the district attorney and public defender representatives.

There are four things that happen during the bail hearing: the magistrate will read the charges to the arrestee, inform her of her next court appearance, determine whether the arrestee will be granted a court-appointed defense attorney, and set the bail amount. The first two activities are formalities that ensure the defendant is aware of what she is being charged with and where her next court date is. Eligibility for public defense is determined by income. If the defendant is deemed eligible, she will be assigned either to the Defender Association or to a private attorney who has been approved to accept court appointments by the City of

Philadelphia. The default is to appoint the Defender Association; if procedural rules require the court to appoint an attorney outside of the Defender Association the magistrate's clerk will appoint the attorney at the top of a rotating list of eligible attorneys known as a "wheel."[8]

A typical bail hearing lasts only a minute or two and the magistrate has broad authority to set bail as she sees fit.[9] Bail decisions fall into three categories: release with no payment required, cash bail or no bail.[10] Those with cash bail will be required to pay a 10% deposit on the total bail amount in order to be released. After disposition, and assuming that the behavioral conditions of the pretrial period were met, 70% of this deposit will be returned. The City of Philadelphia retains 30% of the deposit, even if charges get dropped or the defendant is acquitted on all charges. Those who do not have the 10% deposit in cash can borrow this amount from a commercial bail bondsman, who will accept cars, houses, jewelry and other forms of collateral for their loan. If the defendant's arrest occurred while she is already on probation or parole, her probation officer may choose to file a detainer. If a detainer is filed she may not bail out until a judge removes the detainer.[11]

The research design uses variation in the propensity of the magistrates to assign affordable bail as an instrument for detention status. The validity of the instrument rests on several factors, including that the magistrate received is essentially random and that the instrument will not affect outcomes through a channel other than pretrial detention. The following details help ease concerns along these lines.

Philadelphia employs six Arraignment Court Magistrates at a time, and one of the six will be on duty 24 hours a day, 7 days a week, including holidays. Each day is composed of three work shifts: graveyard (11:30 p.m.–7:30 a.m.), morning (7:30 a.m.–3:30 p.m.) and evening (3:30 p.m.–11:30 p.m.). Each magistrate will work for five days on a particular shift, take five days off, then do five days on the next shift, five days off, and so forth. For example, a magistrate may work the graveyard shift from January 1st to January 5th, have January 6th–10th off, then work

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8. If there are multiple codefendants, such that representing all of them would pose a conflict of interest, one defendant will be randomly selected to be served by the Defender Association and the others will receive a court-appointed attorney. For opaque historical reasons, four out of five defendants charged with murder will be represented by court-appointed attorneys and the fifth will be represented by the homicide division of the Defender Association (Anderson and Heaton 2012). This decision is made by the order in which defendants are entered into the data system and the court-appointed attorney is chosen by a Municipal Court Judge, not a magistrate.

9. If either the defense or the prosecution is unhappy with the decision they can make an appeal to a judge immediately after the bail hearing. However, the bar is high for overturning the original bail decision so this is not very common.

10. Holding a defendant without bail is uncommon, although bail is sometimes set at prohibitively high rates.

11. The detainer hearing usually happens within a week of arrest. Detainer cases are evenly distributed across magistrates and should not bias the results.

the morning shift from January 11th–15th, have the 16th–20th off, do the evening shift from January 21st–25th, take the next five days off, and then start the cycle all over again.

This rotation relieves concerns that certain magistrates set higher bail because they work during shifts that see higher-risk defendants. Over time, each magistrate will be scheduled to work a balanced number of weekends, graveyard shifts, and so forth. However the magistrates do not always work their appointed shifts; in fact, about 20% of the time there is a substitute (usually one of the other magistrates). To avoid potential confounds I instrument with the magistrate who was scheduled to work instead of the magistrate who actually worked. Furthermore, arrestees do not have latitude to strategically postpone their bail hearing to receive a more lenient magistrate. The process from arrest to bail hearing has been described as a conveyor belt: on average the time from arrest to the bail hearing is 17 hours and defendants are seen as soon as Pretrial Services notifies the Arraignment Court that they are ready (Clark et al. 2011). Thus the magistrate received by each defendant is essentially random, at least in that the sample of defendants who are seen by each magistrate should be statistically identical. I confirm this empirically in Section 5.

Since the duties of the bail magistrate are so limited, there are few channels outside of the setting of bail through which the magistrate could affect outcomes. One concern would be a correlation between the schedules of the magistrates and the likelihood of receiving a particular judge, prosecutor or defense attorney later on in the criminal proceedings. However, the peculiar schedule of the magistrates does not align with the schedule of any other actors in the criminal justice system. For one, this is because the other courts are not open on weekends. This is also because Philadelphia predominantly operates on a horizontal system, meaning that a different prosecutor handles each different stage of the criminal proceedings. Likewise, if the defendant is represented by the Defender Association (∼60% of the sample), she will have a different defense attorney at each stage.[12] While attorneys often rotate duties, their rotations are based on a Monday–Friday work week and not the "five days on, five days off" schedule of the magistrates.

Eligibility for public defense is another potential channel through which the magistrate could affect outcomes; 75% of the sample has a public defender at the time of disposition. However, there is no correlation between the leniency of the bail magistrate and having a public defender. This can be seen in Figure 1, where the x and y axes show residuals from regressions of detention and having a public defender (respectively) on controls for the time and season of the bail hearing. The time controls account for the fact that certain magistrates do not work through the entire time period of my data, and each dot represents the average per

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12. The most serious cases are not handled horizontally; however, the choice of attorney to handle these cases has nothing to do with the magistrate.
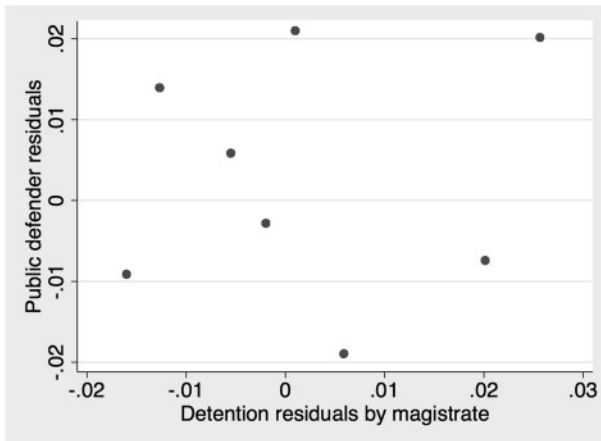
Figure 1. This figure shows the relationship between pretrial detention and having a public defender. Each dot represents the per-magistrate average. Both pretrial detention and public defense have been residualized against time controls to account for the fact that some magistrates work in different time periods.

magistrate. There is no visible correlation between the likelihood of receiving a lenient magistrate and the likelihood of having a public defender. (Nor is there any statistically significant relationship between the two in a regression.) In Section Appendix Table A1, I show that controlling for whether or not the defendant is represented by a public defender has no meaningful effect on the main results.

The only other condition of release that the magistrates are responsible for is determining whether the defendant must phone in periodically with Pretrial Services. As of 2009, approximately 9% of defendants were required to call into pretrial services either once or twice a week as a part of their condition of release (Clark et al. 2011). These phone calls are made to an interactive voice-response system, and there is no therapeutic element involved. Those who violate the call-in requirement do so with impunity: no violation notice is sent to the court, nor are any sanctions applied (Clark et al. 2011). It is unlikely that these calls will have more than a minor effect on case outcomes. In robustness tests, I find that the main results are robust to the inclusion of controls for the telephone call-in requirement (results not shown).

More invasive conditions of release are available to judges later in the criminal proceedings, but not to the magistrate who makes the initial bail assignment. These include electronic monitoring, drug testing, substance abuse counseling, in-person meetings with pretrial services or house arrest. As of 2009, only about 1% of arrestees were assigned to any of these conditions (Clark et al. 2011). The schedules of the judges who assign these conditions of release do not correlate with the rotating schedule of magistrates.

4. Data and Descriptive Statistics

The data for this analysis come from the court records of the Pennsylvania Unified Judicial System. PDF files of case dockets and court summaries were acquired by web-scraping public records; these were converted into data suitable for statistical analysis by text-parsing. The data covers all the Philadelphia arrests in which charges were filed between September 13, 2006 and February 18, 2013. Before September 13, 2006, Philadelphia used a different data management system and the data from that time period is of much lower quality. I do not look at cases which began after February 18, 2013 both because I wanted to leave ample time for all cases to resolve and because one of the magistrates was replaced by a new one on that date.

Each observation in my data set refers to a particular criminal case. A case can have multiple charges and a defendant can have multiple cases. Information about the bail amount, the magistrate, the bail hearing, and the charges at the time of the bail hearing comes from the Municipal Court (lower court) dockets. Information about court fees and whether the defendant is held pretrial on a detainer can be found in the Municipal Court dockets as well as the Court of Common Pleas (felony court) dockets. In addition, each defendant has a Court Summary Report, which summarizes the outcomes of each criminal case in which charges were filed in Pennsylvania. This provides both criminal history and recidivism information, as well as other general descriptors of each case (outcomes, sentencing, attorneys, dates of arrest/disposition, etc.). Average gross income for each ZIP code in 2010 was acquired from IRS.gov.[13]

A few constraints of the data should be noted. First, criminal history and recidivism is only available for crimes committed within Pennsylvania. Of these, I have the full range of past charges, and all post-release charges before December, 2015. Second, the data does not allow me to distinguish between concurrent and consecutive incarceration sentences. The definition of the length of incarceration that is used in this article is the longest sentence received. Finally, a small subset of the data got lost in the web-scraping process. I am missing key data sources for about 0.33% of the sample (about 1000 cases), these have been dropped. Since these missing variables are due to technical errors in the download, they should not result in any systematic selection of cases and are not expected to affect the results. The final sample consists of 331,971 cases.

Figure 2a shows a histogram of the number of days defendants are detained before disposition, conditional on being detained more than three days and less than 600 days. The left tail of the distribution is omitted since the primary definition of "detainees" used in this article is being unable to make bail within three days; the long right-hand tail of the distribution is omitted for visual simplicity. The median number of days

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13. https://www.irs.gov/uac/soi-tax-stats-individual-income-tax-statistics-zip-code-data-soi
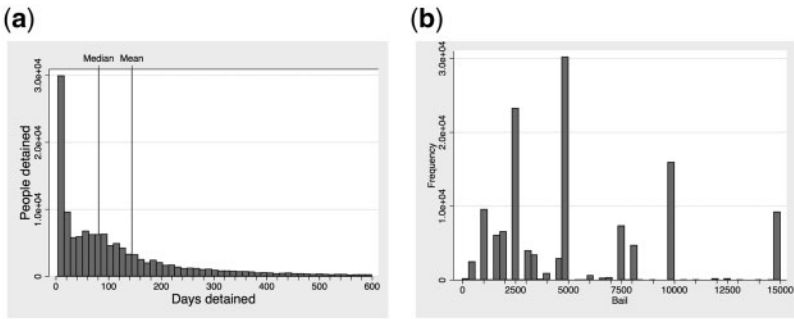
Figure 2. (a) The average number of days detained for those who are detained for more than three days after the bail hearing, truncated at 600 days for visual clarity. (b) The distribution of nonzero bail amounts, truncated at $150,000 (95th percentile).

detained for those who are unable to make bail within three days is 78, the mean is 146.

Summary statistics for the released group, the detained group, and the whole sample are shown in Table 1. Defendants are predominantly male, with an average age of 32 years. In all, 57% of the defendants are black, 28% are white and, with the exception of a tiny group of Asians, the rest are either missing race information or marked as unknown-race. Those detained tend to have longer criminal histories and are facing more serious charges than those released. It should be noted, however, that 28% of the detained sample are only facing misdemeanor charges.[14]

Almost half the sample have their charges dropped, dismissed, or are placed in some sort of diversion program.[15] Almost everyone else was convicted, through plea or at trial, on at least one charge. In all, 90% of cases resolved at trial result in convictions, suggesting that prosecutors will not bring a case to trial if they do not believe they have a strong chance of winning. If a detained defendant pleads quickly to avoid more time waiting in jail, she may be pleading guilty on a case that otherwise would not have proceeded to court.

One third of the sample is released without being required to pay bail and an additional 26% are able to pay their way out within three days of the bail hearing. Figure 2b shows the distribution of bail amounts for defendants with monetary bail set. About 10% of the sample has bail

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14. The offense information used in this article is taken from the charge at the time of the bail hearing. Many of those who were originally charged with felonies subsequently had the felony charge downgraded to a misdemeanor.

15. Diversion programs are designed for those with low-level misdemeanor charges; if the defendant agrees to requirements such as paying restitution to victims, entering rehab, or performing community service, they are generally able to avoid a formal adjudication of guilt.

Table 1. Summary Statistics

	Released	Detained	Total
Age	32.8	32.0	32.5
Male	0.79	0.88	0.83
White	0.30	0.26	0.28
Black	0.52	0.65	0.57
Unknown/missing race	0.15	0.06	0.11
Charged with selling drugs	0.12	0.13	0.12
Charged with robbery	0.02	0.14	0.07
Charged with drug possession	0.18	0.06	0.13
Charged with aggravated assault	0.07	0.11	0.09
Charged with first offense DUI	0.10	0.02	0.06
Number of prior cases	3.90	6.28	4.88
Has felony charge at time of bail hearing	0.36	0.72	0.51
Case proceeds to felony court	0.19	0.40	0.28
Bail	$3413	$61,974	$26,844
Nonfinancial release	0.54	0.01	0.33
Detained >3 days	0	1	0.41
All charges dropped or dismissed	0.48	0.48	0.48
Case went to trial	0.32	0.19	0.27
Not guilty on all charges	0.03	0.03	0.03
Guilty of at least one charge	0.49	0.49	0.49
Pled guilty to at least one charge	0.21	0.33	0.26
Court fees charged	$387	$206	$312
Sentenced to incarceration	0.18	0.32	0.24
Maximum days of incarceration sentence	94	576	292
Minimum days of incarceration before parole eligibility	39	322	155
Observations	195,340	136,631	331,971
Conditional summary statistics			
Court fees charged (cond. on conviction)	$409	$753	$611
Sentenced to incarceration (cond. on conviction)	0.46	0.67	0.49
Max. days of incarc. sentence (cond. on incarceration)	529	1736	1213
Min. days before parole eligibility (cond. on incarceration)	220	971	645

Notes: "Released" is defined as released from pretrial custody within three days after the bail hearing, and "Detained" is defined as detained pretrial for at least four days. The statistic shown is the mean and, unless otherwise indicated, variables are dummies where 1 indicates the presence of a characteristic. Age is measured in years, those marked "Number..." are count variables, and those expressed in dollar amounts are currency. The sentence is coded as zero if the defendant did not receive an incarceration sentence. The summary statistics in the bottom panel are limited to those who are convicted (top two rows) or receive an incarceration sentence (bottom two rows).

set at an amount greater than $0 but less than or equal to $2000. Among this low-bail sample—77% of whom are charged only with misdemeanors—the average number of days detained pretrial is 28, and 40% are detained for at least four days. This group would need to pay a deposit of $200 or less to secure their freedom. The median amount of bail for those who do not post bond is $10,000.
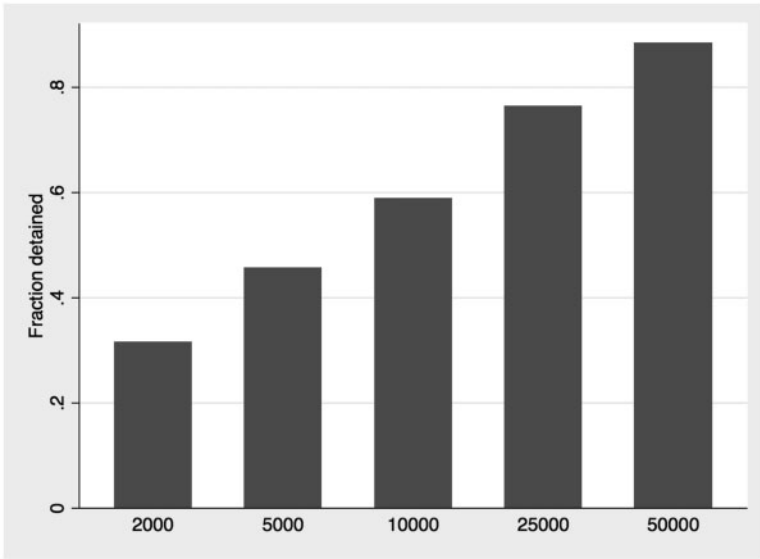
Figure 3. This figure shows the percentage released and detained at a variety of bail levels among defendants who did not have a detainer placed on them (i.e. were free to leave if they posted bail).

Figure 3 shows the percentage detained and released at various levels of bail. This subsample is limited to defendants who do not have a detainer placed on them—in other words, these defendants would be free to leave if they posted bail. Almost half of the defendants with bail set at $5000 do not post bail within three days of the bail hearing. These defendants would only need to post a deposit of $500 in order to secure release. Although a percentage may prefer to stay in jail, it is reasonable to infer that many would post bail if they could afford it. As of 2008, Philadelphia's jails housed 44% more inmates than they were designed to, and 20% of inmates were living in "triple cells" (three inmates in a cell designed for one or two people).[16] "Lock-downs" and restrictions on movement are common, and despite the heat and humidity which characterize Philadelphia's summers, many buildings lacked air conditioning.

5. Empirical Strategy

Instrumenting for sentencing outcomes using varying propensities of randomly assigned or rotating judges is a popular method of identifying causal effects in criminal justice (Kling 2006; Aizer and Doyle 2009; Loeffler 2013; DiTella and Schargrodsky 2013; Mueller-Smith 2015). My empirical specification follows in that tradition. I use a jackknife

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16. From *Williams v. City of Philadelphia*, 2008.

(leave-one-out) instrumental variables method, in which magistrate leniency for case i is calculated using all observations except i. This is a commonly used method to reduce bias due to instrument endogeneity, particularly when there are many instruments (Angrist et al. 1999). Since pretrial detention status is a function of both magistrate leniency and unobserved characteristics that might be correlated with the outcome, these unobserved characteristics will be correlated with the instrument if the pretrial detention status of case i is included in the instrument calculation for case i.

My specification follows in the tradition of Mueller-Smith (2015) and a robustness test in Aizer and Doyle (2009), and allows the preferences of the magistrate to vary across three time periods and according to the offense, criminal history, race and gender of the defendant. The first stage of this specification is shown in equation (1) where a dummy for pretrial detention in case i (*Detention$_i$*) is regressed on the magistrate dummy (*Magistrate$_i$*) interacted with a subset of covariates (Cov_i^{sub})[17] and with indicators for three time periods (T_i), as divided by February 23, 2009 and February 23, 2011.[18] Other offense, criminal history, and demographic controls are included in X_i,[19] and controls for the time and date of the bail hearing are included in *Time$_i$*.[20] The instrument for pretrial detention for the defendant in case i is thus the average detention rate of all other individuals with a similar offense, criminal history, race and

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17. *Cov^{sub}* consists of the following variables: dummies for the 17 most common offenses (murder, robbery, aggravated assault, burglary, theft, shoplifting, simple assault, drug possession, drug sale, drug purchase, marijuana possession, second-degree felony firearm possession, third-degree felony firearm possession, vandalism, prostitution, first offense DUI, motor vehicle theft), a dummy for being labeled black, a dummy for being female, the number of prior cases, the number of prior violent crimes, a dummy for having at least one prior and a dummy for having a detainer.

18. These dates provide a natural break point since certain magistrates left were replaced by others at these times.

19. X_i includes controls for age, age squared, age cubed, the number of prior felony cases, prior cases where the defendant was found guilty of at least one charge, dummies for having at least one prior case, having at least three prior cases, awaiting trial on another charge, and having a prior arrest within five years of the bail hearing. Offense variables include dummies for having a charge in the following category: rape, possession of stolen property, second offense DUI, resisting arrest, stalking, indecent assault, arson, solicitation of prostitutes, disorderly conduct, pedophilia, intimidation of witnesses, accident due to negligence, false reports to a police officer, fleeing an officer, and reckless endangerment. Additional offense controls include dummies for being charged with a first-, second- or third-degree felony, an unclassified felony, a first-, second- or third-degree misdemeanor, an unclassified misdemeanor, or a summary offense. I also control for the total number of charges, the total number of felony charges, the total number of misdemeanor charges, and the total "offense gravity score" of the charges (the offense gravity score is used by Philadelphia to measure the seriousness of a charge on a scale of 1–8).

20. *Time$_i$* includes dummies for each year, a cubic in the day of the year (1–365), dummies for each day of the week, and for each shift in the day (graveyard, morning, evening).

gender who had their bail set by the same magistrate during a two year period.

$$Detention_i = \alpha_1 + Magistrate_i * T_i * \omega_1 + Magistrate_i * Cov_i^{sub} * \phi_1 + Cov_i^{sub} \\ * T_i * \delta_1 + X_i * \gamma_1 + Time_i * \psi_1 + e_i.$$

$$(1)$$

The second stage of the two stage least squares regression is shown in equation (2) where $Case\_Outcome_i$ represents a variety of case outcomes, $\widehat{Detention_i}$ is the fitted value from the jackknifed first stage, and Cov_i^{sub}, X_i, T_i and $Time_i$ are as described above.

$$Case\_Outcome_i = \alpha_2 + \widehat{Detention_i} * \beta_2 + Cov_i^{sub} * T_i * \delta_2 + X_i * \gamma_2 + \\ Time_i * \psi_2 + \epsilon_i.$$

$$(2)$$

Each magistrate sees about 17,000 cases during a two year period. Since the interaction effects are additive, the instrument for each case will be estimated off of many thousands of other defendants. For example, the instrument for a white female with an aggravated assault charge who had bail set by Magistrate 3 will be calculated *not just* using others with the exact same characteristics, but rather the cumulative differential effect that Magistrate 3 has on the detention status of whites, females, and those facing aggravated assault charges, compared to the sample average.

The inclusion of magistrate interactions in the first stage increases the power of the instrument, but it also eases concerns about monotonicity violations (Imbens and Angrist 1994). In this setting, a monotonicity violation would occur if some defendants are *less* likely to be detained pretrial if they have bail set by a usually-strict magistrate. If magistrates have heterogeneous bail preferences—in other words, if they are relatively strict for certain types of defendants but relatively lenient for other types of defendants—the monotonicity assumption would not hold. The data show ample evidence of heterogeneous bail preferences. Figure 4a shows detention rates by magistrate across the entire sample. The y axis shows residuals from a regression of the pretrial detention dummy on a set of time controls; the whiskers show the 95% confidence intervals. Each bar shows the average residuals per magistrate. Figures 4b shows the same per-magistrate average detention residuals among a sample limited to those charged with robbery. The magistrate that is most lenient overall is actually strictest when it comes to robbery: magistrate preferences are not consistent across offense types. This is confirmed by conducting a series of difference-in-means tests, where the null hypothesis is that the average detention residuals for defendants who had bail set by the strictest magistrate (as measured by overall detention rates) will be larger than the average detention-residuals for defendants who saw the most-lenient magistrate. This one-sided test is conducted separately for defendants charged with the 17 most common offense types. Of these 17 different
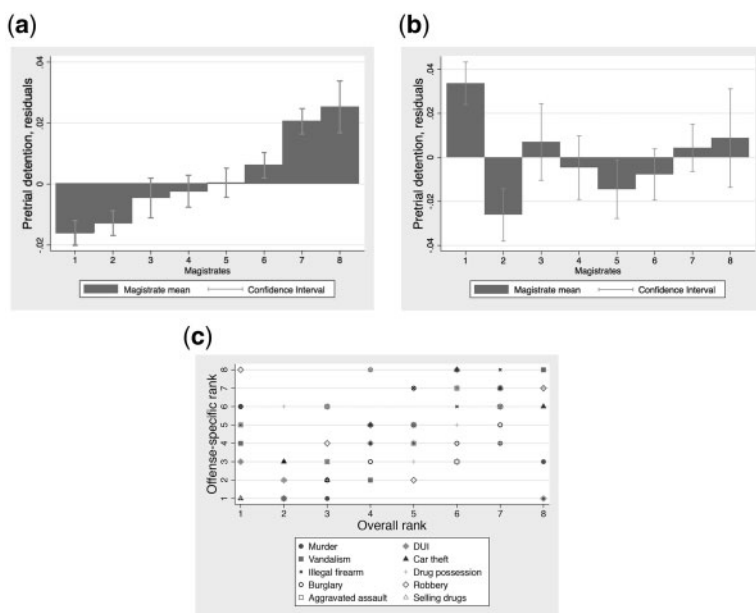
Figure 4. The top two figures show pretrial detention rates by magistrate over the whole sample (a), and for defendants charged with robbery (b). The numbers 1 through 8 delineate the different magistrates by ranking, where magistrate 1 is the most lenient magistrate across the entire sample. The y axes show the residuals from a regression of pretrial detention on time controls; each bar represents the per-magistrate average of the residuals. The error bars indicate the 95% confidence intervals for the mean. The numbering of the magistrates is consistent across both figures. (c) Plots the overall magistrate leniency ranking on the x axis against various crime-specific magistrate leniency rankings on the y axis.

tests, there are four (including robbery) for which I reject the null hypothesis. All four rejecting tests have p-values less than 0.03; two of them have p-values less than 0.000001. Thus for 4 of the 17 most common offenses, being assigned to the magistrate who is most lenient overall would actually *increase* the likelihood of being detained pretrial relative to being assigned the most strict magistrate.

Figure 4c provides additional evidence that magistrate leniency varies by offense type. Figure 4c plots the overall leniency ranking of each of the eight magistrates on the x axis against the leniency ranking of the eight magistrates on the subsample of defendants facing different charges on the y axis. The ranking for each subsample is indicated by a different marker. Under the monotonicity assumption, each magistrate would have the same ranking within each offense category, and the graph would show a single 45 degree line of overlaid symbols. However, as is evidenced in this chart, there is considerable variance in ranking across different offenses. For instance, the magistrate who is most lenient overall (with a

leniency-ranking of 1 on the *x* axis) has the leniency-ranking of 1, 3, 4, 5, 6, and 8 across 10 different offense types.

Violations of the monotonicity assumption will lead to biased estimates if there are heterogeneous treatment effects (Angrist and Krueger 1995). In fact, the combination of a monotonicity violation and heterogeneous treatment effects could even generate a treatment effect estimate with the wrong sign. Consider a simple example in which there are only two offense categories: DUI and robbery. Suppose that pretrial detention had no effect on case outcomes for defendants who are charged with DUI, but increased the likelihood of conviction for people charged with robbery. If the instrument for pretrial detention *increases* the likelihood that DUI defendants will be detained pretrial, but *decreases* the likelihood that a robbery defendant is detained pretrial,[21] then the instrumental variables (IV) approach would estimate that pretrial detention makes a defendant *less* likely to be convicted. This is because the instrument works "backwards" for the group of defendants for whom pretrial detention has an effect: being assigned a generally-strict magistrate decreases instead of increases the likelihood of being detained pretrial.

The inclusion of magistrate interaction terms in the first stage allows magistrates to have different bail-setting preferences over a variety of defendant characteristics. Although this may not entirely eliminate nonmonotonicity bias, it should ameliorate it substantially. In tests, I found that the estimates tended to stabilize as more interaction terms were added. This is discussed more in Section 6.

Without further assumptions, the magistrate received by each defendant must be essentially random to allow for a causal interpretation of the results. Table 2 shows that pretrial detention is endogenous but that the instrument for pretrial detention is uncorrelated with observable characteristics. Each cell of the table comes from a separate regression. The dependent variables of each regression—various covariates describing the case and the defendant—are shown in the left-hand side of the table. Each cell shows the coefficient on pretrial detention (Column 1) or the instrument for pretrial detention (Columns 2 and 3). Column 1 shows results for ordinary least squares (OLS) regressions of each covariate on a dummy for pretrial detention, controlling only for a small set of time controls: fixed effects for each year and a cubic in the day of the year (1–365). As can be seen, pretrial detention is strongly endogenous. Those detained are facing more serious charges, have longer criminal histories, are more likely to be male, and more likely to have a graveyard-shift bail hearing. Column 2 shows results from regressing covariates on the "simple instrument," that is the predicted likelihood of pretrial detention based on the leave-me-out average detention rate per

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21. One could imagine an instrument that works this way if there are more DUI cases than robbery cases and if magistrates who are relatively harsh on DUIs are relatively lenient on robberies.

Table 2. Randomization Test

	(1) OLS	(2) Simple instrument	(3) Interacted instrument
White	−0.0399****	0.0834	
	(0.00158)	(0.0631)	
Male	0.0905****	−0.00484	
	(0.00126)	(−0.00484)	
At least one prior charge	0.140****	−0.0485	
	(0.00143)	(0.0600)	
Robbery	0.127****	0.00994	
	(0.00101)	(0.0364)	
First time DUI	−0.0833****	−0.0429	
	(0.000760)	(0.0335)	
Selling drugs	0.00634****	0.0170	
	(0.00117)	(0.0466)	
Aggravated assault	0.0444****	−0.00302	
	(0.00105)	(0.0395)	
Age	−0.901****	−1.700	0.377
	(0.0398)	(1.574)	(0.602)
Prior felony arrests	0.819****	0.559**	−0.0623
	(0.00772)	(0.274)	(0.108)
Prior convictions	0.779****	−0.127	−0.0796
	(0.00902)	(0.337)	(0.128)
Offense gravity score	9.107****	−0.675	0.158
	(0.0422)	(1.673)	(0.365)
Number felony charges	3.193****	−0.494	−0.0167
	(0.0168)	(0.673)	(0.184)
Rape	0.0156****	−0.0104	0.00116
	(0.000372)	(0.0128)	(0.00457)
Resisting arrest	0.0108****	−0.0273	−0.00407
	(0.000591)	(0.0225)	(0.00878)
Disorderly conduct	−0.00712****	0.00861	0.00254
	(0.000420)	(0.0171)	(0.00274)
Graveyard shift	0.0311****	0.0753	0.00799
	(0.00165)	(0.0650)	(0.0284)
Weekend shift	−0.000252	0.0262	0.0197*
	(0.000635)	(0.0252)	(0.0113)
Observations	331971	331971	331971

$*p < 0.10$, $**p < 0.05$, $***p < 0.01$, $****p < 0.001$.
Notes: The dependent variables are shown on the left-hand side. In Column 1 the independent variable is a dummy for pretrial detention, in Column 2 it's the "simple instrument" for pretrial detention (the predicted likelihood of detention based on the magistrate dummies) and in Column 3 it's the "interacted instrument" (the predicted likelihood of detention based on the magistrate dummies interacted with three time periods, offense, criminal history, and demographics). Each regression controls for the year and season of the bail hearing to account for the fact that some magistrates work in different time periods. Heteroskedastic-robust standard errors in parentheses.

magistrate. Fixed effects for each year, and a cubic in the day of the year, are included to account for the fact that some magistrates work in different time periods. Although pretrial detention is strongly endogenous, this simple instrument for pretrial detention is not. Of the 17 tests

conducted, only one is statistically significant at the 5% level, no more than would be expected by chance.

Column 3 shows regressions of various covariates on the "interacted instrument" for pretrial detention, that is the leave-me-out predicted likelihood of detention based on the magistrate dummies interacted with three time periods, offense, criminal history, and demographics of the defendants, as described above. Once again, fixed effects for each year, and a cubic in the day of the year, are included to account for the fact that some magistrates work in different time periods. The dependent variables in Column 3 are from X_i: variables that are included as controls in the main regression but are not included as interactions with magistrate fixed effects in the first stage. These include less common crime types, general descriptors of the charges (such as the total number of felony charges), indicators for shift times or weekends, and additional measures of criminal history. Also included as a dependent variable is the "offense gravity score," which is a measure used in Philadelphia to evaluate the seriousness of the charges. Once again, the results show that the instrument for pretrial detention is exogenous to a wide variety of observable characteristics.

Figure 5 shows graphical evidence of the relationship between magistrate leniency and conviction status. It consists of two overlaid graphs; in the first graph, with circles as markers, the axes represent residuals from a regression of conviction and pretrial detention respectively on the set of time controls described by *Time*. The second graph, represented by diamonds, is similar except that conviction and pretrial detention are residualized over $Cov^{sub} * T^3, X$ and *Time*. Each marker represents the average detention and conviction residuals of one of the eight magistrates. A linear fit between the per-magistrate conviction residuals and the per-magistrate detention residuals are also shown: the slope of this line is an approximation of the simple instrumental variables regression.[22] As can be seen, there is a clear positive correlation between conviction and detention which is not qualitatively altered once the effect of covariates have been removed.

6. Impacts of Pretrial Detention

Table 3 shows how pretrial detention affects both conviction and the likelihood of pleading guilty using a variety of different jackknife IV specifications. The specifications vary in two ways. First, Columns 1 and 2 exclude covariates from both the first and second stages, whereas Columns 3–6 include covariates in both stages. Second, the instrument set used in the first stage expands as we move to the right (except for

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22. Given the nonmonotonicity concerns discussed in this article, the slope represented in Figure 5 may not be an accurate representation of the magnitude of the causal relationship between pretrial detention and conviction. Nonetheless, it can be useful to see a visual representation of the relationship with relatively unprocessed data.
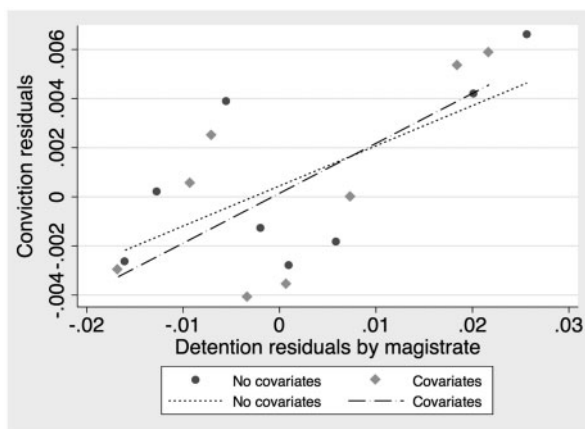
Figure 5. This figure consists of two overlaid graphs. In the first graph, with circles as markers, the axes represent residuals from a regression of conviction and pretrial detention respectively on the set of time controls described by *Time*. The second graph, represented by diamonds, is similar except that conviction and pretrial detention are residualized over $Cov^{sub} * T^3$, X and *Time*. Each marker represents the average detention and conviction residuals of one of the eight magistrates. A linear fit between the per-magistrate conviction residuals and the per-magistrate detention residuals are also shown.

Column 3, which includes the same instrument set as Column 2, but with the addition of covariates in both stages). As discussed above, the larger instrument sets effectively allow magistrate preferences to vary more flexibly over case and defendant characteristics. Column 1 uses only the eight magistrate dummies as instruments. The instruments in Columns 2 and 3 consist of the eight magistrate dummies interacted with dummies for the three time periods. Column 4 adds additional instruments: the interactions between the magistrate dummies and the five most common lead charges, which are drug possession, first offense DUI, robbery, selling drugs and aggravated assault. Column 5 adds interactions between magistrate dummies and the number of prior cases/prior violent charges, dummies for having at least one prior case, having a detainer, and being black or female. Finally, Column 6 allows for more nuanced variation in magistrate preferences across offense categories by adding first-stage interactions between the eight magistrates and the 12 next-most-common lead charges: murder, burglary, theft, shoplifting, simple assault, buying drugs, marijuana possession, second- and third-degree felony firearm possession, vandalism, prostitution, and motor vehicle theft.

Two patterns emerge from evaluating the estimates across the six different specifications. First, standard errors decrease as the instrument becomes more flexible. This is as expected: since magistrates are not uniformly strict or lenient, allowing their bail-setting preferences to vary according to offense, criminal history, race and gender increases the power

Table 3. How Does Pretrial Detention Affect Conviction Rates and Guilty Pleas?

Outcomes	(1)	(2)	(3)	(4)	(5)	(6)
Conviction	0.167**	0.180***	0.282***	0.119***	0.0907**	0.0620**
	(0.0736)	(0.0655)	(0.0868)	(0.0412)	(0.0364)	(0.0291)
						{0.016}
						((0.032))
Guilty plea	0.124**	0.174***	0.177**	0.102***	0.0536*	0.0469*
	(0.0619)	(0.0563)	(0.0776)	(0.0366)	(0.0324)	(0.0262)
						{0.052}
						((0.073))
Instrument set:						
Eight magistrate dummies	Y	Y	Y	Y	Y	Y
Magistrate × 3 time periods		Y	Y	Y	Y	Y
Magistrate × top 5 crimes				Y	Y	Y
Magistrate × crim. history					Y	Y
Magistrate × demographics					Y	Y
Magistrate × top 6–17 crimes						Y
Variables included in both stages:						
Time controls	Y	Y	Y	Y	Y	Y
Defendant and case covariates			Y	Y	Y	Y
First stage F-stat.	34.68	19.46	25.71	21.82	14.99	11.56

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$, ****$p < 0.001$.

Notes: This table shows how pretrial detention affects conviction and guilty pleas using various jackknife instrumental variables specifications. The exogenous variables in the first column are the eight magistrate dummies; in the subsequent columns they include interactions between the magistrate dummies and three time period fixed effects, the five most common crime types, a variety of criminal history variables, defendant demographics, and the remainder of the 17 most common crime types. The first two columns control only for the time and date of the bail hearing, all subsequent columns include the full set of controls for offense, criminal history, and demographics as described in Section 5. Heteroskedastic-robust standard errors are in parentheses, empirical p-values as derived from a permutation test are shown in curly brackets and parametrically estimated p-values are shown in double parentheses. There are 331,971 observations in all regressions. The first-stage F statistic on all magistrate dummies and interaction terms is provided in the bottom row.

of the research design. Second, the magnitude of the effect also decreases as the instrument becomes more flexible. If the treatment effects are heterogeneous—in other words, if the impacts of pretrial detention are greater for certain types of defendants than others—then nonmonotonicity bias will be lower in the interacted specifications than in the simple IV. In particular, if treatment effects are smaller among crime types for which the monotonicity assumption is violated, then the estimates in Columns 1–3 will be biased upwards. The specification shown in Column 6 may still be subject to some nonmonotonicity bias. However I have found that adding additional interactions to the first stage does not substantially change the results, suggesting that any remaining bias should be minimal.

My preferred specification, Column 6, allows magistrates' preferences to vary across all 17 of the most common crime types, across the criminal history, race, and gender of the defendant, and over the three time

periods.[23] The power of the instrument is greatest in this specification, the standard errors are smallest, and nonmonotonicity is less likely to be a concern when magistrates preferences are allowed to vary. It should also be noted that this is the most conservative specification: the effect sizes are smaller than in the simpler specifications. I estimate that pretrial detention leads to a 6.2 percentage point increase in the likelihood of being convicted and a 4.7 percentage point increase in the likelihood of pleading guilty. Compared to the means for each dependent variable, that estimate converts into a 13% increase in the probability of conviction and a 18% increase in the likelihood of pleading guilty.

The estimated effects in my preferred specification are smaller than those found in the concurrent literature. The quasi-experimental estimates shown in Dobbie et al. (2018), Heaton et al. (2017), and Leslie and Pope (2017) suggest that pretrial detention leads to a 15, 20 (misdemeanor), and 13 (felony) percentage point increase, respectively, in the likelihood of conviction.[24] Some of this discrepancy could be due to sample differences or cross-jurisdictional variation. It is also possible that there remains some omitted variable bias in Heaton et al. (2017) and Leslie and Pope (2017), as the source of identifying variation in Harris County and New York City is less clearly exogenous. The quasi-experimental analysis in Heaton et al. (2017) relies on the fact that defendants are more likely to make bail on if they are arrested on Thursday, close to the weekend, than if they are arrested on Tuesday. However, there may be other differences in Tuesday/Thursday cases that affect conviction rates. Leslie and Pope (2017) instrument for pretrial detention using judge leniency, but many of the bail judges in New York City (at least during the time period of their analysis) were assigned to work in fixed shifts in courtrooms that relate to a particular geographic area of the city. The authors account for courtroom and the time of the bail hearing in building the instrument, but is is unclear exactly where the remaining variation comes from, making it hard to ascertain whether there could be a confounding factor.

Dobbie et al. (2018), however, relies primarily on Philadelphia data. Roughly three-fourth of the data used in their analysis should be the same as that used here. The different effect sizes between Dobbie et al. (2018) and this article is thus likely due to different specifications.[25] In particular, the specification used in Dobbie et al. (2018), which shows similar effect size as shown in Column 1 of Table 3, does not allow

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23. The most-common crime types are defined as all offenses for which at least 2% of the sample have that charge.

24. Leslie and Pope (2017) also show results for misdemeanors, but admit to significant confounds in the research design for this subsample.

25. Following the specification used in Dobbie et al. (2018), and using the Philadelphia data only, I am able to generate results that are similar to theirs: being released within three days of the bail hearing leads to a 16 p.p. decrease in conviction and a 13 p.p. decrease in pleading guilty. In comparison, their paper shows a 14 p.p. decrease in conviction and a 11 p.p. decrease in pleading guilty.

magistrate leniency to vary across different case types and thus may produce upward-biased estimates due to violations of the monotonicity assumption. Dobbie et al. (2018) refer to the discrepancy between their results and those found in this study in Footnote 18, but conclude that any potential bias from monotonicity violations is likely to be small. They do so on the basis of two arguments. Referring to a previous draft of this article, Stevenson (2016, unpublished working paper), they state that the results are similar and same-signed regardless of whether magistrate fixed effects are interacted with crime and defendant characteristics. However, "similar" may be in the eyes of the beholder. The estimated effect in the non-interacted specifications is three times larger than the estimated effect in the interacted specifications.[26] Some observers may consider a threefold difference in magnitude to be a meaningful difference, even if it is same-signed.

Dobbie et al. (2018) also argue that monotonicity bias is not a concern because treatment effects do not vary much across various subsamples. (Monotonicity violations only result in bias if there are heterogeneous treatment effects.) While neither this article nor theirs find statistically significant differences in effect sizes across subsamples, this does not mean that treatment effects are homogenous. Subgroup analysis necessarily entails much smaller sample sizes, reducing power. Unless the research design is very high powered, heterogeneity in treatment effects can be hard to detect at the standard 5% level. Given the strong evidence of monotonicity violations in the first stage, a lack of statistically-significant heterogeneity in treatment effects should not equate to a lack of concern about monotonicity bias.

The bottom panel of Table 3 shows the F-statistic of joint significance on the set of first-stage instruments. This statistic is generally decreasing as interaction terms are added. This is as expected; the marginal information content of adding more interaction terms decreases as the first stage becomes more flexible.

Research designs with many instruments are rightly subject to increased scrutiny due to concerns about bias and incorrect standard errors. Bias concerns are mitigated by the use of the jackknifed first stage (Angrist et al. 1999). I verify the statistical significance of the results using a permutation test. This permutation test entails building a number of "false" work schedules for the magistrates. Like the real schedules, each false work schedule has a magistrate working for five days in a row on the same shift, and each magistrate only works one shift per five day period. Within these constraints, work schedules are randomly assigned to create 500 unique false work schedules. This preserves much of the correlational structure of the research design: defendants who have bail set during the same shift, who may have similar characteristics and may

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26. This can been seen in Table 5 of Stevenson (2016, unpublished working paper), which is similar to Table 3 in this version of the article.

even be codefendants on the same case, will also have the same false-schedule magistrate. I calculate the two-stage-least-squares results for each of the false schedules and collect the *t*-statistics on the instrument for pretrial detention in the second stage. The empirical *p*-values are the fraction of false-schedule *t*-statistics which are greater in absolute value than the *t*-statistic from the real data. Since this process is computationally intensive, I only conduct it for select specifications. The empirical *p*-values shown in Column 6 are smaller than those estimated parametrically, confirming that the estimated effects are unlikely to be due to chance.

Table 4 shows how pretrial detention affects conviction rates, guilty pleas, court fees, the likelihood of being incarcerated, and both the maximum and minimum incarceration sentence.[27] Column 1 shows results from the jackknife instrumental variables method with the most fully interacted specification; the first two rows are identical to the final column of Table 3. Column 2 shows results from an OLS regression controlling for the full set of offense, criminal history, demographic, and time controls.

The IV estimates show that pretrial detention leads to an average increase of $129 in nonbail court fees owed, which translates into a 41% increase over the mean. In general, defendants who are convicted in Philadelphia are required to pay court fees to cover a variety of expenses associated with the case, including court costs, victim restitution, lab tests, probation expenses, etc. Conditional on being convicted, court fees average at $611. For the tens of thousands of people convicted as a result of pretrial detention—many of whom were unable to pay even fairly small amounts of bail—these court fees may pose a significant challenge. Most defendants pay only a portion of these fees, remaining in debt to the city. A total of 82% of defendants who were charged court fees are still in debt five years later, with an average debt of $691, or 85% of the total amount.[28] In 2011, Philadelphia hired a collection agency and began an aggressive campaign of collecting unpaid court debt dating back to 1971. This collection effort was controversial, partly because the court lacked records to back up computerized debt claims. Those who do not pay court fees face the threat of criminal prosecution, with a jail sentence of up to six months. There is no evidence, however, that criminal charges were ever filed against Philadelphia debtors (Denvir 2012). Facing public backlash and civil rights lawsuits, Philadelphia scaled back on debt collection in 2014.

The IV results for the likelihood of being incarcerated are positive but noisy; however, the results for the incarceration sentence length are more precise. Pretrial detention leads to an expected increase of 124 days in the

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27. Sentence length is coded as zero for individuals who do not receive an incarceration sentence.

28. These results pertain to defendants for whom I have at least five years of post-arrest data: those arrested in 2010 or earlier.

Table 4. Full Sample Results—Jackknife IV and OLS

	(1) IV	(2) OLS	(3) Mean dep. var.
Conviction	0.0620** (0.0291) {0.016}	0.0333**** (0.00197)	0.49
Guilty plea	0.0469* (0.0262) {0.052}	0.0566**** (0.00181)	0.26
Court fees	129.5**** (33.26) {0.000}	−103.5**** (2.618)	312
Any incarc.	0.0186 (0.0249) {0.466}	0.0976**** (0.00166)	0.24
Max. days	124.7* (74.40) {0.054}	133.7**** (3.463)	292
Min. days	136.4** (62.61) {0.008}	67.78**** (2.539)	155

$*p < 0.10$, $**p < 0.05$, $***p < 0.01$, $****p < 0.001$.

Notes: This table shows how pretrial detention affects various case outcomes using both a jackknife IV regression (Column 1) and an OLS regression (Column 2). Column 3 shows the mean of the outcome variables: dummies for being convicted/pleading guilty, total nonbail court fees in dollars, a dummy for whether or not the defendant receives an incarceration sentence, the maximum days of that incarceration sentence, and the minimum days the defendant must serve before being eligible for parole. Heteroskedastic-robust standard errors are in parentheses and empirical *p*-values are in the curly brackets. In all of the IV specifications magistrate preferences are allowed to vary across three time periods and according to offense, criminal history, and demographics of defendants. There are 331,971 observations per regression. All regressions include the full set of controls as described in Section 5.

maximum days of the incarceration sentence, a 42% increase over the mean. Detention leads to a 136 day increase in the minimum number of days before being eligible for parole. Some defendants who have been detained get released on "time-served"—in other words, the time they spent detained pretrial is considered punishment for the crime. Since it was retrospectively considered punishment, I include time-served as part of the incarceration sentence. Using alternative definitions, in which time-served is not included as part of the sentence length, I estimate that pretrial detention leads to a 92 day increase in the maximum sentence and a 107 day increase in the minimum sentence.

With the exception of court fees, the OLS estimates and the IV estimates are same-signed. The negative correlation between pretrial detention and court fees could be due to the relative poverty of detainees—court fees can be waived for the indigent. The IV estimates for the other outcomes are sometimes smaller and sometimes larger than the OLS estimates; for guilty pleas and the maximum sentence length the two estimates are quite similar in magnitude.

Empirical p-values for all the IV results are shown in curly brackets. Again, the empirical p-values are generally smaller than those estimated parametrically. Additionally, I conduct a wild cluster bootstrap test as proposed in Cameron et al. (2008). For this test, I define a cluster as a magistrate during a two year period. Compared to the parametrically estimated p values, the wild cluster p values change very little for conviction, court fees or incarceration. The p value increases for guilty pleas, such that this estimate is no longer statistically significant at the 10% level. They decrease for the minimum/maximum days of incarceration, such that both estimates are now statistically significant at the 1% level.

Table A1 in the Appendix provides evidence that variation in eligibility for public defense does not confound the estimates of the impacts of pretrial detention. Panel A of Table A1 is identical to Column 1 of Table 4 except that there are two endogenous variables that are instrumented for with magistrate dummies: pretrial detention and a dummy for having a public defender at the time of disposition.[29] I find no statistically significant effect on having a public defender in any specification, and the coefficients on pretrial detention change only trivially. Panel B is similar to Column 1 except that I add the controls for having a public defender in the second stage. Once again, the coefficients on pretrial detention change only trivially; if anything, they increase slightly in both magnitude and precision.

In Table 5 I show the impacts of pretrial detention separately for misdemeanor and felony defendants using the interacted instrumental variable method.[30] The IV effect sizes of the felony sample are similar in magnitude to the full sample, but are noisy. The IV effects among misdemeanors are more precisely measured and, at least in relation to the means of the dependent variables, are larger than the full sample estimates. In fact, pretrial detention among misdemeanor defendants leads to a statistically significant increase in all outcomes. The effects on punishment are particularly large: those detained will be 7.6 percentage points more likely to receive a sentence of incarceration over a mean of 16% incarceration rate. While the expected increase in sentence length is only a month or two, this represents more than a 100% increase relative to the mean. The large incarceration effects among misdemeanor defendants may be partly explained by defendants who are released on time-served, which is more common among misdemeanors. Using alternative definitions of sentence length in which time spent detained pretrial is subtracted from the incarceration sentence, pretrial detention is estimated to lead to a 38 day increase in the maximum days and an 11 day increase in the minimum days.

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29. The dummy is equal to one if the defender has a public defender or a court appointed attorney; 86% of public defense is handled by a public defender. The magistrate has no say over which type of public defense is received.

30. The felony sample is defined as those who were charged with at least one felony at the time of the bail hearing; many of these had their charges downgraded to misdemeanors only by the time of the arraignment.

Table 5. Results for Misdemeanors and Felonies

	Misdemeanor		Felony	
	(1) IV	(2) Mean dep. var.	(3) IV	(4) Mean dep. var.
Conviction	0.0766** (0.0363)	0.50	0.0513 (0.0434)	0.47
Guilty plea	0.0577* (0.0295)	0.16	0.0391 (0.0414)	0.35
Court fees	77.55** (38.03)	$351	139.3*** (53.69)	$274
Any incarc.	0.0759*** (0.0281)	0.16	−0.0257 (0.0398)	0.32
Max. days	55.82** (21.95)	48	182.3 (139.9)	528
Min. days	26.62** (12.09)	18	207.0* (119.3)	288
Observations	163236		168735	

$*p < 0.10$, $**p < 0.05$, $***p < 0.01$, $****p < 0.001$.
Notes: This table shows effect sizes for defendants charged with only misdemeanor crimes (Column 1) and those charged with felonies (Column 3). The means of the outcome variables are shown in Columns 2 and 4: dummies for being convicted/pleading guilty, total nonbail court fees in dollars, receiving an incarceration sentence, the maximum days of that incarceration sentence and the minimum days the defendant must serve before being eligible for parole. Heteroskedastic-robust standard errors are shown in parenthesis. In all IV specifications magistrate preferences are allowed to vary across three time periods and according to offense, criminal history, and demographics of defendants. The means of the dependent and independent variables are shown in the subpanel. All regressions include the full set of controls as described in Section 5.

The estimated impact on sentence lengths is not dissimilar to that found in Leslie and Pope (2017) and Heaton et al. (2017).[31] Leslie and Pope (2017) find that pretrial detention leads to a 157 day increase in the minimum sentence for felonies and Heaton et al. (2017) find that pretrial detention leads to a 19 day increase in the sentence length for misdemeanors.

In Table A2 in the Appendix, I test for evidence of treatment effect heterogeneity across defendant characteristics. Generally, the IV estimates are too noisy to provide definitive evidence on this question. However, there are commonsense reasons why the effects of pretrial detention may vary. Certain offense types, such as DUI, shoplifting, or drug possession, rely on difficult-to-refute evidence and thus leave little room for extralegal factors to influence the outcome. True guilt is often harder to verify for offense categories such as assault or robbery. Conviction in these cases is contingent upon the time and resources devoted to building a strong defense; if pretrial detention limits the ability to gather evidence or meet with the lawyer, it is expected to impact the outcome of the case. Treatment

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31. The average sentence length is reasonably similar across the different jurisdictions: average minimum felony sentences are 212 days in New York City (Leslie and Pope 2017) and 288 days in Philadelphia. Average minimum misdemeanor sentences for released defendants are 7 days in Harris County (Heaton et al. 2017) and 12 days in Philadelphia.

effects may also vary according to the defendant's prior experience with the criminal justice system. Jail is likely to be a particularly adverse experience for those who are incarcerated for the first time, thus increasing the pressure to plead guilty in order to get out of jail. Conversely, those who are more savvy with the criminal justice system may know better than to accept a bad plea deal just because they are detained pretrial.

7. Conclusion

There is currently a broad-reaching movement to reform bail systems across the United States. In recent years, New Jersey, Kentucky, Colorado, Maryland, New Mexico, Chicago, New York City, Harris County, San Francisco and many other places have committed to or implemented pretrial reform. Dozens of jurisdictions are implementing new pretrial risk assessment regimes in partnership with the Laura and John Arnold Foundation and 20 cities have developing pretrial reform proposals with a $75 million fund from the MacArthur Foundation. Philadelphia is also implementing significant changes to their pretrial system: they have instituted an early bail review for defendants who are detained pretrial, and Philadelphia's jail population has fallen by 18% from July 2015 to March 2017 (Gambacorta and Melamed 2017). Their newly elected DA has promised to end the use of monetary bail for those charged with nonviolent offenses (krasnerforda.com 2017).

The renewed interest in the front end of the criminal justice system is welcome. As shown in this article, pretrial detention is not only impactful in its own right, but it has significant downstream consequences: a detained defendant is more likely to be convicted, to receive a lengthy incarceration sentence, and to accrue more courtroom debt. The repercussions entailed with the loss of freedom in the beginning of the criminal proceedings underline the importance of making the pretrial custody decision with care.

Appendix

Table A1. Robustness Checks

Panel A: instrumenting for public defender (full sample, IV)

	(1) Conviction	(2) Guilty plea	(3) Court fees	(4) Any incarc.	(5) Max days	(6) Min days
Pretrial detention	0.0625**	0.0470*	120.5****	0.0230	147.5*	149.0**
	(0.0304)	(0.0271)	(33.17)	(0.0255)	(79.02)	(66.97)
Public defender	0.00339	0.00115	−67.48	0.0329	169.6	93.54
	(0.0539)	(0.0481)	(72.23)	(0.0477)	(197.2)	(170.7)

Panel B: controlling for public defender (full sample, IV)

	(1) Conviction	(2) Guilty plea	(3) Court fees	(4) Any incarc.	(5) Max days	(6) Min days
Pretrial detention	0.0688**	0.0520**	126.0****	0.0246	119.9	131.9**
	(0.0285)	(0.0257)	(33.18)	(0.0246)	(73.50)	(61.78)
Public defender	0.0394****	0.0292****	−36.43****	0.0421****	11.65	−4.382
	(0.00366)	(0.00330)	(4.531)	(0.00314)	(10.03)	(8.544)
Observations	331971	331971	331971	331971	331971	331971
Mean dep. var.	0.49	0.26	312	0.24	292	155

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$, ****$p < 0.001$.
Notes: This table presents robustness checks for the main results. Panel A instruments for two endogenous variables: a dummy for having a public defender and the pretrial detention dummy. Panel B includes adds the controls for having a public defender into the second stage. The outcome variables are dummies for being convicted/pleading guilty, total nonbail court fees in dollars, receiving an incarceration sentence, the maximum days of that incarceration sentence and the minimum days the defendant must serve before being eligible for parole. In all specifications, magistrate preferences are allowed to vary across three time periods and according to offense, criminal history, and demographics of defendants. The means of the dependent variables are shown in the subpanel. All regressions include the full set of controls as described in Section 5. Heteroskedastic-robust standard errors are in parentheses.

Table A2. Comparing Results Across Defendant Subgroups

	(1) White	(2) Black	(3) Young	(4) Old	(5) Few priors	(6) Many priors
Conviction	0.0802	0.0664*	0.0359	0.0716**	0.118	0.0625**
	(0.0590)	(0.0392)	(0.0636)	(0.0358)	(0.0788)	(0.0317)
Guilty pleas	0.0223	0.0204	0.0608	0.0521	0.0916	0.0445
	(0.0549)	(0.0353)	(0.0578)	(0.0324)	(0.0727)	(0.0284)
Court fees	88.64	113.8***	82.73	179.0****	40.44	151.8****
	(75.38)	(44.05)	(76.43)	(40.79)	(105.1)	(35.15)
Any incarc.	−0.0285	−0.00911	−0.00439	0.0217	−0.123**	0.0721**
	(0.0532)	(0.0338)	(0.0556)	(0.0306)	(0.0624)	(0.0284)
Maximum days	195.8	53.83	264.3	28.99	169.7	183.6**
	(135.4)	(112.6)	(209.4)	(76.78)	(213.0)	(78.48)
Minimum days	236.4**	107.0	245.3	57.72	245.2	181.8***
	(109.8)	(95.66)	(182.4)	(62.86)	(173.5)	(66.94)
Observations	94076	191379	167615	164356	124344	297963

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$, ****$p < 0.001$.

Notes: This table shows effect sizes among white defendants, black defendants, those who are under the age of 30 years, those over 30 years, those with zero/one prior arrests, and those with two or more prior arrests. The outcome variables are dummies for being convicted/pleading guilty, total nonbail court fees in dollars, a dummy for whether or not the defendant receives an incarceration sentence, the maximum days of that incarceration sentence and the minimum days the defendant must serve before being eligible for parole. All estimates come from jackknife independent variable specifications where magistrate preferences are allowed to vary across three time periods and according to offense, criminal history and demographics of defendants. Heteroskedastic-robust standard errors are in parentheses.

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