

Exploitative Revenues, Law Enforcement, and the Quality of Government Service*

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Abstract

A growing body of evidence indicates that local police departments are increasingly being used to provide revenue for municipalities by imposing and collecting fees, fines, and asset forfeitures. We examine whether revenue collection activities compromise the criminal investigation functions of local police departments. We find that police departments in cities that collect a greater share of their revenue from fees – conceivably because their governing bodies put pressure on them to generate revenue – solve violent crimes at significantly lower rates. We find this relationship is robust to a variety of empirical strategies, including instrumenting for fines revenue using natural resource booms. Our results suggest that institutional changes – such as decreasing municipal government reliance on fines and fees for revenue – are an important step for changing police behavior and improving the provision of public safety.

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1 Introduction

Recent high-profile fatal encounters and tensions between black citizens and police officers have led to protests and calls for reforms. The popular and scholarly discussion of inequality in police practices in the United States has been focused for the most part on individual police officers' implicit bias or lack of appropriate training.¹ Comparatively less attention has been paid to police departments' institutional structures and incentives, even though these characteristics have been shown to significantly influence police policy (Maguire and Uchida 2000; Luna 2003; Fung 2003; Willis, Mastrofski, and Weisburd 2007).

One aspect of recent criticism of police departments has been the way that some local law enforcement agencies aggressively impose and collect fees, fines, and civilly forfeited assets (Harris, Evans, and Beckett 2010). The Department of Justice's (DOJ) investigation of the Ferguson, Missouri police department revealed that a key driver of the behavior of the Ferguson police was the desire to generate municipal revenue by issuing traffic tickets and imposing fees.² Recent scholarly evidence indicates the practices unearthed in Ferguson are by no means unique to one particular city or state. Census of Governments data from 2012 shows that about 80 percent of American cities with law enforcement institutions derive at least some revenue from fees, fines, and asset forfeitures, with about 6 percent of cities collecting more than 10 percent of their revenues from fines in 2012 (Sances and You 2017). Implementing this practice requires close coordination between governing bodies, such as mayors and city councils, and local police forces, as the DOJ's Ferguson report vividly describes.³

¹See, e.g., Benedict Carey and Erica Goode, "Police Try to Lower Racial Bias, but Under Pressure, It Isn't So Easy," *The New York Times*, July 11, 2016.

²"Investigation of the Ferguson Police Department," *United States Department of Justice Civil Rights Division*, March 4, 2015.

³In March 2010, the city's finance director wrote to the chief of police that "unless ticket writing ramps up significantly before the end of the year, it will be hard to significantly raise collections next year... Given that we are looking at a substantial sales tax shortfall, it's not an insignificant issue." Later, in January 2013, the police chief reported to the city manager that "Municipal Court gross revenue for calendar year 2012 passed the \$2,000,000 mark for the first time in history, reaching \$2,066,050," to which

Police officers are a quintessential example of street-level bureaucrats (Lipsky 1980; Brown 1981) and the exercise of discretion by police has been well-documented in the literature (Wilson 1968). Like any other type of bureaucrat, law enforcement officers face multiple incentives – from their delegating authority, from citizens or interest groups, and from internal budget concerns (Kiewiet and McCubbins 1991, Carpenter 2014). However, political scientists know little about how police departments respond to these different incentives (Gottschalk 2008). Most of the extant literature on police behavior mainly focuses on individual characteristics of police officers or situational conditions affecting their work (Brooks 2015), and there has been little attention paid to how institutional conditions affect police behavior.

If police agencies keep a substantial fraction of revenues from fines and fees, they could be augmenting their own budgets through fee and fine enforcement. In practice, revenue from fines and fees are typically contributed directly to the municipal budget, not the police budget, meaning that direct financial incentives for police departments to collect revenue may be weak. But police forces are also the agents of local governments: Local police chiefs are appointed by the city executive (mayor or city manager), and must respond to city politicians (Wilson 1968; Ostrom and Whitaker 1973; Williams 1984; Chaney and Saltzstein 1998). This means that the police in some cities are under significant pressure from city authorities to raise city funds. Given that local police offices have limited resources, a focus on revenue generating activities may distract police departments from their primary duty of providing public safety.

In this paper, we examine whether revenue collection activities compromise the criminal investigation functions of local police departments. We do so by studying the relationship between police-generated local revenue and crime clearance rates (that is, the rate at which a person or persons are charged or otherwise identified by law enforcement as perpetrators for particular crimes). In cities where the proportion of local revenue coming

the city manager responded, “Awesome! Thanks!” (“Investigation of the Ferguson Police Department,” *United States Department of Justice Civil Rights Division*, March 4, 2015).

from fines and fees is higher, there is presumably more pressure on the local police to raise revenue, and they might engage in revenue generating activities instead of investigating crimes when such resource allocation decisions must be made on the margin. In addition, aggressive collection of fines and fees by police officers could affect local residents' trust in law enforcement officers. In turn, this may lead to less cooperation from citizens to solve crimes at the local level, which also could contribute to less effective investigations by local police officers (Desmond, Papachristos, and Kirk 2016).

Establishing a causal link between reliance on collecting revenues from fees and fines and crime clearance is challenging because the allocation of police resources to revenue collection is not random. Municipalities may face different types of crime – such as prevalent gang activity – which could systematically affect the crime clearance rate. Additionally, while we argue that reliance on fines is associated with lower clearance rates, we cannot rule out reverse causality or omitted variable bias using observational data. To address these concerns, we use two strategies.

First, we use county fixed effects to account for heterogeneity across municipalities that are constant within counties. Second, we use local natural resource booms as an instrument for fines revenue. Previous research has shown that when municipal governments come under financial stress, their reliance on fees and fines increases (Garrett and Wagner 2009; Makowsky and Stratmann 2009). Therefore, we use an exogenous shock to municipal revenue as an instrumental variable. Specifically, we leverage recent revenue increases due to the boom in shale and natural gas production – resulting from pre-existing geology and recent technological innovation – which created significant cross-county variation in revenue increases between 2004 and 2012. We show that increased revenues from shale gas and oil during this period are strongly associated with decreased local government reliance on fines and fees as revenue sources.

We find that, in cities where a relatively higher share of revenue is collected through fines, fees, and asset forfeitures, violent crimes are cleared at a relatively lower rate,

conditional on the background crime rate, the overall police budget, and a host of relevant sociodemographic variables. Specifically, we find that a 1 percent increase in the share of own-source revenues from fees, fines, and forfeitures is associated with a statistically and substantively significant 3.7 percentage point decrease in the violent crime clearance rate. Studies suggest that increased investigative efforts are more important for solving violent crimes than property crimes (McCrary 2002, 2007; Chalfin and McCrary n.d.). Because property crimes are much harder to solve than violent crimes (Braga et al. 2011), marginal decreases in the investigatory resources devoted to violent crimes are likely to have a greater effect on clearance rates than marginal decreases in investigatory resources devoted to property crimes.

Importantly, this effect is driven entirely by cities with populations under 28,010 (the bottom 80% of the US city population distribution). This is a crucial component of our results because large police departments tend to have many specialized divisions charged with performing specific functions. Therefore, it is unlikely that revenue pressure would affect individual officers' decisions to choose between different types of activities since they are confined to specific functions. However, in small town police departments officers "function as generalists, performing a wide variety of problem-solving, administrative, public service and law enforcement tasks, as opposed to the big-city departments where specialization is highly valued" (Falcone, Wells, and Weisheit 2002). Thus, our results are consistent with the hypothesis that managers in police departments facing revenue pressure encourage officers to devote time to revenue collection rather than investigation.

Research suggests that low clearance rates for violent crimes in disadvantaged neighborhoods both reflect and generate low levels of trust in the local police force (Kane 2005; Leovy 2015). This paper sheds further light on this issue by suggesting that aggressive fine enforcement can compound this vicious cycle by further diverting resources from investigations that might identify perpetrators. Both the institutional and the individual harms of aggressive fee and fine collection fall disproportionately heavily on a city's most

disadvantaged residents: Fees and fines are most frequently imposed on them (Harris, Evans, and Beckett 2010) and they are most likely to become victims of violent crimes (Gibson, Fagan, and Antle 2014).

Our work contributes to political scientists' growing focus on the causes and consequences of local law enforcement practices. Recent research points to the unequal impacts of involuntary contacts with law enforcement officials on residents' political participation (Weaver and Lerman 2010; Lerman and Weaver 2014). Our results complement the existing research by documenting one of the institutional causes of unequal policing – the use of police officers as revenue generators – and one of its institutional consequences – compromising police departments' roles as institutions of public safety provision. The analysis we present here also has important implications for criminal justice reform. Procedural changes, such as federal support for police body cameras, or reducing individual bias among police officers, are most often discussed as solutions to criminal justice reforms. Our results suggest that decreasing municipal government reliance on fines and fees for revenue, a solution at the institutional level, may also be an important step for reforming criminal justice systems and providing higher levels of public safety.

2 Policing for Profit and Police as Bureaucrats

While it is well known that cities have limited discretion in many policy areas (Tiebout 1956; Peterson 1981; Ferreira and Gyourko 2009; Frug and Barron 2013), municipal governments have ample discretion over the collection of fines and fees because local police forces and municipal courts that oversee their collection are mainly controlled by city councils. In addition, policing and public safety are two policy areas in which local governments have stronger influence than in other policy realms (Gerber and Hopkins 2011).

Previous research has shown that when municipal governments experience financial stress, their reliance on fees and fines increases (Garrett and Wagner 2009; Makowsky

and Stratmann 2009). Although property taxes are the main component of own-source revenue for local governments, real estate prices rarely change significantly within a short time period, and so revenues from property taxes are relatively stable over time (Alm, Buschman, and Sjoquist 2011). Therefore, local governments tend to rely on traffic tickets and other fines when other sources of revenue are limited.⁴

There is extensive academic study of the negative consequences of police- and court-imposed fees and fines on affected individuals. Scholars tend to focus on the function of these fees and fines as, effectively, forms of regressive taxation (Harris, Evans, and Beckett 2010; Kohler-Hausmann 2014; Katzenstein and Waller 2015; Natapoff 2015; Harris 2016). Another stream of research focuses on the democratic consequences of involuntary contact with law enforcement. The issuance of fines and fees often occurs at traffic stops, which are the most common type of contact with law enforcement personnel.⁵ Studies document that individuals who have repeated unwanted interactions with the law enforcement system are likely to withdraw from civic and political life, further impeding their ability to influence police policy through their local elected officials (Weaver and Lerman 2010; Lerman and Weaver 2014).⁶

If police forces have to play a role in generating revenue for the municipality, it is easy to imagine the police shifting some resources from patrol and criminal investigation functions to revenue generation through the imposition of fees and fines in a resource-scarce environment. Such a shift in resources has been documented in the case of the collection

⁴To be clear, financial stress may be not the sole reason that local governments increase levying fines and fees on their residents. Scholars also argue that the imposition of fines and fees and resulting poverty is a contemporary form of social control of the poor and minorities by bureaucrats and law enforcement officials (Hackworth 2007; Soss, Fording, and Schram 2011; Harris 2016). Our primary interest in this study is isolating the impact of a reliance on fines for revenue while acknowledging that social control may still play an important role in why cities rely on fines.

⁵In 2011, over 62.9 million US residents age 16 or older, or 26% of the population, had one or more contacts with police during the prior 12 months, and this contact was for a traffic stop 86% of the time. “Police Behavior during Traffic and Street Stops, 2011,” *US Department of Justice, Office of Justice Program, Bureau of Justice Statistics*, September 2013. <http://www.bjs.gov/content/pub/pdf/pbtss11.pdf>.

⁶The consequences are even more severe for those who are incarcerated, and labor market opportunities for those with criminal records are severely curtailed as well (Western, Kling, and Weiman 2001).

of court and correctional fees. A New York University Brennan Center study of legal debts in the 15 states with the largest prison populations concluded that “Overdependence on fee revenue compromises the traditional functions of courts and correctional agencies... When probation and parole officers must devote time to fee collection instead of public safety and rehabilitation, they too compromise their roles” (Diller, Bannon, and Nagrecha 2010).

This suggests that institutional context matters in understanding the behavior of law enforcement agencies. Police officers are classic examples of street-level bureaucrats because of their discretion and autonomy in deciding whom to arrest and whom to overlook (Lipsky 1980). Police departments, like schools and welfare agencies, have the special property that within the organization discretion increases as one moves *down* the hierarchy (Wilson 1968). Existing research on police officer discretion mainly focuses on personal characteristics of police officers and environmental or circumstantial factors (Brooks 2015). While institutional conditions have been considered one of the most important factors influencing incentives of federal bureaucrats (e.g., McCubbins 1985; Moe 1990; Wood and Waterman 1991; Bawn 1995), questions of how institutions shape incentives for local bureaucrats such as police officers are relatively understudied.

Police agencies could face both financial and political incentives for revenue generation from fines and fees. There are a handful of existing studies that address the issue of how police activities might be redirected as a result of financial incentives. Studies find that when local governments allow police agencies to keep a substantial fraction of the assets that they seize in drug arrests, police respond to the real net incentives for seizures by increasing the drug arrest rate (Benson, Rasmussen, and Sollars 1995; Baicker and Jacobson 2007; Holcomb, Kovandzic, and Williams 2011). If agencies can keep a substantial fraction of revenues from fines and fees, they could help maximize their budgets or the municipal budget (Niskanen 1971; Lemos and Minzner 2014), and some funds in police budgets come from a portion of traffic ticket fines.

But, unlike asset forfeitures from arrests for drug offenses, revenues from fines and fees generally accrue to the city’s general fund rather than to police department’s own budget.⁷ If this is the case, a direct monetary incentive to increase police departments’ own revenue from issuing more tickets and citations may be weak. However, there is another mechanism – political incentives – that can explain the coordination of law enforcement for policing for city revenues. A chief of police is appointed by either the city council or the chief executive – the mayor or city manager. Given that city officials have some control over police budgets and the choice of a police chief, some scholars argue that municipal police departments have always been political institutions in the US (Williams 1984) and that scholars need to pay attention to political control to explain behaviors of police officers (Ostrom and Whitaker 1973; Chaney and Saltzstein 1998).

Even if police officers receive fixed salaries and, therefore, there is no explicit private benefit from collection of additional fees and fines, law enforcement institutions often have a reputational incentive to participate in policing for profit, if their reputation in the eyes of city officials depends on their success in generating revenue (Lemos and Minzner 2014). If pressure to generate revenue from fines and fees comes without additional resources such as higher budgetary resources for law enforcement, local police officers may need to compromise their traditional roles in criminal investigation in favor of revenue generation from fines and fees due to limited resources. This effect would be more salient in police departments where police officers’ workloads are interchangeable.⁸

Police officials are sometimes frank about the pressures they face. James Tignanlli, president of the Police Officers Association of Michigan union, told *Car and Driver* magazine in 2009 that, “When elected officials say, ‘We need more money,’ they can’t look to the department of public works to raise revenues, so where do they find it? The police

⁷For example, Michigan outlines its policy on the distribution of funds from traffic citations in this memorandum: http://www.house.mi.gov/hfa/PDF/Judiciary/Traffic_Citation_Revenue_Memo.pdf.

⁸Municipalities with larger police forces, like the New York Police Department (NYPD), have many specialized divisions for investigative functions. In those places, the mechanism we outline here might not be observed. In the empirical section, we test whether the relationship between reliance on fines and fees and crime clearance depends on the size of the police force, and we find that it does.

department” (Hunter 2009).⁹

3 Data and Empirical Strategy

Our aim is to examine how reliance on police-collected fees and fines for municipal revenue affects crime clearance in local areas. To measure the use of fines, we use the Census of Governments (COG), a US Census Bureau program that collects revenue and expenditure data for all of the roughly 90,000 local governments in the US every five years, in years ending in two and seven. Starting in 2007, the COG began asking all cities how much of their revenue was collected via fines and fees. As the COG survey instructs respondents, this variable includes “receipts from penalties imposed for violation of law; civil penalties (e.g., for violating court orders); court fees if levied upon conviction of a crime or violation... and forfeits of deposits held for performance guarantees or against loss or damage (such as forfeits of bail and collateral).”¹⁰

When we clean the Census of Government data for the years 2007 and 2012, we only keep entities categorized as “municipal governments” and “township governments,” excluding counties, school districts, and special districts. Since we are interested in resource allocation for law enforcement in municipal governments, we further restrict the sample to municipal governments that have a police force. We identify municipal governments with a police force by examining their public finance records for police budgets. If their police force budget is greater than 0, we assume they have their own police force.¹¹ For each municipality, we calculate the percent of own-source revenues from fines and fees as

⁹Police Chief Michael Reaves of Utica, Michigan, quoted in the same *Car and Driver* story, said that “When I first started in this job 30 years ago, police work was never about revenue enhancement, but if you’re a chief now, you have to look at whether your department produces revenues” (Hunter 2009). Separately, a retired NYPD officer also told reporters that “revenue generating” came first in his job (<http://thefreethoughtproject.com/retired-police-officer-revenue-generating/>).

¹⁰Notably, this variable expressly does not include “penalties relating to tax delinquency; library fines; and sale of confiscated property.” https://www.census.gov/govs/www/class_ch7_misc.html. Figure A in Appendix A presents an example of a survey form asking localities about revenue sources.

¹¹We code a city as having police or courts if the city reports spending more than zero dollars on either service. Based on our correspondence with the Census Bureau, using the spending data is the best available method for determining which general purpose governments provide what services.

well as the per capita own-source revenues from fees and fines.¹²

To measure the crime clearance rate, we use the Uniform Crime Reporting (UCR) data. The FBI has gathered crime statistics from law enforcement agencies across the country since the 1930s, and the UCR program collects statistics on violent crime (murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault) and property crime (burglary, larceny-theft, and motor vehicle theft). The UCR data include crime counts and crime clearance rates by types of crime.¹³ We use the UCR data for years 2007 and 2012, and merge these with local government public finance data using a unique Census place code. This leaves 5,935 unique municipal governments. To account for other variables that are associated with the crime clearance rate, we collect local government demographic data from the American Community Survey and state government finance data from the Census.¹⁴

We also use the data from the Census of State and Local Law Enforcement Agencies (CSLLEA) to control for the police department's budget, the number of fulltime sworn officers, and their functions.¹⁵ The capacity of law enforcement agencies can influence

¹²Although not all revenues from fines and fees come from police activities, late court fees and correctional fees often originate from interactions with law enforcement, and in any case the police are very often responsible for collecting these fees when they go unpaid.

¹³The data for offenses known and clearances by arrest are submitted voluntarily by city, county, and state law enforcement agencies. Once received, the FBI checks the agencies' reports for completeness and arithmetical accuracy. If an unusual fluctuation is detected in an agency's crime count, the FBI compares those counts with counts from previous reports or compares the frequencies to those of agencies similar to the agency in question. When necessary, law enforcement agencies are contacted to correct or explain the figures. "Uniform Crime Reporting Program Data [United States]: Offenses Known and Clearances by Arrest, 2007." *ICPSR 25101*.

¹⁴The FBI has used the National Incidence-Based Reporting System (NIBRS) since 1991 as a more disaggregated system for reporting crime data from law enforcement agencies. The UCR's Summary Reporting System (SRS) and NIBRS differ in four main ways: "(1) The SRS collects aggregated monthly crime in ten offense categories. (2) NIBRS collects disaggregated offense, victim, offender, property, and arrestee information for 49 offenses. (3) The SRS employs a hierarchy rule, which NIBRS does not. (4) NIBRS counts up to 10 offenses per incident." The hierarchy rule is a reporting standard requiring that when more than one offense occurs within an incident, only the most serious crime contributes to the agency's monthly crime totals. The FBI reports that switching from SRS to NIBRS only increased the incidence rate by 2.1% and the majority of those changes come from property crimes that are placed in lower ranks under the Hierarchy Rule (*DOJ Federal Bureau of Investigation, 2015, "Effects of NIBRS on Crime Statistics"*). Therefore, there is no significant difference between using UCR's SRS data and its NIBRS, especially for violent crimes. Also, only a subset of law enforcement offices under the UCR's Summary Reporting System has been participating in the NIBRS.

¹⁵The latest year that the complete CSLLEA data is available is 2008, so we use the CSLLEA data

crime clearance rates and the reallocation of police resources from criminal investigations to fines and fee collecting activities would be less feasible in agencies where a division between criminal investigation and traffic control or patrol functions is clearer.¹⁶

Figure 1: Distribution of Per Capita Revenue from Fines and Fees, 2012

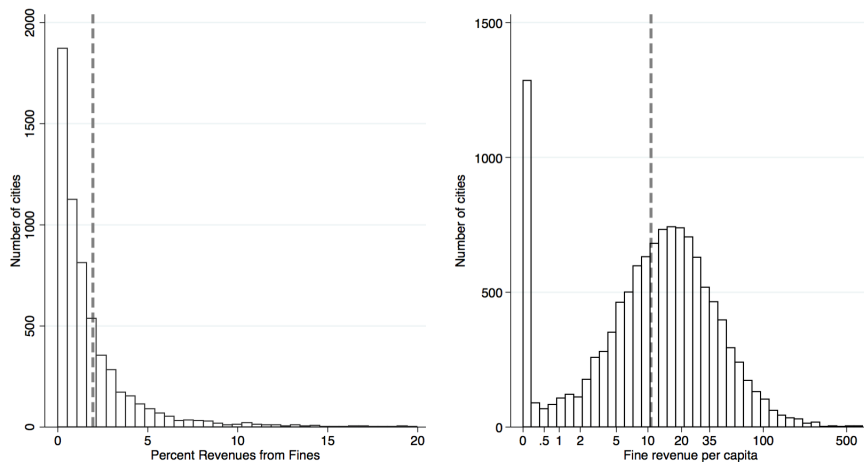


Figure 1 presents the distributions of percent own-source revenue from (left) and per capita (right) fines, fees, and forfeitures for the year 2012.¹⁷ The dotted lines indicate the mean values of a share of fines revenue and per capita revenue from fines, fees, and forfeitures in 2012. The average is 2% and \$10 per capita, respectively, and there is significant variation across cities.¹⁸ Cities with higher number of African Americans, less-educated residents, lower tax revenues, and fewer minority city council members are associated with higher revenues from fines and fees (Sances and You 2017).

from 2008. The DOJ’s Bureau of Justice Statistics also periodically publishes survey data from the Law Enforcement Management and Administrative Statistics (LEMAS) program. The LEMAS samples around 3,000 law enforcement agencies based on the CSLLEA. Although the LEMAS data are available for both 2007 and 2012, the number of samples in those data are limited and information provided under the LEMAS are mostly covered under the CSLLEA; therefore, we use the 2008 CSLLEA data.

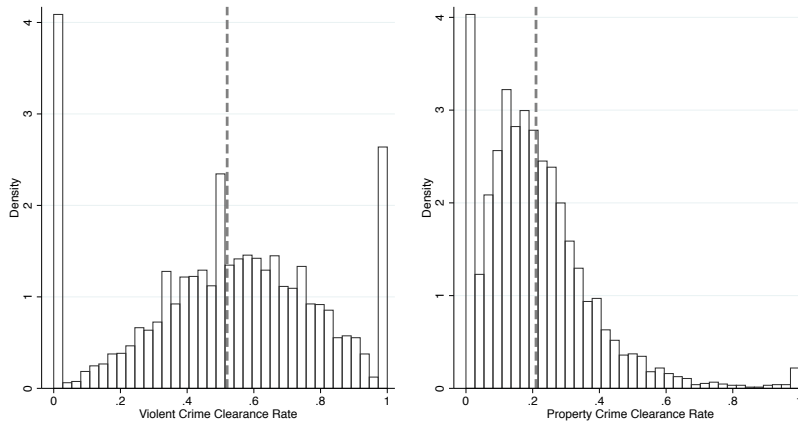
¹⁶We were able to merge the CSLLEA data for over 92% of the cities in our final sample.

¹⁷There are about 600 cities, towns, and villages that reported zero revenues from fines in our sample. Cities may report zero fines revenue because although they may issue fines, they do not use them as a general revenue source (perhaps instead putting the money in a separate state or local fund, such as a library fund).

¹⁸There are 29 cities whose share of own-source revenues from fines and fees was over 20% in 2012. For ease of reading the graph, we do not include those cities when we present the distribution of percent revenues from fines and fees (left) in Figure 1.

Below we present the distribution of clearance rates for violent crimes (left) and property crimes (right) for 2012 in Figure 2. The dotted lines denote the mean value for each clearance rate. Consistent with previous literature on crime clearance (Chalfin and McCrary n.d.; Roberts and Roberts 2015), the figure shows that the property crime clearance rate is much lower than the violent crime clearance rate, on average. Both crime clearance rates also show significant variation across municipalities.¹⁹

Figure 2: Distribution of Crime Clearance Rates, 2012



Identifying the causal effect of reliance on fines and fees to generate municipal revenues on crime clearance rates is challenging because revenues from fines and fees are distributed non-randomly across municipal governments. Even if we include an array of control variables, it is possible that omitted variable bias remains. Unobserved and unobservable variables, such as racial tension or trust between police and residents, could affect both the practice of revenue generation from fees and fines and crime clearance rates. Reverse causality is also possible; it may be the case that when the crime clearance rate is low, people are reluctant to move into the area, thereby reducing the property values and encouraging the municipal government to rely more on fines and fees.

To address these concerns, we employ two empirical strategies. First, we use county

¹⁹We present bivariate relationships between the percent revenues from fines and fees and crime clearance rates and fitted lines from local polynomial regression in Figure B in Appendix B.

fixed effects to account for time-invariant county-specific characteristics.²⁰ The main empirical specification we estimate is:

$$\mathbf{C}_{ijt} = \alpha_j + \gamma_t + \beta_1 \mathbf{Fines}_{ijt} + \beta_2 \mathbf{X}'_{ijt} + \varepsilon_{ijt} \quad (1)$$

where C_{ijt} indicates the crime clearance rate in city i in county j at time t . α_j denotes the county fixed effect, γ_t denotes the time fixed effect, $Fines_{ijt}$ indicates a share of own-source revenue from fines and fees in city i in county j at time t .²¹ X_{ijt} denotes other variables that could be related to both fines collection and crime clearance. We include local government police budgets as a proportion of total local government expenditures, number of fulltime sworn personnel with full arrest powers, total population, proportion of the population between the ages of 15 and 34, black population, education level, unemployment rate, degree of income inequality in the area, and median income as controls.²²

Second, we use an instrumental variable (IV) estimation strategy to address potential reverse causality between fines and crime clearance. The financial conditions of municipal governments are associated with their reliance on fines and fees as revenue generation sources (Garrett and Wagner 2009; Makowsky and Stratmann 2009). Therefore, we use an economic shock to municipal revenue as an instrument for revenue from fines and fees. Specifically, we leverage the fact that a recent boom in shale gas and oil production due to pre-existing geology and technological progress resulted in significant cross-county variation in increased revenue for municipal governments between 2004 and 2012. The technological innovation that combines horizontal drilling with hydrofracturing (“fracking”) has generated very large returns for oil- and natural gas-holding counties in the US

²⁰A more stringent empirical strategy would be a municipality level fixed effect. However, given that the Census of Governments has collected information about revenues from fines and fees only since 2007, the two periods 2007 and 2012 do not exhibit much variation in terms of per capita fines within municipalities.

²¹In the robustness checks section in Appendix D, we also present the results that use per capita fines and fees as a measure for *Fines*. The results are similar.

²²Table B1 presents the summary statistics for these variables.

since about 2005 (Feyrer, Mansur, and Sacerdote 2017).²³

Data on oil and natural gas production comes from Drillinginfo, a private company that provides information on energy sector firms. The Drillinginfo data provides detailed fracking information at the county level for each month. We construct a measure of per capita new production of oil and natural gas from horizontal drilling in each county for the years 2004 and 2012.²⁴ We use the county-level per capita increase in new production as an instrument for revenue from fines and fees in each municipality.²⁵

Revenue increases from shale gas and oil production, combined with the international price of oil and gas, contributes to increased local government revenue through tax income and royalties; therefore, we expect it to be negatively associated with a share of revenue from fines and fees. Because these revenues are the result of technological innovations and geology, new production of oil and gas is exogenous to the characteristics of the municipal government. Fracking activity is also used elsewhere in the academic literature as an instrument for income and voter preference changes (Fedaseyeu, Gilje, and Strahan n.d.). Figure 3 presents the county-level cumulative value of new production from shale oil and gas (in millions of dollars per capita) from 2004 to 2012.

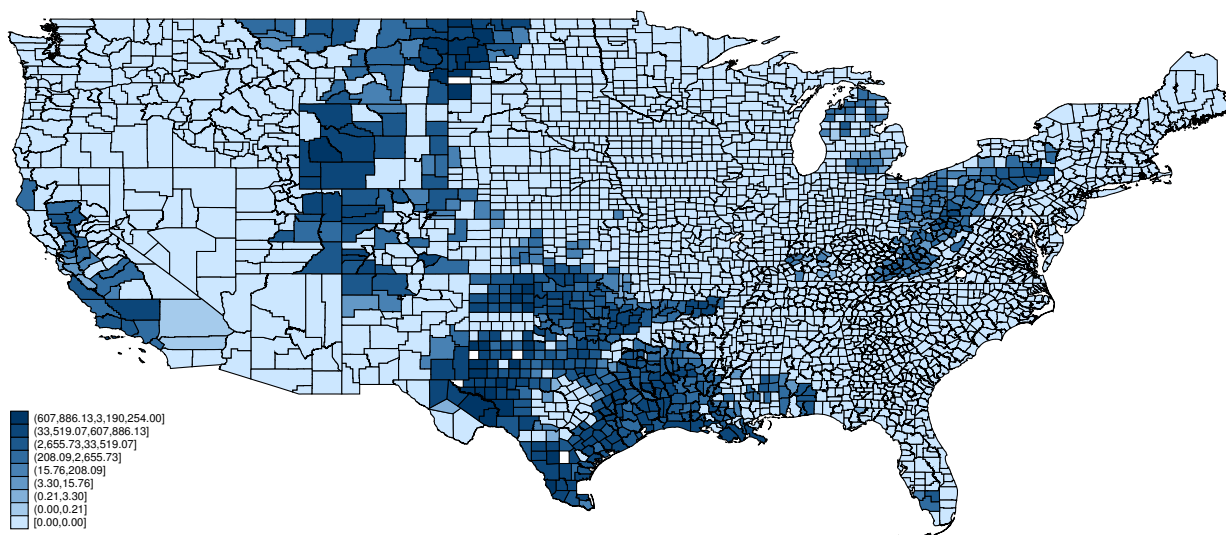
Fracking activities are geographically concentrated. Among cities in our sample, 35.5% are located in counties where fracking took place between 2004 and 2012. If reliance on fines and fees as a revenue source in those fracking communities are much lower than

²³We also experimented with using housing price changes in 2008 as an instrument for fines. Table E1 in Appendix E reports the results of this strategy. Although the coefficients are in the expected direction, we fail to obtain statistical significance in the second stage, which we attribute to the weakness of the housing price first stage relative to the resource boom first stage (that is, decreased median housing values at the city level between 2007 and 2012 are not a strong predictor of higher fines revenues as a result of lower property tax revenue ($F < 10$)). This weak first stage likely results from the lag between housing market conditions and property tax revenues. We present evidence that property tax revenues are not responsive to a housing price change over a five-year period in Table E2 in Appendix E. This is consistent with the literature, which shows that property tax revenues do not tend to decrease following housing price declines due to lags between market values and assessed values of housing and because of simultaneous changes in tax rates (Lutz, Molloy, and Shan 2011; Doerner and Ihlanfeldt 2011).

²⁴We focus on wells that used the horizontal drilling technique to calculate the total productions of oil and gas from fracking.

²⁵We use West Texas Intermediate monthly oil prices and the US natural gas monthly price to calculate the monetary value of new production per capita.

Figure 3: Production of Shale Oil and Gas from Hydraulic Fracturing, 2004 - 2012



Note: This figure plots each county's cumulative value of new production (million dollars) from 2004 to 2012.

that of non-fracking areas, our instrumental variable analysis would have limited generalizability. However, reliance on fines and fees is just as prevalent in fracking areas as in non-fracking areas. On average, the share of own-source revenues from fines and fees is 2.2% in fracking areas compared to 1.8% in non-fracking areas. In terms of per capita fines and fees, fracking areas collect, on average, \$24 per person and non-fracking areas collect \$20 per person from fines and fees. This suggests that reliance on fines and fees is widespread in both fracking and non-fracking areas, and our instrumental variable analysis has general implications.

One concern with using fracking as an instrumental variable for revenues from fines and fees is whether the exclusion restriction holds. If fracking activities influence the number of crimes, the effect of fracking on crime clearance might not occur solely through revenue collections. We test whether fracking is associated with an increased number of crimes in local communities by regressing five-year changes in crime on five-year changes in fracking values. Table 1 presents the results. Fracking activities bear no significant association to the total number of violent crimes (Column (1)) or property crimes (Column(2)).

When we disaggregate by specific types of crime (columns (3) - (9)), we observe similar results. There is no significant change in crime, except murders, in the municipalities where extraction occurs. This is consistent with another study that shows that fracking is not associated with significant increases in total violent and property crimes in counties affected by fracking activities (Feyrer, Mansur, and Sacerdote 2017).²⁶

Table 1: Effects of Fracking on Crime Rates

	(1) Violent Crime	(2) Property Crime	(3) Murder	(4) Assault	(5) Rape	(6) Robbery	(7) Burglary	(8) Larceny	(9) Motor Vehicle Theft
Fracking	122.7 (0.47)	-96.57 (-0.24)	1.439 (1.64)	128.8 (0.50)	-2.598 (-0.54)	-5.020 (-0.23)	28.06 (0.24)	-88.56 (-0.43)	-36.07 (-0.32)
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>N</i>	11079	11079	11079	11079	11079	11079	11079	11079	11079
adj. <i>R</i> ²	0.131	0.056	0.001	0.128	0.020	0.025	0.008	0.043	0.083

Note: Each coefficient represents a separate regression. *t* statistics in parentheses. Standard errors are clustered at the state level. The dependent variable is five-year change (2002-2007 and 2007-2012 changes) in counts of crimes in each municipality. The variable *Fracking* is a change in new value from oil and gas from the prior five years at the county level (2002-2007 and 2007-2012 changes).

The empirical specification for the instrumental variable analysis is as follows:

$$\text{(First Stage) } \text{Fines}_{ijst} = \alpha_s + \alpha_t + \gamma_1 * \text{Fracking}_{jst} + \gamma_2 * \mathbf{X}'_{ijst} + \nu_{ijst} \quad (2)$$

$$\text{(Second Stage) } \text{Clearance}_{ijst} = \alpha_s + \alpha_t + \beta_1 \text{Fines}_{ijst} + \beta_2 * \mathbf{X}'_{ijst} + \varepsilon_{ijst},$$

where i, j, s, t denote city, county, state, and year, respectively. Fracking_{jst} indicates a change in new value from oil and gas from the past five years at the county level. Fines_{ijst} indicates the percent municipal own-source revenues from fines and fees. Clearance_{ijst} is the violent and property crime clearance rate (%). \mathbf{X}'_{ijst} includes the same set of control

²⁶It is possible that fracking could change types of crime in those affected communities. However, given that the FBI has not changed the way it collects crime statistics over the last decade, it is difficult to know whether this is the case. However, as Table 1 shows, there was no noticeable change in incidences of major crime criteria during the fracking boom in those areas. Another concern about using municipal revenue increases from fracking as an instrument for reliance on fines and fees is that revenues from new oil and gas production could allow municipalities in fracking communities to hire more police officers or increase police department budgets in ways that affect their investigative capacities. However, there is no relationship between revenues from fracking and local employment in police offices or salaries for police officers (Sances and You n.d.).

variables as in the county fixed effect model such as the percent budgeted for police out of a city’s total expenditures, police employment, and demographic variables. α_s and α_t indicate state and year fixed effects, respectively.

4 Reliance on Fines and Crime Clearance Rates

In this section, we present the results and discuss potential causal mechanisms. First, we present OLS results with county fixed effects. Table 2 presents the results from estimating equation (1). Column (1) presents the simple bivariate relationship between revenues from fines and fees and violent crime clearance rates. There is a statistically significant and negative relationship. Column (2), after including various control variables as well as county fixed effects, presents the same result for violent crime clearance rates.

In large cities, the workloads of police forces are often divided between criminal investigation and other patrol and traffic division duties, whereas in small cities, officers perform a wider variety of functions (Falcone, Wells, and Weisheit 2002). For large cities, then, it may be difficult to reallocate police resources from crime investigation functions to potential revenue generating activities. Therefore, we divide cities in our sample into two groups based on their population size (larger or smaller than the U.S. average, which is 28,010 people) to see whether there are more salient effects of revenue generation via fines and fees on violent crime clearance in smaller cities where police functions might be more interchangeable because officers tend to be more generalist.²⁷ Columns (3) and (4) in Table 2 present the results. Indeed, the entire overall average effect is driven by small cities. The share of revenues from fines and fees has a significant negative relationship with violent crime clearance rates in small cities, but we do not observe the same effect in large cities (population over 28,010).²⁸ In cities with population sizes below the mean,

²⁷Although the CSLLEA data include variables for police functions such as crime investigation and traffic control, most of the local law enforcement agencies conduct patrol, crime investigation, and traffic control. Hence, it is difficult to know how strictly the division of labor is defined in each local police office department. Therefore, we use population size as a proxy for the division of police functions.

²⁸The number of cities with populations greater than 28,010 is 1,170 (20%) and cities with populations

Table 2: % Revenue from Fines and Fees and Crime Clearance Rates: County Fixed Effects

	Violent Crime				Property Crime	
	(1)	(2)	Smaller Cities ^a	Larger Cities	(5)	(6)
Fines and Fees as City's Own Source Revenue(%)	-0.503*** (-5.08)	-0.313*** (-3.01)	-0.321*** (-2.86)	-0.279 (-0.88)	0.0507 (0.80)	-0.00618 (-0.09)
(ln) Total Crime		-0.944 (-1.88)	-0.749 (-1.31)	-0.669 (-0.57)		-0.217 (-0.50)
Police Budget (%) ^b		0.0848 (1.96)	0.101** (2.06)	-0.0218 (-0.24)		0.0484 (1.96)
Fulltime Sworn Office pc ^c		-126.2 (-0.59)	111.0 (0.41)	203.4 (0.17)		420.8 (1.73)
(ln) Population		-1.631** (-2.44)	-2.200** (-2.36)	-0.751 (-0.53)		0.109 (0.21)
Population aged 15-34 (%)		0.0153 (0.25)	0.0345 (0.45)	-0.165 (-1.36)		0.0348 (0.88)
Black (%)		-0.117*** (-4.22)	-0.119*** (-3.71)	-0.127 (-1.77)		-0.0180 (-1.00)
Lower Education (%) ^d		-0.138*** (-2.70)	-0.0892 (-1.47)	-0.536*** (-4.71)		-0.0558 (-1.86)
Unemployment (%)		-0.445 (-1.88)	-0.465 (-1.79)	-0.0698 (-0.13)		-0.321** (-2.46)
Gini		-0.117 (-1.62)	-0.101 (-1.19)	-0.374** (-2.14)		-0.0362 (-0.86)
(ln) Median Income		-1.078 (-0.68)	-1.664 (-0.95)	0.0106 (0.00)		-2.957*** (-2.86)
Year FE	Y	Y	Y	Y	Y	Y
County FE	N	Y	Y	Y	N	Y
<i>N</i>	10361	9468	7613	1855	10650	9725
adj. <i>R</i> ²	0.004	0.229	0.200	0.494	0.008	0.215

Note: *t* statistics in parentheses. ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the city level. **a:** Smaller cities are defined as having populations equal to or less than 28,010, which constitutes the bottom 80% of the sample. Larger cities, in contrast, are having populations greater than 28,010. **b:** Percent of municipal government's budget spent on local police department. Police budget could be endogenous to municipalities' fines and fees revenue. We also use police budget data from 2002 (the latest year that Census of Government data is available prior to the sample period) to address this concern and there is no significant difference in the results. **c:** Number of fulltime sworn personnel with full arrest powers per capita. **d:** Percent of population over 25 whose education attainment is less than high school. For property crime clearance rates, both larger and smaller cities show no statistically significant relationship between revenues from fines/fees and their clearance rates.

the average number of fulltime sworn officers is 20, whereas that number is 248 in cities with population sizes above the mean. This suggests that in smaller cities, where officers perform a diversity of functions from traffic enforcement to criminal investigation, officers are more able to switch their duties in response to political pressure – and these are exactly the cities where we observe a negative relationship between fee and fine revenue and violent crime clearance rates.

Columns (5) and (6) present the results for property crime clearance rates. In contrast to violent crime, property crime does not appear to be significantly related to per capita revenue from fines and fees. This may be connected to the fact that high levels of police activity can deter property crime (Di Tella and Schargrotsky 2004). Property crimes are much harder to solve than violent crimes. Usually, this is because the victim of a (nonlethal) violent crime is very likely to know or be able to identify the perpetrator, while the victim of a property crime is very unlikely to know or to have seen or met the perpetrator.

This is evident in Figure 2, and from the fact that average clearance rates for property crimes is consistently about half that of violent crimes (Braga et al. 2011). For this reason, marginal decreases in the investigatory resources devoted to violent crimes are likely to have a greater effect on solve rates than marginal decreases in investigatory resources devoted to property crimes (Chalfin and McCrary n.d.). Therefore, a diversion of resources away from property crime investigations is less likely to affect property crime clearance than violent crime clearance, given the baseline low clearance rates of property crimes. This may explain why greater per capita fee and fine revenue is associated with lower violent crime clearance rates but not with lower property crime clearance rates.

Next, we present the results from the instrumental variable analysis in Table 3. The results from the first stage regression are reported in Table C1 in Appendix C. There is a statistically significant and negative relationship between new revenue from oil and

less than or equal to 28,010 is 4,765 (80%).

gas production by fracking in the county and per capita fines and revenues collected in municipalities in that county.²⁹ Columns (1) through (3) present the results for violent crime clearance and Column (4) presents the result for property crime clearance. The results of the instrumental variables analysis is consistent with the results from the county fixed effects analysis: while fee and fine revenue is positively associated with a lower violent crime clearance rate, it is not associated with any change in the property crime clearance rate.³⁰ Specifically, a 1.0 percent increase in own-source revenue from fines and fee is associated with a 3.7 percentage point decrease in the violent crime clearance rate.³¹ We also observe that the negative relationship between a reliance on fines and fees and a violent crime clearance rate is mainly driven by smaller cities, as Column (2) in Table 3 shows.

It is also crucial to note the significance of the percentage of blacks in the municipality in both instrumental variables regressions. An increase of 10% in the municipality’s black population is associated with a nearly 1% lower rate of violent crime clearance and a 0.8% lower rate of property crime clearance, even after controlling for crime rate, police budget, population, proportion of youth in the population, and other relevant sociodemographic variables. This result is consistent with qualitative and quantitative accounts of mistrust between black communities and the police (Goffman 2009, Lerman and Weaver 2014, Desmond, Papachristos, and Kirk 2016).

²⁹The F-statistics are 116.3 and 35.2, respectively, in each regression for violent and property crime clearances, which are much larger than the cutoff point of 10 that roughly defines a weak instrument problem (Stock, Wright, and Yogo 2002).

³⁰The size of effects between county-fixed effects analysis and IV analysis are different because IV estimates capture the local average treatment effect (LATE) (Angrist and Pischke 2009). That is, IV estimates capture the effect of revenue collection from fines and fees on crime clearance rates among ‘complier’ cities: cities that changed their reliance on fines and fees as revenue sources due to fracking activities in the counties where they are located. Therefore, the identification in our case comes from local governments that changed the share of own-source revenue collected from fines and fees due to fracking activities at the county level. The IV estimate is uninformative as to the effect of revenue generation from fines and fees on crime clearance rates for cities that do not change their reliance on fines and fees, even after fracking activities, or that never experienced fracking in their counties.

³¹As robustness checks, we use per capita fines and fees as a measure of the *Fines* variable in the regression, and we include the total number of each type of violent and property crime separately in the regression as control variables. The results are reported in Tables D2 and D4 in Appendix D, and the main results are robust.

Table 3: % Revenue from Fines and Fees and Crime Clearance Rates: Instrumental Variable Analysis

Variable	Violent Crime		Property Crime	
		Smaller Cities ^a	Larger Cities	
	(1)	(2)	(3)	(4)
Panel A: Second Stage				
Fines and Fees as City's Own Source Revenue (%)	-3.721*** (-3.63)	-3.311*** (-3.18)	-29.40 (-0.72)	1.569 (1.29)
(ln) Total Crime	-1.633** (-2.41)	-1.407** (-2.00)	-4.324 (-1.09)	-1.160*** (-2.62)
Police Budget ^b	0.409*** (3.35)	0.399*** (3.11)	1.820 (0.65)	-0.104 (-0.84)
Fulltime Sworn Officer pc ^c	25.47 (0.08)	143.6 (0.36)	222.3 (0.20)	168.0 (0.67)
(ln) Population	-1.365** (-2.02)	-1.367 (-1.44)	-1.251 (-0.32)	1.373** (2.41)
Population aged 15-34 (%)	0.0919 (1.56)	0.0727 (1.10)	0.856 (0.61)	-0.0807 (-1.39)
Black (%)	-0.0993** (-2.09)	-0.0963 (-1.96)	0.0143 (0.05)	-0.0725** (-2.27)
Low Education (%) ^d	-0.0845 (-1.60)	-0.0260 (-0.45)	0.141 (0.21)	-0.111*** (-3.85)
Unemployment (%)	-0.194 (-1.60)	-0.191 (-1.47)	-0.678 (-1.10)	-0.217** (-2.51)
Gini	-0.211** (-2.06)	-0.209 (-1.79)	-0.416 (-0.72)	0.00384 (0.06)
(ln) Median Income	-0.640 (-0.41)	-0.818 (-0.47)	14.68 (0.49)	-6.682*** (-5.16)
Year FE	Y	Y	Y	Y
State FE	Y	Y	Y	Y
N	9170	7379	1791	9415
Panel B: First Stage				
<i>DV = revenues from fines/fees(%)</i>				
Fracking value per capita (\$M)	-11.89*** (-10.79)	-11.03*** (-5.46)	-7.574 (-0.50)	-10.65*** (-5.94)
F-statistics	116.3	104.4	0.2	35.2
Year FE	Y	Y	Y	Y
State FE	Y	Y	Y	Y

Note: *t* statistics in parentheses. ** $p < 0.05$, *** $p < 0.01$. State FE is included to control different statutes and regulations on revenue collections from fines and fees and standard errors are clustered at the state level. **a:** Smaller cities are defined as having populations equal to or less than 28,010, which constitutes the bottom 80% of the sample. Larger cities, in contrast, are having populations greater than 28,010. **b:** Percent of municipal government's budget spent on local police department. We also use police budget data from 2002 to address the potential endogeneity of the police budget and there is no significant difference in the results. **c:** Number of fulltime sworn personnel with full arrest powers per capita. **d:** Percent of population over 25 whose education attainment is less than high school. Using state-year fixed effect to control state-specific time trend instead of state fixed effect and year fixed effect separately produces a similar result. For property crime clearance, both larger and smaller cities show no effect.

One potential threat to the validity of our results is that they might be driven by large, violent cities. For example, cities such as Chicago and Los Angeles have serious gang violence problems, and gang-related violent crimes are notoriously difficult to solve. As a result, police resources may be more efficiently allocated to other types of activities such as collecting traffic tickets in such an environment. To address this issue, we drop cities with the largest gang presences and re-estimate the model; the results remain robust and the are reported in Table D3 in Appendix D.³²

We argue that policing for profit is related to law enforcement personnel reallocating their time and resources from investigative functions due to time and budget constraints. To further establish this as the main mechanism explaining the negative relationship between reliance on fines or fees and lower violent crime clearance rates, we need to show that law enforcement agencies face budget and time constraints.

Regarding budget constraints, it is conceivable that when cities increase their reliance on fines and fees, they may also increase the cities' budgets for police operations. Although we control for the size of the police budget in the main empirical section, as a robustness check, we examine whether changes in revenues from fines and fees are associated with increases in police budgets between 2007 and 2012. We find that the increase in reliance on fines and fees in a city between 2007 and 2012 is not systematically associated with changes in the police budget over the same period.³³ This suggests that police forces are in fact trading off between resources allocated to investigations and resources allocated to revenue collection.

Although we do not have data on how police officers spend their time and our data does not allow us to be certain that the increased fee and fine revenue comes from more unique fines rather than more expensive fines concentrated among the same number of people, available evidence suggests that the police focus on a combination of these strategies and

³²The excluded cities are Chicago, Los Angeles, Philadelphia, Miami, New York, Atlanta, Cleveland, St. Louis, Dallas, Memphis, Nashville, New Orleans, Milwaukee, Orlando, Houston, and Detroit. These cities were noted in the 2013 report from the FBI's National Gang Intelligence Center.

³³Figure F1 in Appendix F presents the results of this exercise.

that both lead them to spend more of their time issuing and enforcing fees and fines at the expense of other kinds of police activities. For example, a report on the Oakland Police Department found that although the department was understaffed by 169 officers and did not investigate 80% of robberies at all in 2014, the department assigned 61% of staff and 54% of funds to patrol activities (Gammon 2015). As for academic research, Garrett and Wagner (2009) found an increase in the number of traffic tickets issued per capita in North Carolina's counties following particularly difficult fiscal years from 1990 to 2003. Furthermore, both the DOJ's Ferguson report and the NYU Brennan Center report (on court fees and fines) show that when fees and fines are more expensive, police then spend time issuing additional fines and arrest warrants for nonpayment.

Another related but different mechanism that could explain the negative relationship between reliance on fines and fees for local government revenues and violent crime clearance rates is changes in levels of trust and legitimacy of local law enforcement due to aggressive fee and fine collection. It is possible that, even if a police department is able to put the same amount of effort into solving violent crimes, these efforts could be less effective if community members in high-fine areas are less willing to cooperate with the police due (in whole or in part) to negative experience related to aggressive fee and fine collection. Studies have shown that negative interactions with law enforcement personnel and salient police misconduct cases increase cynicism of the legal system, reduce trust in the police, especially in Black communities (Kirk et al. 2012), and lead to fewer crimes reported via 911 calls by citizens (Desmond, Papachristos, and Kirk 2016). Due to data limitations, it is not possible to know for certain whether this subtly different potential mechanism is operating in tandem with the main resource allocation mechanism for which we argue, but both mechanisms originate from the use of the police as a source of municipal revenue rather than a provider of public safety.

5 Conclusion

This paper shows that a municipality's increased share of revenue from fees, fines, and asset forfeitures is negatively associated with its rate of violent crime clearance, conditional on the crime rate, the total police budget, and a host of relevant sociodemographic variables. County fixed effects analysis confirms that these results are not driven by omitted variables at the county level that might affect both reliance on fines and crime clearance rates, and an instrumental variables analysis leveraging positive revenue shocks due to increased shale gas production confirms that these results are not being driven by reverse causality. Specifically, we find that a 1 percent increase in the share of own-source revenues from fees, fines, and forfeitures collected by a municipality is associated with a decrease in the violent crime clearance rate of 3.7 percentage points. Furthermore, this result is driven by cities with smaller-than-average populations, where the mean number of sworn police officers is just 20; thus, where police officers are most able to flexibly switch between different functions in response to political pressure, rather than being cordoned into specialized divisions, this pattern emerges.

These results contribute to the scholarly understanding of the negative consequences generated by municipal revenue collection from fees and fines. When revenue is collected through systems of fees, fines, and forfeitures rather than through taxes, the fee collection systems themselves generate undesirable outcomes that may not have been anticipated by policymakers aiming simply to cover a revenue shortfall: Reallocation of police resources is associated with neglect of other important police functions, namely, the investigation of violent crimes. These results suggest that cities where the police are relied upon to collect revenue through fees, fines, and asset forfeitures essentially commandeer their police for revenue collection, which, perhaps unsurprisingly, compromises their ability to perform their traditional functions.

These results also contribute to a broader understanding of the relationship between law enforcement and high-crime communities, and the consequences of that relationship.

Almost forty years ago, James Q. Wilson’s book *Varieties of Police Behavior* described different police forces as having different “styles” with regard to aggressiveness, courtesy, and public service mission. This research shows that a municipality’s revenue needs can contribute to its police force’s “style.” Furthermore, the same police department can deliver differing qualities of police services to different groups of citizens within their community, which may partly explain why citizens of different races and classes can have very different views of the police, even within one city (Skogan 2006).

Another consequence of a police focus on revenue generation is that it necessarily involves increased citizens’ involuntary contact with law enforcement. This consequence is particularly important in light of the recent work by, among others, Weaver and Lerman (2010) and Lerman and Weaver (2014), all of which illustrate that involuntary contact with law enforcement significantly decreases democratic participation, even for those whose voting rights have not been affected. In general, it seems that those who have contact with the carceral state withdraw from all types of contact with the state – including voting, which has the potential to change policy in ways that might benefit them personally. In this way, policing for profit can be part of a vicious cycle of chronic, involuntary contact with law enforcement and low levels of civic engagement.

All the cited studies of the consequences of law enforcement behavior for democratic citizenship, including Wilson’s, comment extensively on the ways in which racial bias shapes these phenomena. The literature on racial bias in the imposition of fees and fines, particularly traffic fines, is vast and does not merit a summary here, although interested readers should refer to Epp, Maynard-Moody, and Haider-Markel (2014). Fines and fees that generate municipal revenue are often implemented in a dramatically racially discriminatory fashion. This may partially explain the very large negative effect of the share of a city’s population that is black on the violent crime clearance rate. Furthermore, the pattern we document in this paper may contribute to the well-documented racial gap in perceptions of police legitimacy (Skogan 2006, Warren 2011, Epp, Maynard-Moody,

and Haider-Markel 2014).

For many American citizens and residents, contact with the police – as a suspect, a victim, or a witness – is the only contact they have with any emissary of the local, state, or federal governments. If some communities are over-policed with regard to the police’s revenue generation function (i.e., if they are the target of aggressive fee and fine enforcement) and consequently under-policed with regard to the police’s criminal investigation function, their taxes are paying for a government service that exploits them for profit rather than protecting them from violence. In this sense they are poorly represented by the local government, and understandably pessimistic about their power to change the situation.

The results we present in this paper also have important implications for criminal justice reform. Recent high-profile shootings of African-Americans by police officers have brought the issue of bias in the criminal justice system into the center of political discourse. While advocates for reform suggest procedural changes, such as federal support for police body cameras, our results indicate that institutional changes, such as decreasing municipal government reliance on fines and fees for revenue, may also be important areas for reform.

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Appendices

A Appendix: Census of Governments Survey Forms of Revenue

Code: U30 ITEM: Fines and Forfeits

Includes: Receipts from penalties imposed for violations of law; civil penalties (e.g., for violating court orders); court fees if levied upon conviction of a crime or violation; court-ordered restitutions to crime victims where the government actually collects the monies; and forfeits of deposits held for performance guarantees or against loss or damage (such as forfeited bail and collateral).

Excludes: Penalties relating to tax delinquency (report at appropriate Tax code); library fines (report at Other Charges, code A89); and sale of confiscated property (use code U99).

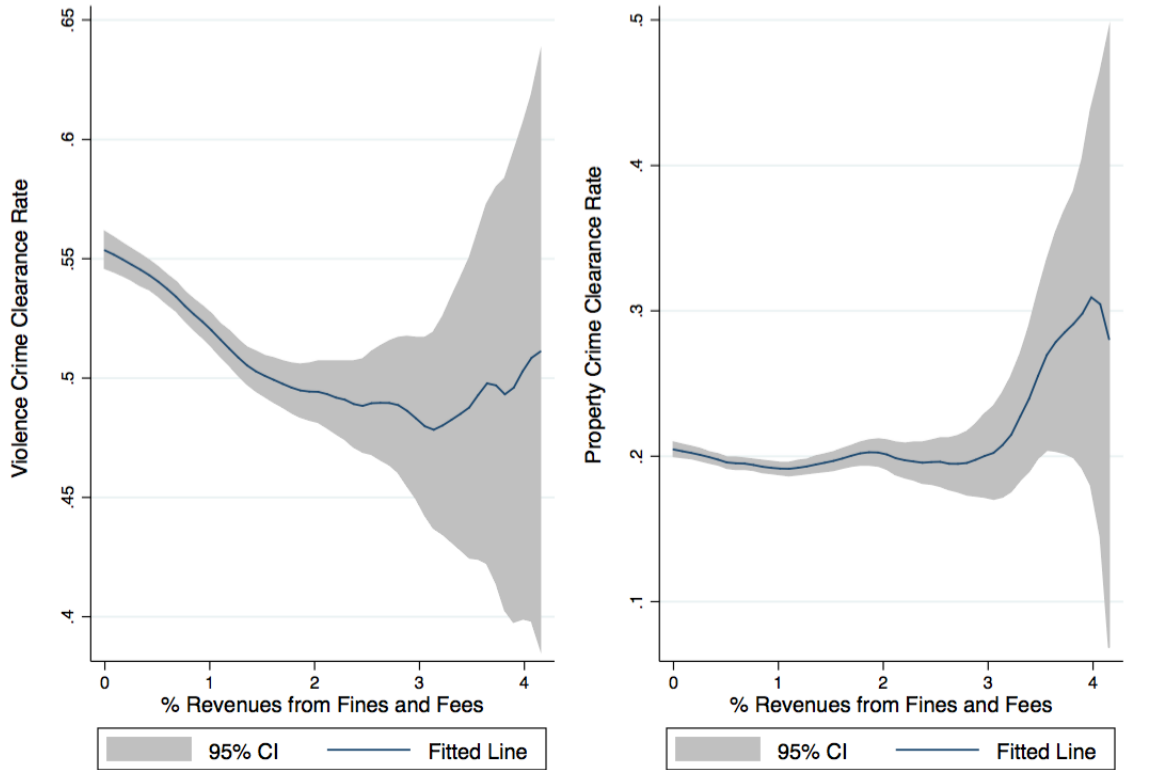
Following is a picture of the form that governments filled out (in 2012):

Figure A1: Census of Government Survey Form

PART 2 - REVENUES - Continued		Other Revenues		
		\$Mil.	Thou.	Dol.
E. Interest earnings - Interest received on all deposits and investment holdings of your government and its agencies.				
Include				
• Interest on construction funds				
Exclude				
• Interest earnings of any employee pension funds U20				
F. Fines and forfeits - Receipts from penalties imposed for violations of law and civil penalties U30				
G. Rents - Revenues from temporary possession or use of government-owned buildings, land, and other properties U40				
H. Royalties - Compensation or portion of proceeds from extraction of natural resources (e.g., oil, gas, and mineral rights) U41				
I. Private donations - Gifts of cash or securities from private individuals or corporations U50				

B Descriptive and Summary Statistics

Figure B1: Bivariate Relationship between Revenues from Fines/Fees and Crime Clearance Rates



Note: The figure presents the bivariate relationships between the percent revenues from fines and fees and violent (left) and property (right) crime clearance rates. Fitted lines come from a kernel-weighted local polynomial regression.

Table B1: Summary Statistics

Variable	N	Mean	SD	Min.	Max.
<i>Panel A. Crime</i>					
# Violent Crime	11870	150.8	1076.2	0	51831
Violent Crime Cleared (%) ^a	10361	52.7	27.1	0	100
Murders	11870	1.8	15.0	0	500
Aggravated Assault	11870	90.2	593.1	0	31211
Forced Rape	11870	7.9	31.4	0	953
Robbery	11870	50.7	460.7	0	21787
# Property Crime	11870	1071.0	4679.3	0	149488
Property Crime Cleared (%) ^b	10650	19.7	14.8	0	100
Burglary	11870	237.4	1023.0	0	29112
Larceny Theft	11870	723.1	3074.0	0	115935
Motor Vehicle Theft	11870	110.5	722.5	0	29231
<i>Panel B. Public Finance</i>					
% Intergovernmental Transfer Revenue	11870	16.3	13.1	0	97.2
% Tax Revenue	11870	47.31	21.0	0	100
% Fines and Fees Revenue	11870	1.9	3.1	0	62.6
Fines per capita (\$)	11870	21.5	32.1	0	677.6
<i>Panel C. Police</i>					
Police Budget as City's Expenditure (%)	11870	19.38	8.93	0	82
Fulltime Sworn Officer	10,584	45.2	132.8	0	3388
<i>Panel D. Demographics</i>					
(ln) Population	11870	9.31	1.12	6.85	15.93
Population 15~34 (%)	11870	27.15	6.97	0	81.87
Black (%)	11870	10.75	17.08	0	99.37
Less than High School (%)	11870	15.30	9.67	0	78.80
Unemployment (%)	11870	4.06	1.95	0	50.19
Gini	11870	42.56	5.49	0	70.2
(ln) Median Income	11870	10.78	0.41	0	12.48

Note: Unit of observation is municipality (N = 5,935) × year (2007 and 2012). a.b. some areas with zero crime have no clearance rate data.

C Appendix: First Stage Result

Table C1: Instrument Variable Analysis: First Stage Result

Variable	Violent Crime			Property Crime
		Smaller Cities ^a	Larger Cities	
	(1)	(2)	(3)	(4)
Fracking value per capita (\$M)	-11.89*** (-10.79)	-11.03*** (-5.46)	-7.574 (-0.50)	-10.65*** (-5.94)
(ln) Total Crime	0.0221 (0.32)	0.0252 (0.43)	-0.0873 (-1.06)	-0.0228 (-0.31)
Police Budget ^b	0.0962*** (5.09)	0.0948*** (4.88)	0.0644*** (6.27)	0.0930*** (5.08)
Fulltime Sworn Officer pc ^c	102.0 (1.83)	119.6 (1.62)	24.20 (1.33)	112.0 (1.92)
(ln) Population	-0.145 (-1.61)	-0.183 (-1.66)	-0.00368 (-0.04)	-0.0876 (-0.90)
Population aged 15-34 (%)	0.0396*** (4.60)	0.0402*** (4.35)	0.0332*** (2.71)	0.0400*** (4.69)
Black (%)	0.00826 (0.76)	0.00783 (0.63)	0.00718 (1.53)	0.00842 (0.84)
Low Education (%) ^d	0.0092 (1.39)	0.00245 (0.34)	0.0212** (2.33)	0.00765 (1.20)
Unemployment (%)	0.0190 (0.96)	0.0257 (1.08)	-0.0160 (-0.87)	0.0191 (0.97)
Gini	-0.0331 (-1.94)	-0.0412** (-2.16)	-0.00644 (-0.45)	-0.0370** (-2.15)
(ln) Median Income	0.819*** (3.30)	0.736** (2.63)	0.752*** (2.74)	0.701*** (2.75)
Constant	-7.834*** (-2.91)	-6.196 (-1.89)	-8.396** (-2.51)	-6.677** (-2.40)
<i>F</i> -statistics	116.3	104.4	0.2	35.2
Year FE	Y	Y	Y	Y
State FE	Y	Y	Y	Y
<i>N</i>	9170	7621	1794	9415
adj. <i>R</i> ²	0.244	0.243	0.289	0.242

Note: *t* statistics in parentheses. ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the state level. **a**: Smaller cities are defined as having populations equal to or less than 28,010, which constitutes the bottom 80% of the sample. Larger cities, in contrast, are defined as having populations greater than 28,010. **b**: Percent of municipal government's budget spent on the local police department. **c**: Number of fulltime sworn personnel with full arrest powers per capita. **d**: Percent of population over 25 whose education attainment is less than high school.

D Appendix: Robustness Checks

Tables D1 and D2 present the results (county fixed effect and instrumental variable analysis, respectively) and when we use per capita fines and fees as an independent variable instead of using a percentage of local own source revenues from fines and fees. Table D3 presents the result with a county fixed effect when we exclude cities with a prevalence of gang activity. Table D4 presents the instrumental variable analysis when we include different types of violent and property crimes as control variables.

Table D1: Per Capita Revenues from Fines and Fees and Crime Clearance Rates: County Fixed Effects

Variable	(1) Violent Crime Clearance (%)	(2) Property Crime Clearance	(3) Violent Crime Clearance	(4) Property Crime Clearance
Per Capita Fines and Fees (\$)	-0.0465*** (-4.29)	-0.000175 (-0.03)	-0.0237** (-2.12)	0.00361 (0.63)
(ln) Total Violent Crime	0.668 (1.50)		-0.911* (-1.69)	
(ln) Total Property Crime		-0.264 (-0.63)		-0.231 (-0.44)
Police Budget (%) ^a	-0.0680* (-1.79)	0.0125 (0.57)	0.0602 (1.19)	0.0470* (1.67)
Fulltime Sworn Officer pc ^b	560.9* (1.70)	732.0** (2.17)	-24.23 (-0.10)	405.7 (1.50)
(ln) Population	-3.778*** (-6.36)	-0.206 (-0.39)	-1.623** (-2.07)	0.130 (0.19)
Population aged 15-34 (%)	0.0129 (0.27)	0.00488 (0.15)	0.00954 (0.14)	0.0331 (0.73)
Black (%)	-0.167*** (-7.85)	0.00696 (0.50)	-0.121*** (-3.64)	-0.0183 (-0.77)
Low Education (%) ^c	-0.0531 (-1.37)	-0.0978*** (-3.70)	-0.142** (-2.32)	-0.0565 (-1.61)
Unemployment	-1.200*** (-6.17)	-0.771*** (-6.81)	-0.431 (-1.41)	-0.322** (-2.09)
Gini	-0.0520 (-0.80)	-0.0510 (-1.19)	-0.105 (-1.25)	-0.0364 (-0.72)
(ln) Median Income	-0.454 (-0.39)	-5.640*** (-5.35)	-1.099 (-0.45)	-2.993** (-2.16)
Constant	101.9*** (7.68)	87.36*** (7.65)	91.63*** (2.98)	51.54*** (3.09)
Year FE	Y	Y	Y	Y
County FE	N	N	Y	Y
<i>N</i>	9468	9725	9468	9725
adj. <i>R</i> ²	0.046	0.030	0.229	0.215

Note: *t* statistics in parentheses. ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at city level. **a**: Percent of municipal government's budget spent on the local police department. **b**: number of fulltime sworn personnel with full arrest powers per capita. **c**: Percent of population over 25 whose education attainment is less than high school.

Table D2: Per Capita Fines and Fees and Crime Clearance Rates: Instrumental Variable Analysis

	(1)	(2)
	Violent Crime Clearance (%)	Property Crime Clearance (%)
Panel A: Second Stage		
Per Capita Fines and Fees (\$)	-0.347*** (-3.84)	0.152 (1.35)
(ln) Total Violent Crime	-0.907 (-1.35)	
(ln) Total Property Crime		-1.678*** (-2.75)
Police Budget ^a	0.141*** (2.74)	0.00453 (0.11)
Fulltime Sworn Officer pc ^b	1574.6 (1.66)	-478.0 (-0.81)
(ln) Population	-1.643** (-2.23)	1.733*** (2.61)
Population aged 15034 (%)	0.0593 (1.21)	-0.0707 (-1.47)
Black (%)	-0.140*** (-3.33)	-0.0579** (-2.53)
Low Education (%) ^c	-0.102 (-1.83)	-0.108*** (-4.06)
Unemployment (%)	-0.124 (-1.00)	-0.245*** (-2.80)
Gini	-0.0427 (-0.62)	-0.0626 (-1.20)
(ln) Median Income	1.186 (0.68)	-7.521*** (-4.38)
Year FE	Y	Y
State FE	Y	Y
N	9170	9415
adj. R ²	0.159	0.121
Panel B: First Stage		
<i>DV = per capita fines and fees (\$)</i>		
Fracking value per capita (\$M)	-127.6*** (-10.75)	-109.8*** (-7.13)
F-statistics	114.5	72.0
Year FE	Y	Y
State FE	Y	Y
N	9170	9415
adj. R ²	0.21	0.21

Note: *t* statistics in parentheses. ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the state level. **a**: Percent of municipal government's budget spent on the local police department. **b**: number of fulltime sworn personnel with full arrest powers per capita. **c**: Percent of population over 25 whose education attainment is less than high school.

Table D3: Per Capita Fines and Fees and Crime Clearance Rates, Excluding Cities with Prevalence of Gangs: County Fixed Effects

Variable	(1) Violent Crime Clearance (%)	(2) Property Crime Clearance	(3) Violent Crime Clearance	(4) Property Crime Clearance
Per Capita Fines and Fees (\$)	-0.459*** (-4.18)	0.0313 (0.45)	-0.313*** (-2.61)	-0.00701 (-0.09)
(ln) Total Violent Crime	0.569 (1.27)		-0.991 (-1.82)	
(ln) Total Property Crime		-0.316 (-0.75)		-0.244 (-0.46)
Police Budget (%) ^a	-0.0360 (-0.91)	0.00917 (0.41)	0.0854 (1.62)	0.0486 (1.70)
Fulltime Sworn Officer pc ^b	383.7 (1.30)	774.6** (2.28)	-123.2 (-0.54)	452.7 (1.61)
(ln) Population	-3.663*** (-6.08)	-0.0248 (-0.05)	-1.603** (-1.99)	0.229 (0.34)
Population aged 15-34 (%)	0.0137 (0.29)	0.000503 (0.02)	0.0153 (0.23)	0.0325 (0.72)
Black (%)	-0.163*** (-7.60)	0.00701 (0.50)	-0.116*** (-3.44)	-0.0161 (-0.67)
Low Education (%) ^c	-0.0521 (-1.35)	-0.0977*** (-3.68)	-0.137** (-2.24)	-0.0549 (-1.54)
Unemployment	-1.236*** (-6.37)	-0.769*** (-6.78)	-0.447 (-1.46)	-0.316** (-2.05)
Gini	-0.0720 (-1.10)	-0.0485 (-1.12)	-0.120 (-1.42)	-0.0353 (-0.69)
(ln) Median Income	-0.866 (-0.75)	-5.748*** (-5.39)	-1.120 (-0.46)	-3.008** (-2.16)
Constant	106.2*** (8.11)	87.07*** (7.59)	92.19*** (2.99)	50.74*** (3.02)
Year FE	Y	Y	Y	Y
County FE	N	N	Y	Y
<i>N</i>	9438	9695	9438	9695
adj. <i>R</i> ²	0.043	0.029	0.227	0.214

Note: *t* statistics in parentheses. ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at city level. **a**: Percent of municipal government's budget spent on the local police department. **b**: number of fulltime sworn personnel with full arrest powers per capita. **c**: Percent of population over 25 whose education attainment is less than high school.

Table D4: Revenues from Fines and Fees and Crime Clearance Rate: Instrumental Variable Analysis with Different Types of Crime as Controls

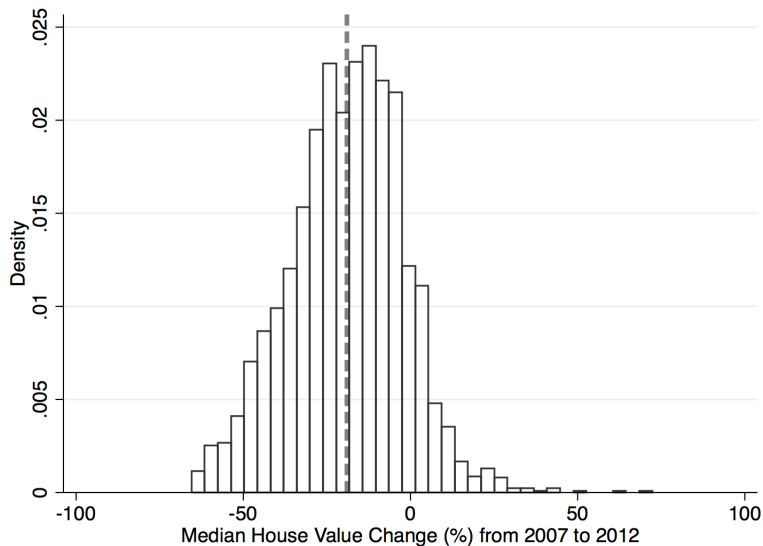
	(1) Violent Crime Clearance (%)	(2) Property Crime Clearance (%)
Panel A: Second Stage		
Fines and Fees as City's Own Source Revenue (%)	-3.577*** (-3.66)	1.340 (1.28)
Murders	0.0903 (1.78)	0.0493 (1.34)
Assault	-0.000439 (-0.29)	-0.000779 (-0.81)
Rape	-0.0241 (-1.53)	0.00611 (0.76)
Robbery	-0.00264 (-1.03)	-0.00147 (-0.68)
Burglary	-0.000960 (-1.11)	-0.00268*** (-5.20)
Larceny	0.000189 (0.97)	0.000584*** (2.73)
Motor Vehicle Theft	0.000789 (1.46)	0.000635 (1.80)
Police Budget ^a	0.395*** (3.41)	-0.0820 (-0.76)
Full Time Sworn Officer pc ^b	-124.8 (-0.44)	89.82 (0.38)
(ln) Population	-2.846*** (-4.29)	0.306 (0.81)
Population aged 15-34 (%)	0.0840 (1.46)	-0.0734 (-1.44)
Black (%)	-0.122*** (-2.83)	-0.0651** (-2.20)
Low Education (%) ^c	-0.0948 (-1.80)	-0.102*** (-3.67)
Unemployment	-0.206 (-1.73)	-0.219*** (-2.65)
Gini	-0.193 (-1.90)	-0.00432 (-0.07)
(ln) Median Income	0.567 (0.34)	-5.910*** (-4.68)
Year FE	Y	Y
State FE	Y	Y
N	9170	9415
adj. R ²	0.168	0.144
Panel B: First Stage		
<i>DV = revenues from fines and fees (%)</i>		
Fracking value per capita (\$M)	-11.92*** (-10.84)	-10.67*** (-5.93)
F-statistics	117.5	35.2
Year FE	Y	Y
State FE	Y	Y
N	9170	9,415
adj. R ²	0.24	0.24

Note: *t* statistics in parentheses. ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the state level. **a:** Percent of municipal government's budget spent on local police department. **b:** number of full time sworn personnel with full arrest powers per capita. **c:** Percent of population over 25 whose education attainment is less than high school.

E Housing Price Changes as an IV

In the main text, we use the per capita revenue from fracking activities as an instrument for revenues from fines and fees. In this section, we use a *positive* shock to municipal finances as an instrument. As a robustness check, we present the results when we use housing price decreases due to the 2008 financial crisis, a *negative* shock to municipal finances, as an instrument. Zillow Group, an online real estate database company, provides a monthly median housing price for many housing markets in the US. We download Zillow Home Value data (<http://www.zillow.com/research/data/>) and calculate the annual median housing value for the years 2007 and 2012. We then calculate the percent changes in home values between 2007 and 2012. Among 5,935 unique municipalities in our data, we are able to find the median house value for 3,594 cities for 2007 and 3,687 cities for 2012. We use the percent changes in home values from 2007 to 2012 as an instrumental variable for the percent own-source revenues from fines and fees. Figure E1 presents the distribution of housing value changes (%) from 2007 to 2012. The average price change is a 19% drop in housing values from 2007 to 2012.

Figure E1: Median House Value Change (%) from 2007 to 2012



The empirical specification for the instrumental variable analysis is as follows:

$$\begin{aligned} \text{(First Stage)} \quad \text{Fines}_{ist} &= \alpha_s + \gamma_1 * \text{Housing Price Change}_{ist} + \gamma_2 * \mathbf{X}'_{ist} + \nu_{ist} \\ \text{(Second Stage)} \quad \text{Clearance}_{ist} &= \alpha_s + \beta_1 \mathbf{Fines}_{ist} + \beta_2 * \mathbf{X}'_{ist} + \varepsilon_{ist} \end{aligned} \quad (3)$$

, where i, s, t denote city, state, and year, respectively. *Housing Price Change* $_{ist}$ indicates a percent change in the median housing value from 2007 to 2012 in city i . *Fines* $_{ist}$ indicates the percent municipal own-source revenues from fines and fees. We also measure this variable using per capita revenue from fines and fees as a robustness check.

$Clearance_{ist}$ is the violent and property crime clearance rate (%) in the year 2012. \mathbf{X}'_{ist} includes various control variables such as the percent budgeted for the police out of a city's total expenditure and demographic variables. α_s indicates state fixed effects and standard errors are clustered at the state level.

Table E1 presents the results. Columns (1) and (2) present the results when we use the own-source revenue shares from fines and fees as a measure of *Fines* variables and columns (3) and (4) present the results when we use the per capita fines and fees as a measure of *Fines* variables. The coefficients are all in the expected direction but regressions on violent crime clearance rates do not show any statistical significance and coefficients on the property crime clearance rates are statistically significant only at the 10% level. Panel B in Table E1 presents the first stage estimates. Areas where the median housing value increased from 2007 to 2012 are associated less with reliance on fines and fees, but smaller *F*-statistics suggest that there is a weak instrument problem at play (Stock, Wright, and Yogo 2002; Angrist and Pischke 2009).

Table E1: Reliance on Fines and Fees and Crime Clearance Rates: Using Housing Value Change as an Instrumental Variable

	(1)	(2)	(3)	(4)
	Violent Crime Clearance (%)	Property Crime Clearance	Violent Crime Clearance (%)	Property Crime Clearance
<i>Panel A: Second Stage</i>				
Fines as City's Own Source Revenue (%)	-0.0241 (-0.89)	-0.0299 (-1.91)		
Per Capita Fines (\$)			-0.00204 (-0.89)	-0.00255 (-1.85)
<i>Panel B: First Stage</i>				
Housing Price Change (%)	-0.02 (-1.76)	-0.02 (-1.81)	-0.28** (-2.16)	-0.27** (-2.19)
<i>F</i> -Statistics	3.04	3.19	4.58	4.67
Controls	Y	Y	Y	Y
State FE	Y	Y	Y	Y
<i>N</i>	2673	2752	2673	2752

Note: *t* statistics in parentheses. ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the state level.

The motivation for using housing-value change as an instrumental variable for reliance on fines and fees as revenue sources is that a drop in housing values may cause a significant drop in property taxes for municipal governments; therefore, they might seek other revenue sources such as fines and fees. However, if we do not observe a significant drop in property taxes after housing value changes, this may explain why we do not observe a tight relationship between changes in housing values and reliance on fines and fees. The extant literature documents that the share of revenues from property taxes are quite stable over time (Alm, Buschman, and Sjoquist 2011) and property tax revenues do not

tend to decrease following housing price declines due to lags between market values and assessed values of housing (Lutz, Molloy, and Shan 2011). Doerner and Ihlanfeldt (2011), using a panel of Florida cities, also find that while an increase in house prices raises revenues, decreases in prices have no effect on revenues. To see whether housing price changes alter the property tax revenues for cities within a short time period, we run the following model:

$$\text{Property Tax}_{it} = \beta_1 \text{Property Tax}_{it-1} + \beta_2 \text{Housing Value Change}_i + \mathbf{X}'_{it} \Gamma + \varepsilon_{it} \quad (4)$$

where i indicates a city and t indicates year. The *Property Tax* variable is measured in two ways: (1) the total amount of revenues from property taxes, and (2) the share of property tax revenues in a city's own-source revenues. We include a lagged dependent variable (values in the year of 2007). The variable *Housing Value Change* is measured by the absolute change in price in the regression of the total amount of property revenues and the percent changes in price in the regression of the share of property tax revenues in own-source revenues. X_{it} includes the intergovernmental transfers, demographic variables, and average housing price in 2007. Errors are clustered at the state level.¹ Table E2 presents the results. Although the directions of the coefficient are consistent with expectations, coefficients on *(ln) Housing Price Difference* and *Percent Change in Housing Price* are statistically insignificant, which suggest that changes in housing values were not reflected well in the property tax revenues for municipal governments. This could explain why we do not observe a strong first-stage relationship when we use housing value changes as an instrument for revenues from fines and fees.

¹Since we include a lagged dependent variable, we do not use a state fixed effect (Angrist and Pischke 2009).

Table E2: Housing Value Change and Property Tax Revenues

<i>DV=</i>	(1) (ln) Total Property Tax Revenue	(2) Property Tax Revenue Share in Own-Source Revenue (%)
(ln) Housing Price Difference	-0.0843 (-1.31)	
(ln) Lagged Property Tax Revenue	0.884*** (22.65)	
(ln) Intergovernmental Transfers	0.0588 (1.30)	
Percent Change in Housing Price		-0.00302 (-0.18)
Lagged Property Tax Revenue Share (%)		88.18*** (41.98)
Intergovernmental Transfers' Share in Total Revenue		0.0479*** (2.73)
(ln) Population	0.0323 (0.67)	-0.474** (-2.67)
Black (%)	-0.142 (-0.77)	1.861 (0.95)
Population with less than High school education (%)	0.269 (0.58)	0.0808 (0.03)
Unemployment (%)	1.479 (1.74)	4.518 (0.68)
Gini	2.807** (2.24)	6.741** (2.43)
(ln) Median Income	0.214 (1.24)	2.978*** (3.84)
(ln) Housing Price in 2007	0.276 (1.23)	1.213 (1.65)
Constant	-6.130*** (-2.76)	-42.71*** (-3.58)
<i>N</i>	381	3089
adj. <i>R</i> ²	0.897	0.826

Note: *t* statistics in parentheses. ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the state level.

F Relationship between Police Budgets and Fines Changes

Figure F1: Changes in Per Capita Fees and Fines and Changes in Police Budgets, 2007-2012

