Local Public Finance and Discriminatory Policing: Evidence from Traffic Stops in Missouri

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June 2, 2018

Abstract

This paper provides evidence of racial variation in local governments' traffic enforcement responses to budget stress using data from policing agencies in the state of Missouri for the years 2001 through 2014. Like previous studies, we find that local budget stress is associated with higher citation rates. In addition, we find that there is an increase in traffic-stop arrests. However, we find that these effects are concentrated among white (rather than black or Hispanic) drivers. This statistical difference is robust to the inclusion of a range of covariates for traffic stops and to the inclusion of local population features interacted with year. These results are consistent with a model where traffic police selectively target higher-income drivers to compensate for budget stress. Also consistent with this view, we find that the racial difference in citation and arrest rates is highest where the white-to-black income ratio is highest.

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1 Introduction

New models of policing combining aggressive tactics with data-driven management metrics have created tensions between the residents of racial and ethnic minority communities and police (Heymann, 2000), with little evidence of substantial public safety gains (MacDonald et al., 2016). In this project, we examine the political and social determinants of racially targeted policing, where historically traffic and misdemeanor enforcement has been concentrated among drivers and residents in minority communities. Our goal is to provide evidence on how the institutional preferences of law enforcement agencies influence disparities in policing activities, which potentially lead to the reproduction of disadvantage among heavily policed populations.

A large literature has documented that traffic police disproportionately target black and Hispanic drivers when making stops. On the micro level, economic theorists have formalized conditions for measuring discrimination and econometricians have demonstrated discrimination at the level of individual traffic stops (e.g. Knowles et al., 2001; Rojek et al., 2004). At the macro level, the consequences of this discrimination have been observed at the level of entire criminal justice systems and entire communities (Fagan and Ash, 2017).

Another line of research has examined the public-finance motivations underlying aggressive policing. It is well-documented that local governments rely on revenue from traffic tickets, and officials often look to this source of revenue to help overcome budget shortfalls. In fact, some jurisdictions structure revenues that they anticipate from fines, fees and seizures into agency budgets (Baicker and Jacobson, 2007). Other jurisdictions pursue these revenue-generating activities not only to provide municipal services, but to sustain their own police forces. For example, the recent Ferguson Report issued by the U.S. Department of Justice suggests that the municipality tried to cloak its taxing

power in the exercise of police power by functionally equating the power of taxation with the power to punish (DOJ, 2015). The report noted that local police in Ferguson and nearby communities had grown to depend on these revenue streams to sustain the size of the police force and to pay salaries and annual increases to the officers.

In this paper, we explore empirically the intersection of race, policing, and this form of latent taxation, to determine whether the burden to close budget gaps falls disproportionately on non-white motorists and pedestrians. We use data from the State of Missouri to assess whether police officers' ticketing behaviors are discriminatory, and in particular, whether the disparity in ticketing changes when a municipality is faced with governmental pressures to increase ticketing revenue.

To provide empirical evidence on these issues, we construct a data set on local fiscal stress for the 769 local policing agencies in Missouri from 2000-2014. When local governments experience negative budgetary shocks (shortfalls), police may be given incentives to increase traffic enforcement to generate revenue (Garrett and Wagner, 2009). We couple traffic enforcement data with measures of legal financial obligations to assess the monetizing effects of intensified enforcement.

We find that at times of budget stress, local police and sheriffs increase their targeting of white drivers. Holding the number of traffic stops constant, the citation rate and arrest rate for white drivers increases. There is no effect on citations and arrests of non-white drivers. The finding is robust to a number of alternative specifications and checks. It does not apear to be driven by counfounding trends.

These results are different from other work in political science showing that discrimination can increase due to institutional pressures, such as the electoral cycle (Kubik and Moran, 2003; Park, 2014). Instead, they are consistent with a model where traffic police selectively target higher-income drivers to compensate for budget stress. To probe this possibility, we look at whether the result depends on the ratio of incomes

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of white residents to black residents in the local community. Indeed, we find that the racial difference in citation and arrest rates is highest where the white-to-black income ratio is highest.

Future research can provide further evidence on the reasons officers behave this way. We can ask whether officers are awarene of white residents' higher incomes on average, for example. In such a scenario, officers might typically discriminate against black and Hispanic drivers, as most research in this area suggests, but increase citations and arrests of white drivers only when "necessary."

2   Background

Racial disparities in traffic stops and citations are widespread in Missouri (Hernández-Murillo and Knowles, 2004; Rojek et al., 2004; Rosenfeld et al., 2011) and elsewhere (Harris, 1999; Epp et al., 2014). Early work by economists on discriminatory enforcement in highway searches suggested two alternative explanations. Either police were stopping people of color more often because they were more likely to have drugs or contraband (statistical discrimination), or they were stopping these motorists more often based on racial preferences (taste-based discrimination) (Knowles et al., 2001; Persico and Todd, 2006).

These racial preferences might also include the officer's beliefs about the ability to pay the fine. This is related to the role of traffic enforcement as a revenue-generating process, a central focus of the Ferguson Report (DOJ, 2015). These fines can grow into a broader range of fees that act as a latent tax on poor people (CEA, 2015; Bannon et al., 2010; Harris, 2017). To the extent that low-income people have less political influence over policing, then extractive stops focused in low-income communities can serve as a regressive tax policy.

Figure 1: Edmundson Mayor's Memo to Police Department Re Traffic Tickets

MEMO

Date: April 18, 2014

To: Edmundson P. D. — Sergeants and Patrolmen
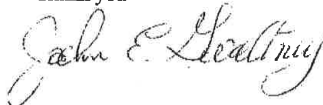
Subject: Traffic tickets

In the past several weeks, the Board and I have noticed a marked downturn in traffic and other tickets being written by your department. It is correct that we have no quotas and want only "good tickets" written. However, we do have a record of your past performance to compare to your current performance and the picture that I see is a very disappointing one.

I wish to take this opportunity to remind you that the tickets that you write do add to the revenue on which the P. D. budget is established and will directly affect pay adjustments at budget time.

It is and has always been the desire of myself and the Board to provide a safe and pleasant work place with good compensation and benefits for everyone. However, our ability to continue doing this is being compromised by your work slow down. I realize that your work production records are directly affected by many extenuating circumstances and those factors are always accounted for as your work records are reviewed by myself and human resources.

As budget time approaches, please make a self evaluation of your work habits and motivations, then make the changes that you see that will be fair to yourself and the city.

Thank you

Mayor John Gwaltney

Monetary penalties have proven to be quite popular in state legislatures and in criminal legal institutions. Fines are seen both as a legitimate deterrent to wrongdoing and a means of transferring the costs of criminal justice administration (courts, police, prisons, etc.) to those accused of breaking the law, costs that would otherwise fall on ostensibly law-abiding taxpayers. In addition, unlike prison, fines do not keep the defendant out of the workforce.

Traffic stops can provide a politically expedient mechanism to generate revenue. Administrative fees allow state and local legislators to get around tough rules limiting local tax increases. Fines and administrative fees therefore provide a path to budgetary relief with limited legislative or court oversight. Much of this is administrative (as opposed to statutory) rule-making, a tax that is not called a tax.

Recent studies, such as the DOJ Ferguson Report (DOJ, 2015), are supportive of this instrumental motivation for police to pursue traffic stops: maximizing revenue to police agencies to sustain or expand police budgets. Police departments are often encouraged to maintain this revenue source at the expected level, and local executives have even reminded police departments that these revenues directly affect officers' pay. For example, in Figure 1 we include an infamous memo by Mayor John Gwaltney of Edmundson, Missouri, encouraging the local police department to write more tickets.

The Ferguson Report (2015) illustrates how this revenue-generating regime disproportionately penetrates communities with high proportions of people of color. Disparate racial treatment at each stage of processing in Ferguson skews the criminal justice "tax" toward minorities, whose economic position often is more tenuous than that of their white counterparts (Parker et al., 2010). The case of Ferguson is part of the broader geography of racial targeting in the aggressiveness of policing (Geller et al., 2014; Fagan and Ash, 2017).

In cases like Ferguson, we see how the seemingly minor instance of a traffic citation

can extend to far greater impacts. Traffic stops lead to tickets and fines, and the inability to pay those fines can lead to criminal arrests. Once arrested, the inability to post bail raises issues both before and after adjudication. Defendants charged with minor misdemeanors or outstanding warrants may have difficulty retaining counsel if required to pay a fee to establish indigency. The assignment of counsel may be delayed during the scramble to post bond between arrest and first appearance. The risk of fee default at that stage, which leads to pretrial delay or (worse) pretrial detention, leads to the risk of an adverse court outcome in terms of charging and sentencing. Failure to pay fees (which, as we said, can be seen as taxes) can prejudice court outcomes and impose related burdens, including further monetary fines and criminal convictions. In effect, these regimes require defendants to pay fees and costs for the very court processes that lead to their punishment.

The use of arrest- or ticketing-generated revenues to offset budget shortfalls is hardly confined to Missouri. For example, Garrett and Wagner (2009) found that police in North Carolina issued more tickets after local revenue shortfalls, and Rowe (2010) found that discrimination against out-of-town drivers in traffic enforcement by police in Massachusetts is motivated by revenue shortfalls. Baicker and Jacobson (2007) showed that laws permitting police seizures of money incentivized police to increase drug arrest activities, leading to a tug-of-war betwen police and local public finance authorities. Surveying this literature, the Council of Economic Advisers (2015) concluded that "[i]ncreases in criminal justice spending have put a strain on local criminal justice budgets and led to the broader use of fine[s], penalties, and itemized criminal justice fees in an effort to support budgets."

Revenue generation is one of several domains where criminal justice agents increase enforcement of criminal laws in response to incentives, and where race may figure into that stepped-up enforcement. For example, Gordon and Huber (2007) showed that

when trial judges are up for election, they issue harsher criminal sentences, and Berdejo and Yuchtman (2013) showed that criminal sentences are 10% longer as judges approach the end of their electoral cycle. Park (2014) found that this electoral-pressure effect is disproportionately focused among black defendants. Relatedly, Kubik and Moran (2003) showed that states are approximately 25% more likely to conduct executions in gubernatorial election years than in other years, and that there is a larger effect on the probability that an African-American defendant will be executed than on the probability that a white defendant will be executed.

This paper aims to identify whether traffic police, like judges (Park, 2014) and governors (Kubik and Moran, 2003), become more disciminatory in response to stronger enforcement incentives. The Ferguson Report (2015) found evidence of fiscal enforcement motives within the courts, city government, and the police in particular. But why apply enforcement pressure disproportionately to racial minorities, whose economic position may make them less able and less likely to pay? In a standard model of policing, race should not matter and one would expect no effect of budget stress on racial disparity in traffic stops. In a political economy model where a local politician can allocate ticketing efforts across identifiable racial groups, one might expect budget stress to increase racial disparity of ticketing as a political strategy to increase taxes imposed on an electoral minority. On the other hand, if an identifiable racial group has a lower propensity of actually paying tickets (due to lower average incomes, for example), one might expect greater allocation of ticketing effort to the higher-income group due to a higher marginal return on ticketing effort. In that model, one might see the pattern of discrimination (against people of color) in traffic stops to reverse, such that police write citations more often to white motorists (who have higher ability-to-pay on average). Because there are many factors that could influence this relationship, empirical evidence is needed to determine the average effect.

3 Data

The paper merges two main datasets for the analysis. The first is the local government finances data for Missouri, from which we construct a measure of budget distress. The second is the agency-level traffic stops data, used to construct measures of traffic enforcement effort across races. There are 769 agencies in the sample, for which we have 13 years of annual panel data from 2000 through 2012. We also include a variety of municpal- and county-level Census demographic measures.

The data on local government financial accounts come from the IndFin local government finances census dataset. This is a survey of all local governments administered every five years; if the localities do not provide previous years' data, those values are imputed by Bureau of Census statisticians. This induces measurement error but should not bias the estimates away from zero in either direction. The survey includes items on revenues, expenditures, assets, and liabilities. The data are matched to municipality governments (police departments) and county governments (sheriff's departments). Our preferred measure of local budgetary distress is based on Garrett and Wagner (2009). We have the log government revenue for agency i at year t, G_{it}. Our measure of fiscal health at year t is the proportional change in log revenue for the *previous* year, ΔG_{it-1}. This is meant to summarize the idea that there is a shortfall that is realized at the end of the year, which the government may try to make up for the next year through increased ticketing.

The data on traffic stops come from the Missouri Attorney General's Racial Profiling database. This is an annual survey of policing agencies that includes a distribution across race and ethnicity for all traffic policing actions. Missouri has been collecting statewide incident-level data on police traffic stops since 2001. Figure 2 shows the form that agencies have to fill out for every traffic stop. We have access to aggregate data, by

Figure 2: Vehicle Stop Information Form for Racial Profiling Database

VEHICLE STOP INFORMATION

DATE | | | | TIME | ○ AM ○ PM
MM   DD   YY

1 VIOLATION RESULTING IN STOP (✔ all that apply)
☐ MOVING ☐ EQUIPMENT ☐ LICENSE ☐ INVESTIGATIVE
If a "moving" violation, (✔ category of violation)
☐ SPEED ☐ LANE VIOLATION ☐ FOLLOW TOO CLOSE
☐ CVE ☐ FAIL TO SIGNAL ☐ OTHER MOVING VIOLATION

2 RESULT OF STOP (✔ all that apply)
☐ CITATION ☐ WARNING ☐ NO ACTION ☐ OTHER

3 DRIVER'S RACE/MINORITY STATUS (based **only** on visual observation)
☐ WHITE ☐ BLACK/AFRICAN-AMERICAN ☐ HISPANIC/LATINO
☐ AMERICAN INDIAN/ALASKA NATIVE ☐ ASIAN ☐ OTHER/UNKNOWN

4 DRIVER'S AGE ☐ UNDER 18 ☐ 18-29 ☐ 30-39 ☐ 40+

5 DRIVER'S GENDER ☐ MALE ☐ FEMALE

6 LOCATION OF STOP
☐ INTERSTATE HIGHWAY ☐ U.S. HIGHWAY ☐ STATE HIGHWAY
☐ COUNTY ROAD ☐ CITY STREET ☐ OTHER

7 WAS A SEARCH INITIATED? ☐ YES ☐ NO
If YES, probable cause/authority for search (✔ all that apply)
☐ CONSENT ☐ INVENTORY ☐ DRUG/ALCOHOL ODOR
☐ INCIDENT TO ARREST ☐ PLAIN VIEW CONTRABAND ☐ OTHER
☐ DRUG DOG ALERT ☐ REASONABLE SUSPICION-WEAPON (TERRY STOP)

8 WHAT WAS SEARCHED?
☐ DRIVER ONLY ☐ PROPERTY ONLY ☐ DRIVER AND PROPERTY

9 DURATION OF SEARCH
☐ 0-15 MINUTES ☐ 16-30 MIN. ☐ 31+ MIN.

10 WAS CONTRABAND DISCOVERED? ☐ YES ☐ NO
If YES, type of contraband (✔ all that apply)
☐ DRUGS/ALCOHOL/PARAPHERNALIA ☐ CURRENCY
☐ WEAPON ☐ STOLEN PROPERTY ☐ OTHER

11 WAS DRIVER ARRESTED? ☐ YES ☐ NO

12 IF ARREST MADE, CRIME/VIOLATION ALLEGED (✔ all that apply)
☐ OUTSTANDING WARRANT ☐ OFFENSE AGAINST PERSON
☐ RESISTING ARREST ☐ DRUG VIOLATION ☐ DWI/BAC
☐ PROPERTY CRIME ☐ TRAFFIC VIOLATION ☐ OTHER

Revised September 2004

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agency and the race/ethnicity of the person stopped, for the years 2001 through 2013, and use the years 2001 through 2012. Hernández-Murillo and Knowles (2004), Rojek et al. (2004), and Rosenfeld et al. (2011) all have used these data to analyze aggregate racial disparities in traffic stops at different points in time.

The merged traffic stop and finance data include over 700 of Missouri's counties and cities, while smaller municipalities, such as villages, are not included. We do not include these smaller municipalities, because they are difficult to merge with finance data (they may be less likely to respond to the IndFin survey, municipality names were less consistent for these locations, and quite a few municipalities cross county borders). However, these smaller municipalities have far fewer traffic stops than those included in the dataset, and they also typically have populations that are much less diverse. The local finance data are available for most of the sheriff and police departments in the dataset for the years 2002, 2007, and 2012 when the IndFin survey was conducted, with more departments responding in 2007 and 2012 than in 2002. In non-survey years, we have finance data for fewer departments, including thirty-one percent of three thousand sheriff's departments and seventeen percent of four thousand police departments.

Finally, we collected and merged in a range of demographic variables from the Census, matchable to county or municipality. We use the 2000 census as these data are only available every ten years. We use these as controls, interacted with year, and we also use them in heterogeneity analysis, as seen below.

We focus on four outcome variables constructed from this racial profiling data. First, we compute the **citation rate,** which is the number of citations issued by agency i to drivers of race r during year t, divided by the number of total traffic stops by agency i of drivers of race r during year t. Similarly, the **search rate** is the number of searches divided by the number of stops. The **hit rate** is the number of contraband discoveries divided by the number of searches. The **arrest rate** is the number of arrests divided

by the number of stops. Summary statistics for these measures, by race, are reported in Table 1.

There are few differences by race or ethnicity in the citation rate. However, search rates are significantly higher for black and Hispanic motorists. The hit rate is highest for whites, suggesting preferential treatment for whites in searches on average (e.g. Hernández-Murillo and Knowles, 2004). To assess the statistical significance of these baseline differences, we estimate the following multivariate regression:

$$Y_{irt} = \alpha_{it} + \gamma_0 \text{Black}_{irt} + \gamma_1 \text{Hispanic}_{irt} + X'_{irt}\beta_{it} + \epsilon_{irt} \qquad (1)$$

where α_{it} is an agency-year fixed effect, Black_{irt} is a dummy variable equaling one for black drivers, and Hispanic_{irt} is a dummy variable equaling one for hispanic drivers. We run this regression for black, Hispanic, and white drivers, so γ_0 and γ_1 give the average differences of blacks and Hispanics from whites, after residualizing out the fixed effects and controls.

We have access to a range of covariates, represented in X_{irt}, which again are aggregated by race. For demographics, we have age (proportion of drivers in bins 18-29, 30-39, and 40+) and gender (proportion male). We have the location (city-street, county road, interstate, state highway, U.S. highway) of the stop, reason for the stop (ex: moving violation), and the authority given for a search (consent, drug/alcohol odor, drug dog alert, incident to arrest, inventory, plain view, or reasonable suspicion). We also include the reason for arrest – drug violation, driving while intoxicated, assault, outstanding warrant, property crime, resisting arrest, and traffic violation.

The results from estimating Equation (1) are reported in Table 2. Black drivers do not differ from white drivers in the citation rate, but Hispanics are cited at a significantly higher rate. Both blacks and Hispanics are searched at a higher rate, with lower

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Table 1: Summary Statistics on Stop Outcomes by Race

Race		Counts (by Agency-Year)					Rates			
		Stops	Citations	Searches	Hits	Arrests	Citation	Search	Hit	Arrest
Asian	Mean	20.252	12.477	.638	.098	.421	.47758	.04141	.16249	.02991
	S.D.	113.435	77.607	4.19	.683	2.449	.40513	.13085	.32547	.11145
Black	Mean	370.198	243.65	42.278	7.482	30.927	.4649	.11049	.2235	.08258
	S.D.	2512.05	1622.92	291.431	51.49	213.47	.3274	.14343	.2962	.13253
Hispanic	Mean	46.7598	29.767	6.098	.9004	4.209	.4984	.13605	.1685	.0960
	S.D.	346.630	250.81	36.629	5.703	25.63	.3492	.188554	.27531	.1636
Native American	Mean	2.31014	1.227	.1898	.043	.129	.4897	.09361	.2306	.070403
	S.D.	13.8205	8.0881	1.169	.352	.869	.4471	.22918	.38566	.20051
White	Mean	1798.05	1023.13	117.293	27.083	80.55	.4635	.0796	.27893	.05428
	S.D.	12252.96	7723.77	610.852	154.453	453.08	.2733	.082901	.2285	.072318
Other	Mean	16.989	9.858	.781	.1425	.459	.47397	.0622	.19780	.04267
	S.D.	106.65	74.457	4.672	.8924	2.714	.3848	.1599	.3398	.13552
Total (All Races)	Mean	2144.987	1253.507	158.8789	33.8649	96.18069				
	S.D.	14068.95	9069.148	822.0107	189.0172	561.3441				

Table 2: Racial Differences in Stop Outcomes: Regression Estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Citation Rate		Search Rate		Hit Rate		Arrest Rate	
Black Driver	-0.00688	0.00435	0.0297**	0.0394**	-0.0343**	-0.0220**	0.0274**	0.0337**
	(0.00456)	(0.00495)	(0.00264)	(0.00242)	(0.00649)	(0.00781)	(0.00238)	(0.00213)
Hispanic Driver	0.0239**	0.0351**	0.0549**	0.0582**	-0.0894**	-0.0739**	0.0400**	0.0453**
	(0.00634)	(0.00766)	(0.00361)	(0.00350)	(0.00647)	(0.00867)	(0.00337)	(0.00322)
Agency-Year FE's	X	X	X	X	X	X	X	X
Demographics		X		X		X		X
Stop Reasons		X		X		X		X
Search Reasons				X		X		
Arrest Reasons								X
N	22751	16327	22769	16268	16695	12126	19448	16249
Adj. R^2	0.615	0.636	0.269	0.661	0.301	0.296	0.287	0.656

Notes. Observation is an agency-race-year, where whites, blacks, and hispanics are included. Standard errors in parentheses, clustered by agency. + $p<0.10$, * $p<0.05$, ** $p<0.01$.

contraband hit rates, than whites. Both blacks and Hispanics are arrested at higher rates than whites. In particular, the lower rate of unproductive searches for whites (Columns 5 and 6) suggests that police are more careful and selective in searching white motorists compared to non-white drivers (e.g. Hernández-Murillo and Knowles, 2004).

4   Empirical Strategy

This section describes the approach for analyzing the relationship between local budget stress and discriminatory policing. The research design is based on that employed by Garrett and Wagner (2009), who found, using data from 1990 through 2003, that North Carolina municipalities with negative budget shocks responded by issuing more traffic tickets. The main goal is to measure disparate racial impacts of budget response by policing agencies.

We estimate the racial disparity in the change in enforcement outcome Y_{it} (e.g., the citation rate) for agency i, race r, and year t using

$$\Delta Y_{irt} = \alpha_{ir} + \alpha_{rt} + \rho D_{it} + \rho_r R_r D_{it} + X'_{irt}\beta + \epsilon_{irt} \tag{2}$$

where α_{it} is an agency-race interacted fixed effect, α_{rt} is a race-year interacted fixed effect, and ϵ_{irt} is an error term. We cluster standard errors by policing agency to allow for serial correlation across time in the agencies.

The treatment variable D_{it} is a measure for fiscal distress, defined as the negative change in revenue for the previous year in jurisdiction i. This is our preferred measure of local budgetary distress, based on Garrett and Wagner (2009). We expect, based on the previous paper, that $\hat{\rho} > 0$ for revenue-relevant enforcement actions; that is, fiscal

distresss (lower revenue growth) should be associated with higher growth in citations. The identification assumption for unbiased OLS estimates of ρ is that D_{it} is uncorrelated with other unobserved factors affecting traffic tickets in period t, conditional on the fixed effects. This may be a strong assumption if last year's budget conditions influence other socioeconomic and/or political factors this year that in turn affect traffic ticketing. An example of this type of factor would be decreases in expenditures on traffic lights and road signs, which may reduce ticketing.

The term R_r is a dummy variable for the comparison race, and the term ρ_r gives the differential impact of lagged fiscal distress on race r. If local governments in budgetary distress seek to impose a larger share of taxes on members of racial minority groups, that would be consistent with $\hat{\rho}_r > 0$ for $r \in \{Black, Hispanic\}$. If instead local governments focus less enforcement on minorities due to their lower income in response to budget distress, that would be consistent with $\hat{\rho}_r < 0$ for $r \in \{Black, Hispanic\}$.

5 Results

This section reports our results. We look at a range of outcomes discussed in Section 3. We provide regression estimates for ρ and ρ_r in Equation (2) from Section 4. We report a number of specification checks, and then look at heterogeneous effects based on the characteristics of the jurisdictions.

The first regression estimates are reported in Table 3. We look at four outcomes: citation rate, search rate, hit rate, and arrest rate, defined in Section 3. The tables include our baseline specifications (with agency-race and race-year fixed effects) in Columns 1, 3, 5, and 7. The other columns (2, 4, 6, 8) include a number of stop-related covariates for the demographics of drivers arrested, and the reasons for stops, searches, and arrests, which may be correlated with driver race and subsequent outcomes.

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Table 3: Effect of Budget Conditions on Enforcement Rates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Δ Citation Rate		Δ Search Rate		Δ Hit Rate		Δ Arrest Rate	
Fiscal Distress	0.0548*	0.0481*	0.0305*	0.00790	0.00239	-0.00230	0.0347*	0.0215*
	(0.0226)	(0.0239)	(0.0153)	(0.0134)	(0.0341)	(0.0386)	(0.0133)	(0.0106)
×Black Driver	-0.0693+	-0.0724	-0.0446	-0.0145	0.0107	-0.0181	-0.0689	-0.0400
	(0.0391)	(0.0449)	(0.0395)	(0.0332)	(0.0729)	(0.0804)	(0.0444)	(0.0298)
×Hispanic Driver	-0.0514	-0.0378	0.0706	0.0799**	0.0175	0.00506	0.0371	0.0153
	(0.0455)	(0.0490)	(0.0511)	(0.0300)	(0.0768)	(0.0795)	(0.0386)	(0.0284)
Agency-Race FE's	X	X	X	X	X	X	X	X
Race-Year FE's	X	X	X	X	X	X	X	X
Demographics		X		X		X		X
Stop Reasons		X		X		X		X
Search Reasons				X		X		
Arrest Reasons								X
N	3374	2866	3377	2863	3022	2569	2624	2617
R^2	0.165	0.267	0.140	0.247	0.167	0.218	0.149	0.221

Notes. Observation is an agency-race-year, where whites, blacks, and hispanics are included. Standard errors in parentheses, clustered by agency. $+$ p$<$0.10, * p$<$0.05, ** p$<$0.01.

We find, first, that a decrease in government revenue growth the previous year is associated with a higher citation rate, but only for white drivers (Columns 1 and 2). The coefficients for the interactions on black driver and hispanic driver are about as large as the baseline coefficient for white drivers. There is a small effect on the search rate, and a large and significant effect on the arrest rate. There is no significant effect on the hit rate. Adding detailed controls on the stop features does not change the major features of the results.[1]

In Table 4 we look at the change in counts, rather than rates, to see what components of our variables are changing in response to the budget distress. First, we check whether it is driven by changes in total stops (versus changes in total citations, for example). We can see from Columns (1) and (2) that the results are not driven by change in total stops, which does not change in response to fiscal distress. The coefficients for number of citations, searches, search hits, and arrests are all positive, but significant only for arrests. Meanwhile, the interacted negative effect on citations for black drivers is negative and significant. Overall, the effects on counts substantiate the main finding that fiscal distress changes the number of citations assigned to and number of arrrests of white drivers, while not affecting the total number of traffic stops.

Next, in Table 5 we further probe the results for citation rates. First, we look at the races separately. We see that there is a positive relationship between fiscal distress and citation rate for white drivers (Column 1), but none for black (Column 2) and Hispanic (Column 3) drivers. The effect for whites alone (Column 4), and the three-race interacted effect (Column 5), are robust to adding a set of pre-treatment census demographic controls (total population, percent white, percent urban, and percent over 65), interacted with a full set of dummies for each year in our data. In response

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[1]Note that adding controls changes the sample size because this information is missing for some jurisdictions. The results do not change when limiting to the jurisdictions for which we have this information.

Table 4: Effect of Budget Conditions on Enforcement Counts

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Δ Log Total Stops		Δ Log Citations		Δ Log Searches		Δ Log Search Hits		Δ Log Arrests	
Fiscal Distress	-0.0674	-0.0441	0.143	0.220	0.214	0.164	0.129	0.168	0.521**	0.429**
	(0.112)	(0.116)	(0.136)	(0.150)	(0.176)	(0.164)	(0.167)	(0.194)	(0.178)	(0.164)
×Black Driver	-0.140	-0.0193	-0.381*	-0.405*	-0.308+	-0.156	-0.268	-0.417	-0.358+	-0.171
	(0.121)	(0.126)	(0.150)	(0.185)	(0.160)	(0.165)	(0.223)	(0.258)	(0.212)	(0.191)
×Hispanic Driver	0.0421	-0.0112	-0.115	-0.268	0.0669	-0.00784	0.0513	-0.147	-0.127	-0.198
	(0.162)	(0.159)	(0.186)	(0.216)	(0.229)	(0.234)	(0.249)	(0.280)	(0.256)	(0.262)
Agency-Race FE's	X	X	X	X	X	X	X	X	X	X
Race-Year FE's	X	X	X	X	X	X	X	X	X	X
Demographics		X		X		X		X		X
Stop Reasons		X		X		X		X		X
Search Reasons						X		X		
Arrest Reasons										X
N	3364	2855	3343	2837	3345	2834	3329	2831	2623	2616
R^2	0.132	0.218	0.132	0.225	0.099	0.324	0.096	0.194	0.110	0.271

Notes. Observation is an agency-race-year, where whites, blacks, and hispanics are included. Standard errors in parentheses, clustered by agency. + p<0.10, * p<0.05, ** p<0.01.

Table 5: Robustness Checks: Effect of Budget Conditions on Citation Rates

	(1)	(2)	(3)	(4)	(5)
	Effect on Δ Log Citation Rate				
Fiscal Distress	0.0458+	-0.0232	-0.0006	0.0516*	0.0539*
	(0.0244)	(0.0405)	(0.0516)	(0.0223)	(0.0210)
×Black Driver					-0.0815*
					(0.0403)
×Hispanic Driver					-0.0475
					(0.0448)
Sample	Whites	Blacks	Hispanics	Whites	All
Agency-Race FE's	X	X	X	X	X
Race-Year FE's	X	X	X	X	X
Demographics	X	X	X	X	X
Stop Reasons	X	X	X	X	X
Census X Year FE's				X	X
N	1009	940	916	952	2729
R^2	0.264	0.308	0.219	0.286	0.215

Notes. Observation is an agency-race-year, where whites, blacks, and hispanics are included. Standard errors in parentheses, clustered by agency. + p<0.10, * p<0.05, ** p<0.01.

Table 6: Robustness Checks: Effect of Budget Conditions on Arrest Rates

	(1)	(2)	(3)	(4)	(5)
	Effect on Δ Log Arrest Rate				
Fiscal Distress	0.0223*	-0.00873	0.0311	0.0215*	0.0196*
	(0.00954)	(0.0234)	(0.0255)	(0.00888)	(0.00961)
$\times$ Black Driver					-0.0416
					(0.0277)
$\times$ Hispanic Driver					0.0153
					(0.0254)
Sample	Whites	Blacks	Hispanics	Whites	All
Agency-Year FE's	X	X	X	X	X
Race-Year FE's	X	X	X	X	X
Demographics	X	X	X	X	X
Stop Reasons	X	X	X	X	X
Census X Year FE's				X	X
N	920	856	840	892	2552
R^2	0.577	0.568	0.517	0.514	0.506

Notes. Observation is an agency-race-year, where whites, blacks, and hispanics are included. Standard errors in parentheses, clustered by agency. + p<0.10, * p<0.05, ** p<0.01.

to budget shortfalls, whites are getting more tickets, but not blacks and Hispanics.

Table 6 includes similar robustness checks for arrest rates. Again, we see a positive effect for whites, but no effect for black and Hispanic drivers. These coefficients are robust to the full set of census covariates interacted with each year in the data. Overall, these results support the view that in response to budget stress, Missouri police are arresting white drivers more often.

Table 7 presents the results from our first heterogeneity analysis. One might wonder whether the effects of fiscal distress are concentrated in rural or urban areas, or whether they are concentrated in areas with relatively high racial minority populations. To make these categories, we divided at the median values of urban density and racial makeup.

Table 7: Heterogeneity by Urban Density and Race Makeup

	(1) Δ Citation Rate	(2) Δ Citation Rate	(3) Δ Arrest Rate	(4) Δ Arrest Rate	(5) Δ Citation Rate	(6) Δ Citation Rate	(7) Δ Arrest Rate	(8) Δ Arrest Rate
Fiscal Distress	0.0985*	0.0148	0.0360	0.0180*	0.0707*	0.0444+	0.0450*	0.00879
	(0.0466)	(0.0191)	(0.0221)	(0.00762)	(0.0326)	(0.0248)	(0.0187)	(0.0123)
×Black Driver	-0.156+	-0.0320	-0.105+	-0.0138	0.00105	-0.0996*	-0.0121	-0.0442
	(0.0871)	(0.0381)	(0.0581)	(0.0243)	(0.0762)	(0.0498)	(0.0440)	(0.0283)
×Hispanic Driver	-0.113	-0.00709	0.0471	-0.0143	-0.0446	-0.0454	-0.0455	0.0189
	(0.0952)	(0.0457)	(0.0491)	(0.0265)	(0.116)	(0.0479)	(0.0580)	(0.0218)
Sample	Rural	Urban	Rural	Urban	<2% Black	>2% Black	<2% Black	>2% Black
Agency-Race FE's	X	X	X	X	X	X	X	X
Race-Year FE's	X	X	X	X	X	X	X	X
Demographics	X	X	X	X	X	X	X	X
Stop Reasons	X	X	X	X	X	X	X	X
Arrest Reasons			X	X			X	X
N	790	1995	720	1885	702	2083	669	1936
R^2	0.285	0.223	0.596	0.508	0.327	0.198	0.602	0.476

Notes. Observation is an agency-race-year, where whites, blacks, and hispanics are included. Standard errors in parentheses, clustered by agency. + p<0.10, * p<0.05, ** p<0.01.

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Overall, we do not see major differences across rual and urban communities. However, the racial difference in effects of fiscal distress on citation rates is focused in areas with larger black populations. This likely reflects that there are a greater number of black residents and therefore more variation to drive the effect.

Finally, Table 8 considers the importance of the white-black income ratio. We see that with respect to citation rates, the decrease for blacks as fiscal distress grows is highest and statistically significant when the white-black income ratio is highest (Columns 3 and 4). Similarly, the effect on arrests for whites is highest when there is a high white-black income ratio (Columns 7 and 8), and the interacted effect with the black indicator has a larger coefficient that is almost statistically significant ($p = .118$ for Column 8).

These results provide additional evidence of discrimination toward white drivers due to a revenue motive. When white residents have relatively high incomes, they have a relatively high ability to pay tickets and the court fees related to arrests. Given constraints on the total number of traffic stops that can be made, police agencies under fiscal distress re-allocate citations and arrests to these high-income drivers.

6   Conclusion

The broad contribution of this project is the identification of some of the ways in which local governments may be supporting discrimination and inequality by connecting their policing practices with budgetary policies. While there is evidence of the relationship between local budget policies and police law enforcement practices along with much evidence of racial discrimination in policing, this paper is the first to show the connection between these processes. We find that in response to budget distress, there is greater enforcement activity (ticketing and arrests) for white drivers, but not for non-

Table 8: Heterogeneity by White-Black Income Ratio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Δ Citation Rate				Δ Arrest Rate		
Fiscal Distress	0.0662*	0.0488	0.0461+	0.0441	0.0183	0.00105	0.0506**	0.0303+
	(0.0330)	(0.0333)	(0.0255)	(0.0280)	(0.0171)	(0.0158)	(0.0168)	(0.0159)
×Black Driver	-0.0695	-0.0732	-0.0818+	-0.105*	-0.0552	-0.0217	-0.0969	-0.0762
	(0.0588)	(0.0635)	(0.0420)	(0.0468)	(0.0412)	(0.0336)	(0.0725)	(0.0482)
×Hispanic Driver	-0.136*	-0.0657	0.0137	0.00453	0.0412	-0.0135	0.0338	0.0338
	(0.0658)	(0.0637)	(0.0531)	(0.0648)	(0.0475)	(0.0283)	(0.0483)	(0.0408)

Sample	Low W-B Ratio		High W-B Ratio		Low W-B Ratio		High W-B Ratio	
Agency-Race FE's	X	X	X	X	X	X	X	X
Race-Year FE's	X	X	X	X	X	X	X	X
Demographics	X	X	X	X	X	X	X	X
Stop Reasons	X	X	X	X	X	X	X	X
Arrest Reasons					X	X	X	X
Census X Year FE's		X		X		X		X
N	1513	1274	1848	1455	1195	1193	1417	1359
R^2	0.135	0.336	0.127	0.215	0.067	0.560	0.124	0.528

Notes. Observation is an agency-race-year, where whites, blacks, and hispanics are included. Standard errors in parentheses, clustered by agency. + p<0.10, * p<0.05, ** p<0.01.

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white drivers. This result differs from Park (2014), where judges responded to stronger enforcement incentives to administer punishment with greater discrimination: blacks were more likely to pay a racial punishment tax under pressure-incentive conditions than were whites (see Kennedy, 1998).

There could be many mechanisms underlying the effect uncovered here. One simple explanation is that police are aware of white drivers' greater ability to pay traffic tickets. When higher revenue is necessary, and with a limited amount of time for making stops, there is greater targeting of white drivers. Consistent with this idea, we find that the racial differences in enforcement effects is highest in areas where there is a large white-to-black income ratio.

Future work can shed further light on the factors contributing to this relatinoshiop. Understanding how budget factors affect police discrimination may elicit institutional policies for reducing discrimination. The broader social consequences of these processes are also uncertain. For example, in future work one could see if these racially disparate budget effects have a subsequent impact on crime. The findings presented here highlight the complex relationship between local budgets, policing, and race as well as much that remains to be studied.

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A   Appendix

Table 9: Demographics of Agencies with and without Finance Data

| | Mean Total Population | | Mean Pct. White | |
Year	Finance Data	No Finance Data	Finance Data	No Finance Data
2000	42320.09	2986.71	90.09	91.06
2012	72116.08	5011.89	81.51	93.13