USING TERROR ALERT LEVELS TO ESTIMATE THE EFFECT OF POLICE ON CRIME*

JONATHAN KLICK *and* *ALEXANDER TABARROK*
Florida State University *George Mason University*

Abstract

Changes in the terror alert level set by the Department of Homeland Security provide a shock to police presence in Washington, D.C. Using daily crime data during the period the terror alert system has been in place, we show that the level of crime decreases significantly, both statistically and economically, in Washington, D.C., during high-alert periods. The decrease in the level of crime is especially large in the National Mall. This provides strong evidence of the causal effect of police on the level of crime and suggests a research strategy that can be used in other cities.

I. Introduction

Do police deter crime? A majority of studies surveyed found that either there is no relationship or increases in the number of police are associated with increases in the level of crime.[1] Most economists are suspicious of these results. It is no surprise to find that places with an inordinate amount of crime tend to employ a large police force. Nor is it unreasonable to suspect that jurisdictions increase the size of their police forces when they witness or expect an increase in the level of crime. Thus, neither cross-sectional nor time-series analyses can credibly identify a causal effect of police on crime. But crime and crime fighting cost Americans hundreds of billion of dollars every year. Expenditures on police alone, for example, are over $65 billion a year.[2] The enormous expenditure on policing makes breaking the endogeneity circle more than a mere academic puzzle. Isolating a causal rela-

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[1] For the survey, see Samuel Cameron, The Economics of Crime Deterrence: A Survey of Theory and Evidence, 41 Kyklos 301, 323 (1988).

[2] See Sidra Lea Gifford, Justice Expenditure and Employment in the United States, 1999 (Bur. Just. Stat. Bull. No. NCJ 191746, February 2002) (http://www.ojp.usdoj.gov/bjs/pub/pdf/jeeus99.pdf).

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tionship between increases in the number of police and reductions in the level of crime has large policy consequences.[3]

II. Terror Alerts as Shocks to Police Presence

In a seminal paper, Steven Levitt showed how the circle could be broken
q1 by identifying variations in police presence that were not caused by variations in crime.[4] He found that police presence increased in mayoral and gubernatorial election years but not in off-election years. Since crime is unlikely to be correlated with election timing, this identification strategy can, in principle, break the circle. However, this strategy proved to be problematic in practice. Variations in police presence brought on by electoral cycles are not large, and variations in other factors impede precise estimation. Although Levitt initially did estimate a significant deterrent effect, Justin McCrary later showed that a programming error made Levitt's results appear more precise than justified. McCrary concluded, "In the absence of stronger research designs, or perhaps heroic data collection, a precise estimate of the causal effect
q2 of police on crime will remain at large."[5]

We claim that a stronger research design than that used in the past and a new data source let us better estimate the causal effect of police on crime. On March 11, 2002, the Office of Homeland Security introduced the Homeland Security Advisory System (HSAS) to inform the public and other government agencies about the risk of terrorist attacks. During high-alert times, the police increase their presence on the streets of Washington, D.C. We use the high-alert periods to break the circle of endogeneity to estimate the effect of police on crime.

In addition to a stronger research design than that used in the past, we also improve on the data. Most previous studies use annual data. Annual data are subject to an inherent trade-off—a longer time series improves the precision of estimates but increases the possibility of omitted-variable bias.

[3] It is interesting to note that combining police ($65 billion), judicial ($35 billion), and correction expenditures ($49 billion) gives a total direct spending on criminal justice of $149 billion—more than a quarter of that spent on elementary and secondary schooling ($433 billion as of 2001). Yet there are many more papers on the return to education than on the return to policing.

[4] Steven D. Levitt, Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime, 87 Am. Econ. Rev. 270 (1997). For other notable attempts to break the endogeneity circle, see Thomas Marvell & Carlisle Moody, Police Levels, Crime Rates, and Specification Problems, 34 Criminology 609 (1996); Hope Corman & H. Naci Mocan, A Time-Series Analysis of Crime, Deterrence, and Drug Abuse in New York City, 90 Am. Econ. Rev. 584 (2000); and Steven D. Levitt, Using Electoral Cycles in Police Hiring to Estimate the Effects of Police on Crime: Reply, 92 Am. Econ. Rev. 1244 (2002).

[5] Levitt, Reply, *supra* note 4, concedes the errors identified in Justin McCrary, Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime: Comment, 92 Am. Econ. Rev. 1236 (2002). However, Levitt's study provides estimates using the number of municipal workers and firefighters as instruments to show that there is a statistically significant negative effect of police on crime.

Panel data reduce the need for a long time series but raise the problem of endogeneity and omitted-variable bias in the cross-sectional component.[6] We use daily crime data from a single city, Washington, D.C., for our analysis. Daily data are less subject to endogeneity problems from crime to police. Also, our focus on a single city reduces omitted-variable bias in the cross-sectional component.

Our paper is most closely related to that by Rafael Di Tella and Ernesto Schargrodsky.[7] A terrorist attack on the main Jewish center in Buenos Aires in July 1994 led to increased police presence on blocks with Jewish and Muslim institutions (mosques, synagogues, schools, and so forth). Di Tella and Schargrodsky found that auto theft declined by 75 percent on protected blocks but that little or no changes were observed one or two blocks distant. Like them, we take advantage of presumably exogenous shocks to police presence and the fact that these shocks may have different impacts across space and time. Our research design differs in two important respects, however. First, Di Tella and Schargrodsky observe only one precipitating event, the attack in July 1994. During our sampling period, however, the terror alert level rose and fell four times, so we have events that turn on and off repeatedly—this is an important virtue in that it reduces the possibility of spurious correlation. Second, we use daily data, and the "treatment windows"—the time from the onset to the conclusion of the shocks—are short, a matter of days or weeks, thus reducing the possibility that our results are due to changes in other factors. As we note below, our results on auto thefts are quite similar to those of Di Tella and Schargrodsky, despite the different locations of the studies, thus the results are quite complementary.

III. Data and Research Design

We use daily police reports of crime from the Metropolitan Police Department of the District of Columbia (Washington, D.C). These are the same data that the police department uses for its internal decisions and statistical analysis.[8] Our data cover the time period since the alert system began, March

[6] In Edward L. Glaeser, Bruce Sacerdote, & José A. Scheinkman, Crime and Social Interactions, 111 Q. J. Econ. 507, 507 (1996), the authors write that "the most intriguing aspect of crime is its astoundingly high variance across time and space." They go on to note that economic and social conditions per se can explain only a fraction of this variance, suggesting that omitted-variable bias could easily skew results.

[7] Rafael Di Tella & Ernesto Schargrodsky, Do Police Reduce Crime? Estimates Using the Allocation of Police Forces after a Terrorist Attack, 94 Am. Econ. Rev. 115 (2004).

[8] The Metropolitan Police Department's (MPD's) internal crime data may vary somewhat from official index totals as reported to the Federal Bureau of Investigation for a variety of reasons, including late reporting and reclassification of some offenses. The MPD requires that the following disclaimer be made: "These data reflect preliminary crime reports made by individual police districts to the MPD's Central Crime Analysis Unit. These data DO NOT reflect official index crime totals as reported to the FBI's Uniform Crime Reporting Program. These data are subject to change for a variety of reasons, including late reporting, reclassification of some offenses, and the discovery that some offenses were unfounded."

TABLE 1

Crimes in Washington, D.C., by Type:
March 12, 2002–July 30, 2003 (506 Days)

Offense Category	Total	Daily Average
Assault with a deadly weapon	5,682	11.2
Arson	129	.3
Burglary	7,071	14.0
Homicide	368	.7
Robbery	5,937	11.7
Sex abuse	530	1.0
Stolen auto	12,149	24.0
Theft	10,230	20.2
Theft from auto	13,726	27.1
Total	55,882	110.4

12, 2002, to July 30, 2003. During these 506 days, there were 55,882 crimes, q3 or an average of 110 per day. Table 1 provides further details on the number of crimes during this period by crime category.

The HSAS alert system is broken into five color-coded threat conditions: low (green), guarded (blue), elevated (yellow), high (orange), and severe (red). Since its inception, the HSAS has never fallen below elevated, but, on four occasions during our time period, it has risen to high, the second highest level. The threat level was high September 10–14, 2002; February 10–27, 2003; March 17–April 16, 2003; and May 20–30, 2003.

It is important to understand that the primary purpose of the HSAS is not to advise the public. The primary purpose is to inform and coordinate the antiterrorism efforts of all federal agencies. The HSAS alert system is binding on all federal agencies (except the military), which must conform their antiterrorism efforts to the HSAS threat level. High-alert status indicates a high risk of terrorist attack. During a high-risk period, government agencies take actions such as "coordinating necessary security efforts with Federal, State and local law enforcement . . . taking additional precautions at public events . . . preparing to execute contingency procedures . . . restricting threatened facility access to essential personnel only."[9]

Although the HSAS is not binding on state and local law enforcement agencies, they are strongly encouraged to monitor the HSAS and take appropriate actions. For obvious reasons, the D.C. police are acutely aware of the threat level. During a high-alert period, the D.C. police department increases the number of patrols, increases the length of shifts in order to put more police on the street, and activates a Joint Operations Command Center, which is run by the D.C. police but also includes federal, regional, and other

[9] See Homeland Security Presidential Directive-3 (March 2002) (http://www.whitehouse.gov/news/releases/2002/03/20020312-5.html).

TABLE 2

Total Daily Crime Decreases on High-Alert Days

	(1)	(2)
High Alert	−7.316*	−6.046*
	(2.877)	(2.537)
Log(midday ridership)		17.341**
		(5.309)
R^2	.14	.17

Note.—The dependent variable is the daily total number of crimes (aggregated over type of crime and district where the crime was committed) in Washington, D.C., during the period March 12, 2002–July 30, 2003. Both regressions contain day-of-the-week fixed effects. The number of observations is 506. Robust standard errors are in parentheses.

* Significantly different from zero at the 5 percent level.

** Significantly different from zero at the 1 percent level.

local officials. In addition to increasing its physical presence, the police department increases its virtual street presence by activating a closed-circuit camera system that covers sensitive areas of the National Mall. The camera system is not permanent; it is activated only during heightened terror alert periods or during major events such as presidential inaugurations.[10]

IV. Results

The results from our most basic regression are presented in Table 2, where we regress daily D.C. crime totals against the terror alert level (1 = high, 0 = elevated) and a day-of-the-week indicator. The coefficient on the alert q4 level is statistically significant at the 5 percent level and indicates that on high-alert days, total crimes decrease by an average of seven crimes per day, or approximately 6.6 percent. We use dummy variables (not shown) for each day of the week to control for day effects (crime is highest on Fridays).

We hypothesize that the level of crime decreases on high-alert days in D.C. because of greater police presence on the streets. An alternative hypothesis is that tourism is reduced on high-alert days, and as a result, there are fewer potential victims, which leads to fewer crimes.[11] We are skeptical of the latter explanation on theoretical grounds because, holding all else equal, daily crime is unlikely to vary significantly on the basis of the number of daily visitors. The vast majority of visitors to Washington, D.C., are never

[10] The increased patrols and activation of the closed-circuit television system are discussed in an official news release (see Metropolitan Police Department, MPDC Lowers Emergency Response Level—UPDATE (February 27, 2003) (http://mpdc.dc.gov/news/news.shtm)). We discuss changes in police presence in more detail in the text further below.

[11] The premise of the argument is dubious. We spoke with people at the Washington, D.C., Convention and Tourism Corporation (which monitors hotel occupancy rates), with people in the hotel industry, and with the D.C. police and the statistician for the D.C. Metro system, and they all said that they had not noticed any reduction in tourism during high-alert periods.

the victim of a crime. Since there are far more visitors than crimes, it seems unlikely that the number of visitors constrains the number of crimes. More plausibly, the number of crimes is constrained by the number of criminals, which can be considered fixed on a daily basis.[12]

To test whether fewer visitors could explain our results, we obtained daily q5 data on public transportation (Metro) ridership.[13] The Metro data suggest a very small decrease in midday ridership on high-alert days. Specifically, while days without a high alert averaged 116,000 midday riders, that number decreased to 113,000 riders on high-alert days, a decrease of less than 3 percent. This difference in means is not statistically significant.

To investigate the effect of tourism more systematically, in column 2 of Table 2 we verify that high-alert levels are not being confounded with tourism levels by including logged midday Metro ridership directly in the regression. The coefficient on the alert level is slightly smaller, at −6.2 crimes per day. Interestingly, we find that increased Metro ridership is correlated with an increase in crime. The increase, however, is very small—a 10 percent increase in Metro ridership increases the number of crimes by only 1.7 per day on average. Thus, given that midday Metro ridership is a good proxy for tourism, changes in the number of tourists cannot explain the systematic change in crime that we estimate.[14] We offer another test of the tourism thesis below when we examine what happens to the number of burglaries (a non-tourist-based crime) during high-alert periods.

While suggestive of the effect of police on crime, our data provide more variation to exploit. Washington, D.C., is split into seven police districts. Each distinct might have its own peculiar crime pattern because of differences in geography, population density, income, and so forth. Table 3, for example, indicates that some districts have twice as many crimes per day as other districts. To control for these differences in our regressions, we include district fixed effects. More important, we make use of the fact that the White House, Congress, Smithsonian Institution, and many other prominent government agencies and public areas of Washington, D.C., are located in District 1, the National Mall area. We hypothesize that during a terror alert, most of the increased police attention will be devoted to District 1. As noted above, the

[12] To illustrate, consider the "gazelle/lion" model of crime. A large group of gazelles makes a daily trek to a watering hole. On average, there are, say, 1,000 gazelles in the group, but on any given day the group might be anywhere between, say, 800 and 1,200. The number of lions is constrained in the long run by the average number of gazelles, but on any given day the probability that a lion catches a gazelle is fixed (it is no more difficult to catch a gazelle when the herd is 800 than when the herd is 1,200). Gazelles, of course, prefer to travel in large groups to lower their individual chances of being victimized, but the number of gazelles eaten daily depends only on the number of lions and not on the number of gazelles.

[13] We also found data on monthly hotel occupancy rates; these actually increased during high-alert days, although the increase was small and not statistically significant.

[14] Note that, generally speaking, midday ridership will consist mostly of tourists instead of commuters, who ride the Metro during the rush-hour periods.

TABLE 3

CRIMES IN WASHINGTON, D.C., BY DISTRICT: MARCH 12, 2002–JULY 30, 2003 (506 Days)

District	Total	Daily Average
District 1 (National Mall)	8,653	17.1
District 2	6,578	13.0
District 3	10,019	19.8
District 4	9,159	18.1
District 5	8,096	16.0
District 6	7,843	15.5
District 7	5,465	10.8

police department can quickly increase its street presence through greater use of overtime, putting more officers on the streets instead of behind desks, and using the closed-circuit television system. It is also possible that the police department diverts resources from other districts to the National Mall. The D.C. police, however, have stated that official policy is that no regular patrols will be reduced during high-alert periods.[15] If police presence were decreased in other districts, we would expect to see higher levels of crime in other districts during high-alert periods. The analysis below, however, suggests no such effect.

The regression with district fixed effects is in Table 4. During periods of high alert, crime in the National Mall area decreases by 2.62 crimes per day. Crime also decreases in the other districts, by .571 crimes per day, but this effect is not statistically significant. Recall that on an average day, there are 17.1 crimes on the National Mall, implying a decline during high-alert days of approximately 15 percent, more than twice as large as that found for the city as a whole. Stated differently, almost one-half (43.6 percent) of the total crime decline during high-alert periods is concentrated in District 1, the National Mall area.[16]

To calculate an elasticity of crime with respect to police, we need to estimate the actual increase in police presence on the street during high-alert periods. Understandably, the D.C. police are reluctant to discuss in any detail the actions that they take during a heightened terror alert. The increased patrols and activation of the closed-circuit television system is discussed in

[15] See Metropolitan Police Department, *supra* note 10.

[16] Allowing each district to have its own High Alert coefficient produces similar results. District 1 crime decreases significantly during high-alert periods (with a coefficient of −2.3, almost the same as earlier), while the levels of crime in the other districts decrease slightly or not at all. The one exception is the level of crime in District 3, which also experiences a statistically significant crime decrease, although the decrease is smaller than in District 1 both absolutely and in percentage terms. District 3 borders District 1 and is very close to the White House, so it likely receives additional protection during high-alert days. We also find similar results when we allow each district to have its own day-of-the-week effects. Owing to limited data, it is difficult in some of these specifications to estimate standard errors.

TABLE 4

Reduction in Crime on High-Alert Days: Concentration on the National Mall

	Coefficient (Robust)	Coefficient (HAC)	Coefficient (Clustered by Alert Status and Week)
High Alert × District 1	−2.621**	−2.621*	−2.621*
	(.044)	(1.19)	(1.225)
High Alert × Other Districts	−.571	−.571	−.571
	(.455)	(.366)	(.364)
Log(midday ridership)	2.477*	2.477**	2.477**
	(.364)	(.522)	(.527)
Constant	−11.058**	−11.058	−11.058+
	(4.211)	(5.87)	(5.923)

Note.—The dependent variable is daily crime totals by district. Standard errors (in parentheses) are clustered by district. All regressions contain day-of-the-week fixed effects and district fixed effects. The number of observations is 3,542. R^2 = .28. HAC = heteroskedastic autocorrelation consistent.
+ Significantly different from zero at the 10 percent level.
* Significantly different from zero at the 5 percent level.
** Significantly different from zero at the 1 percent level.

an official news release from February 27, 2003.[17] Unofficially, we were told that during heightened alert periods, the police department switches from three 8-hour shifts a day to two 12-hour shifts, thus increasing the effective police presence by 50 percent.[18] Despite several requests, however, the D.C. police would neither confirm nor deny this exact procedure. Nevertheless, if we use take 50 percent as an approximate figure, then we estimate an elasticity of crime with respect to police presence of −15 percent/50 percent = −.3. As it turns out, this is exactly the figure estimated by Thomas Marvell and Carlisle Moody and is also consistent with a range of elasticities on different crimes from approximately .2 to .9 analyzed by Levitt, Corman and Mocan, and Di Tella and Schargrodsky.[19]

Crime may come in waves; we control for some of this using day-of-the-week effects, but there may be other sources of dependence that result in serial correlation and thus downwardly biased standard errors.[20] To address q6 this problem, the second column of Table 4 reruns the regression using hetero-

[17] See Metropolitan Police Department, *supra* note 10.

[18] With three shifts of x police, there are $3x$ police on the street per day; with two shifts, there are $2y$, assuming that $2y = 3x$ (the same number of police are allocated over the day); then $y = 3/2x$, an increase of .5.

[19] Marvell & Moody, *supra* note 4; Levitt, Reply, *supra* note 4; Corman & Mocan, *supra* note 4; Di Tella & Schargrodsky, *supra* note 7.

[20] Using Jeffrey M. Wooldridge's (Econometric Analysis of Cross Section and Panel Data (2002)) test, we cannot reject the hypothesis of no first-order serial correlation at the 5 percent level but can reject it at the 10 percent level. Serial correlation in the dependent variable will be especially important if the treatment variable is also serially correlated; this is less of a problem in this study than in most others since our treatment variable turns on and off repeatedly (see Marianne Bertrand, Esther Duflo, & Sendhil Mullainathan, How Much Should We Trust Differences-in-Differences Estimates? 119 Q. J. Econ 249 (2004), for an analysis).

skedastic autocorrelation-consistent errors (HAC, or Newey-West standard errors).[21] We continue to find a statistically significant decrease in crime in District 1 on high-alert days. An alternative procedure is to use time and district clustering.[22] The clustering approach requires a somewhat arbitrary decision of the time units on which to cluster but has the advantage that we can easily allow for different clusters in nonalert and alert periods. We cluster by week and district and allow for different clusters in alert and nonalert periods in the third column of Table 4 and continue to find statistically significant effects. Other variants produce similar results. In further regressions, we continue to use HAC errors.

We have argued that it is plausible that most of the increased police attention falls on District 1 because of the presence in that district of the White House, Congress, Supreme Court, and so forth. It is revealing to take this argument one step further and assume that all of the increased protection falls on District 1. In this case, the difference between the High Alert × q7 District One and the High Alert × Other Districts coefficients is a difference-in-difference estimator that controls for all common factors between the districts. If bad weather, for example, causes decreases in crime, a coincidental correlation with the timing of a high alert could confound our results. The difference-in-difference estimator controls for any factors such as weather, tourism, or other events that affect the districts similarly. Even after controlling for all such factors and recognizing that our assumption is too strong, we still find that crime decreases in District 1 during high-alert periods by some two crimes per day, or more than 12 percent.

V. Crime-Specific Regressions

q8 In Table 5, we break down total crime into violent and nonviolent categories. Violent crimes show no response to increased police presence on high-alert days. Among nonviolent crimes, auto theft and theft from autos show very large effects, a decline during high-alert days of 43 percent. Di Tella and Schargrodsky also find very large effects of increased police presence on auto theft, a decline of 75 percent in blocks with additional protection. Using our estimate of changes in police presence, we find an elasticity of −.86, which lies in between Levitt's estimate of −1.69 and Di Tella and Schargrodsky's estimates of −.17 to .33.[23]

The large declines in crime involving automobile thefts and thefts from automobiles support the idea that increased police presence is the driving force in reducing crime during high-alert periods because these are "street"

[21] The procedure requires choosing a maximum lag length for the number of autocorrelations. We use a lag length of six chosen "optimally" according to the benchmark rule proposed by James H. Stock & Mark W. Watson, Introduction to Econometrics (2003).

[22] As in Di Tella & Schargrodsky, *supra* note 7.

[23] *Id.;* Levitt, Reply, *supra* note 4.

TABLE 5

Reduction in Crime on High-Alert Days: Concentration among Street Crimes

		Property Crimes		
	Violent Crimes	Auto Theft and Theft from Auto	Burglary	Theft
High Alert × District 1^{+}	−.007	−2.383*	−.288^{+}	.058
	(.373)	(.714)	(.171)	(.279)
High Alert × Other Districts^{+}	−.057	−.409	−.169^{+}	.065
	(.116)	(.267)	(.090)	(.098)
Log(midday ridership)	−2.684	.527	.247^{+}	1.128**
	(1.916)	(.363)	(.137)	(.153)
Constant	−.007	2.319	−1.284	−9.409**
	(.373)	(4.064)	(1.534)	(1.714)
Mean in District 1 during high alert	N.A.	5.56	1.951	N.A.
District 1 high alert/mean × 100 (%)	N.A.	−42.8	−14.8	N.A.

Note.—The dependent variable is daily crime totals by district. All regressions contain day-of-the-week dummies and district fixed effects. All standard errors are heteroskedastic autocorrelation consistent (Newey-West) with clustering by district. N.A. = not applicable.

$^{+}$ Significantly different from zero at the 10 percent level.

* Significantly different from zero at the 5 percent level.

** Significantly different from zero at the 1 percent level.

crimes. Temporary increases in street police and closed-circuit cameras are unlikely to deter crimes such as homicide, which often occur in homes among q9 people who know one another, but are much more likely to deter street crimes.[24]

During a high-alert period, citizens may report crimes at a higher rate even though the true crime rate remains constant. If the report rate increases at the same time that the true crime rate decreases, the reported crime rate may fail to decrease or may even increase. To the extent that report rates differ across alert periods, our results are biased against finding a significant decrease in crime. Report rates tend to be high (around 92 percent) and stable for auto theft because insurance companies require a police report to pay out, so for our largest effects, we can be confident that changes in the report q10 rate are not biasing the results.[25]

Surprisingly, burglary also shows a significant decline of 15 percent, or

[24] A puzzling aspect of the earlier literature, for example, Levitt, Using Electoral Cycles, *supra* note 4; and Corman & Mocan, *supra* note 4, is that homicide has often been found to be one of the crimes most deterrable by increased police. Since police rarely observe let alone prevent a homicide, this result does not appear to be plausible (although homicide may be deterrable on other margins such as probability of detection or severity of punishment). On the location of homicides versus other crimes, see Callie Marie Rennison & Michael R. Rand, Criminal Victimization 2002 (Bur. Just. Stat. Nat'l Crime Victimization Surv., Rep. No. NCJ 199994, August 2003) (http://www.ojp.usdoj.gov/bjs/pub/pdf/cv02.pdf).

[25] On the report rate, see Bureau of Justice Statistics, Personal and Property Crimes: Percent Distribution of Victimizations by Type of Crime and Whether or Not Reported to the Police in Criminal Victimization in the United States, table 91 for 1996–2001 (2000–2003) (http://www.ojp.usdoj.gov/bjs/pub/pdf/cvus/previous/cvus91.pdf).

an elasticity of −.3. The negative and statistically significant coefficient on burglaries is important because burglaries are not crimes against tourists. If the declines in crime that we find during high-alert periods were due to reductions in tourism rather than increases in police presence, we would not expect to see a decrease in burglaries.[26]

VI. Conclusion

Given the importance of police protection in budgetary terms and the welfare effects of crime, the lack of credible causal estimates of the effect of police on crime is troublesome. Although Levitt laid out a useful framework for isolating the causal effect of police on crime, limited variation in his primary instrument and data ambiguities limit the policy value of his estimates, as shown by McCrary and by Levitt's later study.[27] We use the easily identifiable and clearly exogenous shock provided by changes in the terror alert level in Washington, D.C., to evaluate the causal effect of police on crime. A notable benefit of our research design is that our treatment, the terror alert level, turns on and off repeatedly during our sample. In addition, we use daily crime data and the treatment window is short, a matter of days or weeks, so our results are less likely to be due to changes in other factors. Using a variety of specifications, we show that an increase in police presence of about 50 percent leads to a statistically and economically significant decrease in the level of crime on the order of 15 percent, or an elasticity of .3. Most of the decrease in crime comes from decreases in the street crimes of auto theft and theft from automobiles, where we estimate an elasticity of police on crime of −.86. We provide analyses that suggest that this decrease is not an artifact of changing tourism patterns induced by changes in the terror alert level.

While our research provides a credible estimate of the causal effect of police on crime, more research is needed to determine if this effect and its magnitude can be generalized to other cities or if it is peculiar to the Washington, D.C., area. In principle, our design, which uses terror alert changes as exogenous shocks to police presence and daily crime data, can be implemented in analyses of the crime patterns in other metropolitan areas.

[26] Our coefficients on log(midday ridership) are potentially interesting as well. It might seem surprising that we estimate a positive coefficient in the burglary regression given our observation that burglaries are unrelated to tourism. However, it may well be the case that our ridership variable is picking up weather effects. Note also that the effect is miniscule, a 1 percent increase in midday ridership increases crime by .01 times the corresponding beta coefficient.

[27] Levitt, Using Electoral Cycles, *supra* note 4; McCrary, *supra* note 5; Levitt, Reply, *supra* note 4.

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QUERIES TO THE AUTHOR

1 Au: Italics removed because it is not JLE style to use italics for emphasis or definition of terms.

2 Au: Please provide the page number for the McCrary quote.

3 Au: Please check the values in the last column of Table 1; they total only 110.2.

4 Au: ″indicates that on alert days″ changed to ″indicates that on high-alert days″; OK?

5 Au: In note 13, ″these actually increased during terror alert days″ changed to ″these actually increased during high-alert days″; OK?

6 Au: Table 4 correct here and below? Was originally Table 2.

7 Au: ″difference-in-difference″ or ″differences-in-differences″?

8 Au: In Table 5, does ″N.A.″ stand for ″not available″ or ″not applicable″?

9 Au: ″deter street crimes such as automobile theft and theft from autos.″ changed to ″deter street crimes.″ because street crimes have defined explained earlier in the paragraph.

10 Au: In note 25, for what years did you use table 91?

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