The Threat is Stronger than the Execution:

An Analysis of the Deterrent Effect of Police on Crime

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Abstract

Deterrence theory suggests that police acting as sentinels has the greatest deterrent effect on crime in the criminal justice system, overshadowing police as apprehenders, the court system, and incarceration. This analytical literature review examines the two ways police can deter crime: police force size and police deployment strategies. The mechanisms affecting change in police force size and street-level police behavior are included in order to provide a starting point for policymakers to effectively revitalize policing agencies and their practices.

Keywords:

JEL Classifications: K42 Illegal behavior and the Enforcement of Law

1   Introduction

From an economic standpoint, the goal of the criminal justice system is to reduce

crime. The total social costs of crime include the costs of victimization, and criminal

justice system costs, such as police costs, court costs, and prison costs. Today the annual

cost of victimization in the U.S. is estimated to be between $200 billion in reported

crimes and $310 billion including unreported crimes (Chalfin 2013). The U.S. criminal

justice system costs about $200 billion annually, with 60% of that budget allocated

towards policing costs (U.S. Census Bureau 2011). Since the 1980s, the prison system in

the U.S. has grown at a faster rate than ever before. For instance, the U.S. has 25% of the

world's prisoners, and only 5% of the world's population (The Economist 2012), which

amounts to 20 times more inmates in prison today than we did in 1980 (Sabol, Minton

and Harrison 2008). In 2011, the Supreme Court ruled California's prison overcrowding

as unconstitutional (Liptak 2011). More recently, the Obama administration aims to

release thousands of inmates, namely non-violent drug criminals (Apuzzo 2014).

Prisons are so overcrowded that prosecutors are being forced to bargain down

sentencing for convicts (Berman 2013). There is a growing body of evidence that prisons

are actually criminogenic, meaning that people who enter prison are more likely to

continue committing crime after they leave prison than if they had never entered in

prison at all (Durlauf and Nagin 2011). Thus, our current criminal justice system is not only clogged, but it is arguably perpetuating crime as much as it is reducing it.

If we want to reduce the social costs of crime, the most effective way to do that is to deter crime from happening in the first place. The evidence shows that the certainty of apprehension is a more effective crime deterrent than the severity of punishment (Nagin 2013). This suggests that the most effective way to reduce the total social costs of crime and the most effective way to deter crime is through policing. Increased deterrence would not only reduce the number of criminals incarcerated, but deterrence is also more effective when the capacity to sanction is large. This suggests that implementing more effective deterrence, either through increasing the police force size or implementing effective deterrent policing strategies, would have positive feedback effect on itself.

1.1 The Questions

This paper aims to understand to what extent police deter crime, and to explore the policy implications surrounding that answer. Theoretically, police can deter crime either quantitatively through police force size, or qualitatively through police deployment strategies. Section 3 is dedicated to answering: *Do increases in police force size have a deterrent effect on crime?* If so, we would want to know: *What mechanisms are responsible for changing the police force size?* Section 4 answers the questions: *Which police*

deployment strategies effectively deter crime? In order to implement the most effective

strategies, we would need to know: *What affects the street-level behavior of the police?* After

answering these questions, Section 5 posits: *What are the policy implications concerning*

police and crime? Before jumping into the literature, I will provide contextual and

theoretical background on deterrence, and then review the literature history and

obstacles in section 2.

1.2   Isolating the Deterrent Effect of Police on Crime

Deterrence theory is made up of negative incentives, such as policing and

incarceration, and positive incentives, such as low unemployment rates and community

programs that deter crime. Within negative deterrence, disagreement exists over

whether increasing the certainty of punishment or increasing severity of punishment is

more effective at reducing crime. In terms of the deterrence theory as a whole, this

analytical review focuses specifically on the certainty of punishment, or more

accurately, the certainty of apprehension. While there is consistent theoretical and

empirical evidence supporting the fact that certainty of apprehension is effective at

deterring crime, sentencing lengths studies provide inconsistent conclusions about their

effectiveness on crime (Nagin 2013). Evidence is beginning to show that imprisonment

may even have a criminogenic effect rather than a rehabilitation effect (Durlauf and

Nagin 2011). In this way, it is important to study the effect of police on crime.

1.3   The Power of Deterrence

Deterrence is a theory of criminal choice (Nagin 2013). Becker's economic model

of crime treats criminals as optimizing individuals who create rational choices based on

the expected payoff of crime relative to the expected payoff of legal activity under the

possibility of apprehension, conviction, and punishment (Becker 1968). Figure 1 is a

simplified probability tree showing the cost and benefits that a would-be criminal

weighs when considering offending. If a criminal does decide to commit a crime, the

perceived reward of committing the crime must be greater than the perceived cost of

The Criminal Perspective:
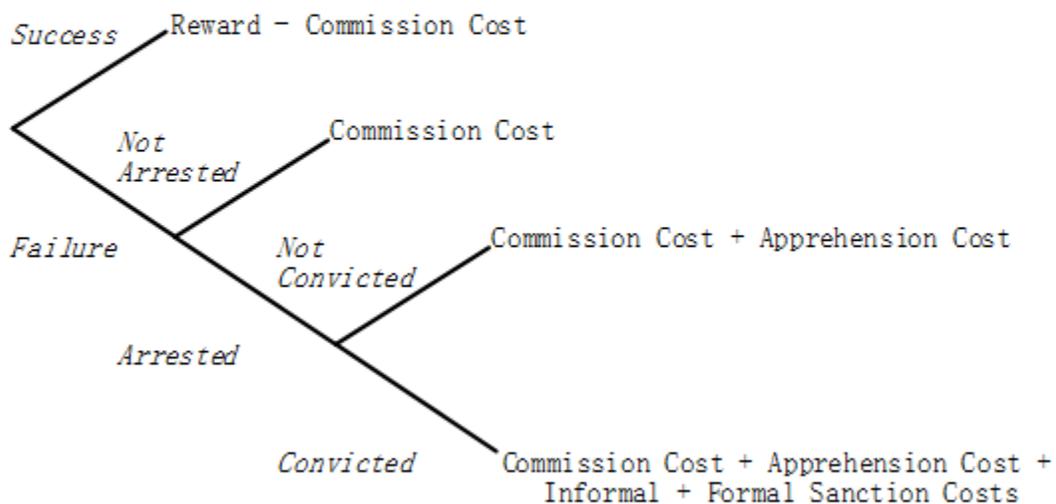Weighing Costs & Benefits of Crime

Figure 1

committing the crime, which may include planning, effort, victim resistance, and shame. The criminal is either successful[1] and gains the net benefit of the reward minus the commission cost, or the criminal fails. If the criminal is not arrested, only the commission cost is incurred. If the criminal is arrested, the court system either decides to not convict, in which case the criminal incurs the commission cost and apprehension cost—such as the unpleasantness of arrestment, legal fees, and potential pretrial detention, along with potential job loss and social costs—or the court decides to convict, and the criminal incurs commission, apprehension, and informal and formal sanction costs. Formal sanction cost is the loss of freedom given incarceration, and informal sanction costs include potential job loss and disapproval by family, friends, and the community (Nagin 2013).

This model implies that increases in perceived commission cost have a greater deterrent effect than an equal increase in perceived apprehension cost. Likewise, an increase in perceived apprehension cost has a greater deterrent effect than an equal increase in informal and formal sanction costs. This explains why shame, a part of the commission and apprehension costs, plays a more definitive role than sanction cost when a criminal decides whether or not to commit a crime (Nagin 2013).

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[1] While it is possible that a criminal could succeed and then get arrested, we can assume the criminal would retain the commission cost, lose the reward gained, and the results would be the same as if they failed and got arrested. For simplicity's sake, I have left these branches out.

Passing through all sects of the criminal justice system and ending in incarceration is highly uncertain. The most immediate and thus important part of the criminal justice system affecting certainty is the police. The threat of conviction and sanction are virtually nonexistent without police on the front lines. Thus, it is important that we understand how police affect crime.

Police have two roles: they can function either as sentinels who deter crime, or apprehenders who arrest criminals after a crime has already been committed. Both roles carry the power of arrest authority. In the sentinel role, police reduce the chance of success of committing a crime, and the would-be offender remains a non-offender. This is what is termed 'general deterrence.' When the would-be offender decides to commit a crime, the police fill the apprehender role in which police affect the probability of arrest, which is what is called 'specific deterrence.' Given the criminal perspective probability tree, police acting as sentinels is a more effective deterrent than police acting as apprehenders, which is a more effective deterrent than sanction costs.

Thus, the certainty of apprehension is a more effective deterrent than the severity of sanction, which necessarily follows apprehension. While both roles have their place in the criminal justice system, the sentinel role is preferable because deterring a crime from happening is preferable to arresting a criminal post-crime. Preventing crimes from occurring reduces total social costs, including victimization cost, arrest cost, court cost,

incarceration cost, and costs to the offender. This paper mainly explores the effects that

the police sentinel role have on crime, with some inevitable cross-over with the police

apprehender role. From this theoretical perspective, it could be supposed that an

increase in the size of the police force would increase the presence of both police roles,

and that the more effective policing strategies would maximize the effect of the sentinel

role.

This paper will be mainly focusing on the deterrence of Part I crimes, including

homicide, rape, assault, burglary, robbery, auto theft, and larceny. The evidence

provided in this analytical review largely supports the suppressible crimes theory,

which suggests that police deter against crimes that occur in public settings and crimes

that are economically motivated, while crimes committed out of emotion may be

difficult to deter (Kane 2006)[2].

2   Literature History & Obstacles

The first literature tests how changes in police force size affects crime rates while

the second tests how different police deployment strategies affects crime rates. Before

getting into these literatures, I will briefly detail the histories of each literature. Then I

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[2] A similar theory to the suppressible crimes theory is the susceptible crimes classification. One way that they differ in that the suppressible crimes theory considers burglary as a suppressible crime because it is economically motived while the susceptible crimes theory considers burglary as a *non*-susceptible crime, arguing that because it occurs primarily at night and in private dwellings, police do not act as a significant deterrent against burglaries (Draca, Machin and Witt 2011).

will explain the obstacles that must be addressed in order to conduct these studies and produce valid results.

2.1   A Brief History of the Police-Crime Literature

Pre-twentieth century, U.S. police were civil servants whose activities ranged from housing the homeless overnight and retrieving lost children to standardizing weights (Monkkonen 1992). The 1930s marked the beginning of the professional era of policing focusing solely on crime control (Monkkonen 1992). The idea that police act as a deterrent against crime was first developed as a public policy precept through a heated political debate, backed by "demonstration projects" from the early 20th century (Gottfredson, et al. 1997). In the late 1960s, Becker modeled crime using the rational agent theory, opening doors for economists to research a world that had only been studied previously by criminologists.

Unfortunately, the first two decades of testing the effect of police force size on crime did not control for endogeneity and simultaneity issues. Cameron (1988) found that eighteen of twenty-two studies concluded that either no relationship existed between police and crime rates, or that there was a positive relationship, leading him to criticize the theoretical grounds of the studies, and to question the validity of the deterrence hypothesis. Today, it is widely accepted that these early studies testing for the deterrent effect of police on crime are ridden with unaddressed endogeneity,

simultaneity, and misspecification issues, not to mention bureaucratic consequences of police agencies. Through time, these problems have been addressed to make for better, albeit difficult to conduct, studies. About a decade later, Marvell and Moody (1996) found that only ten out of thirty-six studies that tested the deterrent effect of police on crime concluded a significant negative relationship. Now a highly cited paper in the field for both its recommendations to mitigate problems during the testing of the relationship between police and crime and its success in doing so, *Specification Problems, Police Levels, and Crime Rates* has served as a foundation for economists testing the police-crime relationship.

Police deployment strategy studies have varied over time with which police strategies were in vogue at the time. The professionalization of the police force in the early twentieth century and the strategies they used are still considered the standard model of policing today. Strategies that fall under the standard model of policing, such as reactive arrests, rapid response to emergency calls, and random patrols, have been consistently condemned for the last three decades by academia (Weisburd and Eck 2004). Crackdowns became a popular policing strategy in the 1980s, which transitioned into—and was virtually replaced with—hot spot policing in the 1990s. Problem-oriented policing, community policing, and broken-windows policing also became popular tactics in the 1990s (Weisburd and Eck 2004). The dramatic and unexpected drop in crime in the 1990s in the U.S. led to increased confidence in police strategy

innovation as well as a way to legitimize new policing strategies in the mind of the public (Weisburd and Eck 2004). While studies improved in their soundness through more precise empirical methods, observations, and record-keeping of qualitative data, mean reversion continues to be problematic for many modern localized studies. An increasing number of studies include more than one city in order to partially evade this problem. Taking many similar studies of policing strategies conducted at different times and in different places and aggregating their results helps to find whether certain strategies are consistently strong, weak, or mixed in evidence.

2.2   Empirical Obstacles in Testing the Effect of Police on Crime

There are more studies testing changes in police force size than policing strategies because of the data required for each literature: changes in police force size use quantitative data whereas police deployment strategies use quantitative and qualitative data that requires consistent observation to verify its legitimacy. While the locality that is thus more commonplace in the strategies literature makes it less prone to endogeneity and simultaneity issues inherent in most of the police force size literature, locality can suffer from mean reversion issues. It is essential empirical problems in both literatures and how econometricians address them are recognized and understood, as they determine whether or not a study's results can be considered valid.

2.1.1   The Police-Crime Endogeneity Problem[3]

Because theoretically the productivity of the police force responds to changes in

crime, and crime responds to changes in the productivity of the police force, there is an

inherent endogeneity issue in testing the relationship of police on crime. For example, if

the size of the police force is increased in response to increasing crime rates, it may

appear that there is a positive correlation between police force size and crime rates,

even if police are causing a reduction in crime (Levitt 1997). The same positive

correlation problem with crime rates could occur for implementing more effective

policing strategies. Therefore, this endogeneity issue must be addressed in studies

testing for the effect of police on crime. This is less of an issue for localized police

deployment strategy studies and localized natural experiments because an increase in

crime increases arrest levels instantaneously while it takes more time for arrest levels to

reduce crime (D'Alessio and Stolzenberg 1998). It is estimated that it takes at least six

months for an increase in the police force size to react to crime (Corman and Mocan

2000). Thus, there is a trade-off: studies conducted in multiple cities and over multiple

years produce more generalizable results, but studies that are focused on one location

for a relatively short period of time hardly suffers from the police-crime endogeneity

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[3] Depending on the methodology used to address this problem, this police-crime problem can be termed as an endogeneity issue or a simultaneity issue. For the sake of this paper, this problem facing economists in testing the deterrent effect of police on crime will be termed the "police-crime endogeneity problem."

problem. Therefore, the remainder of this subsection will discuss how the police force size literature has dealt with this issue.

The Granger causality test allows one to see if an increase in police force size slightly lagged in the past Granger-causes a decrease in current crime rates, which is appropriate since crime responds to police with a lag rather than instantaneously. Although the Granger causality test avoids the endogeneity issue, Marell and Moody (1996) remind readers that it inherently ignores same-period relationships, and is limited to providing information on the existtence, direction, and minimum estimated size of the effect of police on crime. Although Shoesmith (2010) mainly uses a panel techniques in his study, he also uses Error Correction Models, which is a similar approach as the Granger causality methodology.

Appropriate panel techniques applied to cross-sectional data (Benson and Rasmussen 1998), localized high-frequency time-series data (Corman and Mocan 2000), and national time-series data (Shoesmith 2010) is another way to address the police-crime endogeneity issue. Corman and Mocan (2000) is the first study to use high-frequency (monthly, rather than annual) data, which minimizes the endogeneity issue as annual data is likely plagued by endogeneity. With monthly data, the lag of time in months between the crime increase and police force size increase can be pin-pointed, and thus the change in crime from a time of less police to a time of more police can be

measured. Benson and Rasmussen's (1998) empirical work used the "War on Drugs" of the 1980s as an exogenous decrease in police resources spent on Part I crimes and an increase in police resources spent on drug crimes to see if Part I crime rates would increase in response.

Other ways that economists have attempted to circumvent the endogeneity problem are through creative exploitation of natural experiments such as terrorist attacks (Di Tella and Schargrodsky 2004; Klick and Tabarrok 2005; Draca, Machin and Witt 2011), racial profiling scandals (Shi 2009; Heaton 2010), and police layoffs (DeAngelo and Hansen 2009) to test the exogenous shock of an increase or decrease in the size of the police force on crime rates through a lagged time series model. These studies admit and are criticized for (Worrall and Kovandzic 2010) their limitation of locality, which not only minimizes the police-crime endogeneity problem, but also keeps results from being generalizable. Some (Nagin 2013) argue contrarily to others (Gottfredson, et al. 1997) that the natural experiment methodology is superior because of how it dissapates the police-crime enodogeneity issue. However, it is sometimes difficult to ensure that the exogenous change is not directly correlated with crime. For example, it is possible that opportunities to commit crime may have decreased during a terrorist alert.Thus, the validity of the results depend on the authors' ability to prove that the mechanism causing a change in police force size does not directly affect crime. Furthermore, natural experiment studies fail to measure marginal effects of changing

the size of the police force. For instance, even if criminals are shown to respond to a large exogenous increase in police force size or presence, that does not mean that criminals would respond in a proportional degree to a marginal increase in police force size or presence; it is possible that a marginal increase in police will have no effect, or that it will only have a small, initial effect that quickly dissipates. In short, natural experiment studies are better at testing for whether police generally deter potential criminals or not. If the goal is to test the effect of a marginal increase in the police force size or presence, the other methodologies presented here are more appropriates tests, despite the myriad of empirical problems they face.

Instrumental variables such as gubernatiorial elections (Levitt 1997), state taxes (Lin 2009), law enforcement grants (Evans and Owens 2007; Worrall and Kovandzic 2010), and firefighters (Levitt 2002) have been used for changes in police force size to address the police-crime endogeneity issue. Similarly to natural experiments, the instrument for police force size cannot be concurrent with changes in crime. Worrall and Kovandzic (2010) convincingly argued that while most models that have used this strategy are just-identified, they should be over-identified so that instrument validity testing is possible in addition to relevance testing. The difficulty finding appropriate instruments is the main obstacle to this methodology.

2.12   The Incapacitation-Deterrence Simultaneity Problem

The amount of criminals locked up in jail or in prison as a result of an increase in police activity, or incapacitation, must be taken into consideration when testing for the deterrent effect of police on crime. It can be difficult to discern whether, and to what extent, a negative relationship between crime and police is a result of deterrence or of incapacitation. Thus, empirical studies meant to test deterrence are really conducting a joint test of deterrence and incapacitation (Kessler and Levitt 1999). The localization in police deployment strategy studies and in natural experiments minimizes incapacitation effects just as it minimizes the police-crime endogeneity problem since incapacitation takes time to have an effect on crime rates. Thus, the following studies parsing out deterrence from incapacitation are most vital to the non-localized methodologies of the police force size literature.

The distinction between deterrence and incapacitation in studies testing the police-crime relationship is highly important concerning implications for public policy. For instance, if incapacitation played a large role in the drop of crime, then policies like the three-strikes laws[4] would be inefficient and expensive whereas if deterrence was the main force lowering crime rates, the three-strikes laws would reduce total prison time as the deterred offset the longer sentences of the incarcerated (Levitt 1998). More

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[4] The three-strikes laws are a set of state-instituted statutes that impose harsher sentences on criminals who have committed three or more serious offenses, typically felonies, to combat habitual criminals.

generally, an increase in the arrest rate for a specific crime would be expected to have a

different effect on other crime rates depending on whether incapacitation or deterrence

dominates. We could assume incapacitation for a certain crime would lower other crime

rates since incarcerated people cannot commit any crimes, whereas deterrence from one

type of crime—say, larceny—could have a substitution effect to another type of crime—

to burglary, for example—and thus a resulting increase in another crime rate. In order

to conduct a study to separate those deterred from those incapacitated, Levitt (1998)

had to make two assumptions. First, he had to assume criminals are repeat offenders in

order for the incapacitation effect to exist—which is valid given that over two-thirds of

criminals were arrested for a new crime within three years, and over three-fourths were

arrested again within five years (Durose, Cooper and Snyder 2014). Second, Levitt

assumed that there is a substitution effect between crimes, which is reasonable given

the body of literature supporting substitution effects (Detotto and Pulina 2013). For the

study, it was assumed that property crimes would be substituted for other property

crimes, and violent crimes are substitutes for other violent crimes. Levitt (1998) found

that deterrence dominates incapacitation effects in explaining the negative correlations

between arrest rates and crime rates for property crimes where 75% of the observed

effect of arrest rates on crime is from deterrence. Incapacitation dominates deterrence

for rape, neither incapacitation nor deterrence dominates for robbery, and deterrence

dominates incapacitation for property crimes and for assault. Not only does this

provide some support for the property crimes aspect of the suppressible crimes theory, but it implies that empirical studies can cautiously assume deterrence is the dominating factor for property crimes and assault while deterrence partially contributes to robbery, and likely has only a marginal effect on rape.

Soon after, Levitt and Kessler (1999) measured deterrence by exploiting a natural experiment through California's Proposition 8, which exogenously imposed sentence enhancements on select crimes. There is a period of time between when the law is enacted and when the additional incapacitation effect from the new sentence enhancement begins. In this period of time, because the incapacitation effect is constant, any immediate decrease in crime was due to deterrence. Crimes that Proposition 8 covered fell by 4% in the first year relative to other crimes, and by 8% in covered crimes after three years. This suggests that deterrence through harsher sentences has a modest effect. There was a 20% reduction in covered crimes relative to other crimes 7 years later, suggesting that incapacitation plays a role as well. This study is important not only because it suggests a method of testing the deterrent effect of sentence-based policies, but because it shows the difficulty of disentangling deterrence and incapacitation.

Corman and Mocan (2000) used an algorithm and a subsequent Poisson distribution to estimate the upper-bound of the incapacitation effect for their county-

level Florida data in their panel study. The incapacitation elasticities ranged from the lowest -0.006 for murders to the highest -0.032 for assault, showing that the potential incapacitation effect is small. Using this method, other studies without an exogenous change in police could estimate the upper-bound of the potential incapacitation effect. Marvell and Moody (1996) acknowledged that the incarcerated population is the most important control in their Granger causality regression and found that deleting the prison population had little impact on the results. Some other studies without the exogenous advantage built into their empirical methodology cite the studies discussed above (Levitt 1998; Kessler and Levitt 1999) to communicate their awareness of the incapcitation-deterrence simultaneity problem and their dismissal of it because of its small effects.

2.1.3 The Mean Reversion Problem

Because the police deployment strategies literature contains highly localized studies, it is prone to mean reversion. This means that, while one may be trying to test the effect of a policing strategy on crime rates, other exogenous trends may be simultaneously affecting crime rates in the long-run. For example, because the broken-windows strategy was first widely implemented in New York City, most studies testing the broken-windows theory use 1990s New York City data, but fail to take into account that the intensively treated areas were the same areas that experienced the largest

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increases in crime from the 1980s crack epidemic (Harcourt and Ludwig 2006). The idea

of mean reversion is that the large increases in crime from the crack epidemic that

happened decades ago means that we could reasonably expect crime to fall

dramatically in those areas back to their relative pre-crack epidemic equilibrium. This

not only makes it difficult to isolate the effect of policing strategies, but it also

potentially overestimates the effects of policing strategies. Therefore, mean reversion

can be a problem for police strategies studies, especially for theories like broken-

windows where a majority of the studies are conducted with the same localization

factors, and thus the same mean reversion problems as each other. This is why it is

important to analyze the effect of a policing strategy on crime in many different cities

and over different periods of time for greater generalizability.

2.1.4   Misspecification Problems

Benson and Rasmussen (1994) followed up on Cameron's (1988) review of police

force size studies, arguing that it is not the deterrence hypothesis that should be

questioned, but the empirical methodologies of the reviewed studies. For instance,

econometric models of crime are generally misspecified because they do not take into

account that police are not only arresting and deterring Part I crimes, but also Part II

crimes, such as narcotics, vandalism, vice, fraud, and major traffic violations (Benson

and Rasmussen 1998). Because of available data, the studies Cameron (1988) reviewed

tested for the impact of total police resources on Part I crimes only. Since there are more Part II crimes than Part I crimes (over four times as many in Florida in 1987, for example), it is not reasonable to assume an increase in police resources will be exclusively allocated to Part I crimes (Benson and Rasmussen 1998). In other words, testing how the number of police officers or police expenditures affects crime is not appropriate unless you have matching data on all police activity, or how police expenditures or police officers are allocated. Thus, police force size studies must keep in mind that police have other activities to do besides focus on Part I crimes. The police deployment strategies literature generally does not face this issue because those studies focus on what police are doing. For instance, the broken-windows hypothesis states that cracking down on Part II crimes decreases Part I crimes, showing greater awareness of police resource allocation in the strategies literature.

Furthermore, Benson and Rasmussen argued that the simultaneous equation estimation and OLS procedures can produce large biases, supporting the use of panel techniques to test crime theory instead, which has been strongly supported by other economists in the field (1998). Likewise, Marvell and Moody (1996) critiqued studies for their incomplete control variables and biased and inefficient OLS estimates that underestimated the deterrent effect of police on crime.

It is also difficult to determine what variable to use to measure police deterrence on crime for the police force size literature: police officers, arrest rates, arrests per officer, and expenditures have all been used. It is generally accepted that using expenditures is not the best measure of police because budget classifications change over time (Marvell and Moody 1996) and because police expenditures are positively correlated to police strength only about half of the time (Koper, Maguire and Moore 2001). Expenditures also may not be the best measure because, while most police expenditures are spent on police wages, some of the budget goes to increasing the capitalization of police through technology like cars and radios, which may actually decrease the effectiveness of police deterrence as it encourages reactive rather than proactive policing (Benson and Rasmussen 1998). While many studies use some form of police officer levels, more recent studies argue that arrest rates are more appropriate because they measure police force effectiveness rather than just police numbers (Shoesmith 2010). Others argue that arrests per officer may be better than using raw arrest rates because arrests per officer may be able to capture police crackdowns, which may increase the real or percieved risk of apprehension in ways raw arrest count rates could not capture (Kane 2006). In the police strategies literature, depending on which strategy is being tested, variables such as hours patrolled, number of arrests, and qualitative data are used to measure police force saturation of a strategy.

2.1.5 Police Bureaucracy Problems

There is evidence that police are incentivized to be reactive to crimes rather than proactive, meaning that police are incentivized to fill their apprehension role and ignore their sentinel role. Because policymakers use crime rate and arrest rate statistics to decide how much money should be allocated from taxpayers towards police budgets, police are incentivized to keep crime rates up in order to show that they are needed, and to gain higher budgets for themselves (Benson and Rasmussen 1998), often over-stating standards for police staffing to policymakers and exaggerating to the press to increase the public's perception of fear towards crime in order to gain excessive budgets (Ammons and Edwards 2008). This incentive structure further confuses the endogeneity problem of crime rates and police force size. While the incentive to be reactive does not seem to have had an interfering effect on police deployment strategy studies, it is possible it could be an obstacle to changing police strategies in the long-run to focus on deterrence efforts rather than arrest rates.

Crime reporting and recording behavior is affected by change in police force size (Levitt 1998) as well as by technology (Cameron 1988), suggesting the data used to test the effect of police on crime is imperfect. For example, if a marginal increase in police levels leads to a marginal increase in recorded crime, then there would appear to be a positive correlation between crime rates and arrest rates (Cameron 1988). Levitt (1998)

tested this bias and found that each additional officer is associated with the reporting of five more Part I crimes that would have gone unreported otherwise annually, a small but measurable impact. Changes in policing strategies could likewise lead to a change in reporting. For instance, police are currently less inclined to write a report in high-crime areas relative to low-crime areas (Smith 1986), which could change with the implementation of a strategy that specifically focuses on high-crime areas, such as hot spot policing. A cost-benefit analysis that did not take this bias into account would dramatically underestimate the benefits of increasing the size of the police force.

3 Police Force Size

This section focuses on two literatures concerning police force size. Section 3.1 attempts to answer the central question: *Do increases in police force size have a deterrent effect on crime?* Because there is evidence that changes in police force size has an impact on crime rates as detailed below, Section 3.2 follows naturally, attempting to address the supplemental question: *What mechanisms are responsible for changing the police force size?* Understanding what causes changes in police force size will enable policymakers to make informed decisions that would have an effect on the police force size, which in turn would have an effect on crime rates. Section 3.2 is an accessory to section 3.1, and is meant to provide the reader with a summary of basic information on another existing literature.

3.1   Literature by Methodology

Because the police-crime endogeneity problem is the first and arguably the largest problem that economists encounter when testing for the effect of changes in police force size on crime, I have organized this literature by methodology. This allows us to interpret and compare the results of the studies within one methodology as well as

Police Deterrent Elasticities of Part I Crimes

Method	Study	Police Measure	All Part I Crimes	Rape	Assault	Homicide	Robbery	Burglary	Auto Theft	Larceny
Granger	Marvel & Moody (1996)	total # police	−0.30	-	-	−0.36	−0.48	−0.32	−0.85	−0.22
Granger	Marvel & Moody (1996)	# police officers	−0.27	−0.20	-	−0.49	−0.54	−0.25	−0.77	−0.21
Granger	Kovandzic & Sloan (2002)	total # police	−0.14	-	-	-	−0.21	−0.19	-	−0.12
Panel	Corman & Mocan (2002)	total # police	/	=	-	-	−0.53	−0.42	-	=
Panel	Corman & Mocan (2002)	total # arrests	/	=	-	−0.34	−0.94	−0.36	−0.40	=
Natural Exp.	Klick & Tabarrok (2005)	policing hours	/	-	-	-	-	−0.30	−0.86*	-
Natural Exp.	Draca, Machin, & Witt (2011)	policing hours	−0.32	-	/	/	/	-	/	/
Instrumental V.	Evans & Owens (2007)	Additional # police officers	/	-	−0.9	-	−1.2	−0.5	−0.8	-
Instrumental V.	Worrall & Kovandzic (2010)	Additional # police officers	/	-	−0.14	−0.76	−0.98	−0.36	-	-
Instrumental V.	Lin (2009)	Police officers + grant $	/	-	-	−1.33	−1.42	−1.11	-	−0.94

(−): not statistically significant
(/): not reported in study
(=): crime type not included in study
(*): includes auto theft & thefts from autos

Figure 2

comparing the aggregate results of studies conducted with different methodologies to each other using the knowledge from the section 2. These different methodologies not only represent the different ways economists have attempted to circumvent the police-crime endogeneity problem and other empirical issues, but also the progress that has been made in this literature towards stronger and more convincing conclusions. Every study that has been done since the drastic improvement in the empirical methodologies of this literature in the mid-90s supports the police deterrence hypothesis. Figure 2 shows reported elasticities from some of the reviewed studies that provided them.

3.1.1   Granger Causality Methodology

The Granger causality methodology has the strength of avoiding the police-crime endogeneity issue through lagging police force size data on crime rate data (and vice versa), and the weaknesses through the lack of acknowledging same-period relationships and only being able to provide the existence, direction, and minimum estimated size of the effect of police on crime. Below I will discuss the implementation of two Granger causality studies—the latter which closely followed the methodology of the former—and then compare and analyze the results to determine their contribution to the police-crime literature.

Granger Causality Methodology: The Studies

Using the Granger causality test in order to determine the deterrent effect of police on crime was pioneered by Marvell and Moody (1996). Their study allowed for the testing Granger causation in both directions, meaning that they tested both the effect of police on crime and also the effect of crime on police. Using pooled city and state data from 49 states and 56 cities from 1972 to 1992, Marvell and Moody (1996) conducted a Granger causality test and found that while a 10% increase in crime only led to a 1.5% increase in the number of police, the number of sworn police officers had a more substantial deterrent effect on most types of crime, with more robust results at the city level. They estimate six times as much crime is prevented per officer for cities relative to all places on average. It is likely that the results are more robust at the city level than at the state level because the greater density of cities allows each additional officer to have greater visibility per person (Gottfredson, et al. 1997). The impact of the total number of police (including civilians) on crime, with the exception of the statistically insignificant rape and assault, is an elasticity of -0.30 at the city level, which has become the standard elasticity for comparison in subsequent studies testing the deterrent effect of police on crime. It is possible that testing the effect of police on assault and rape is problematic because police agencies are more likely than they were before to record assault and rape cases in the proper categories and because new laws encouraging women to report domestic violence in the 1990s might affect the recorded

rape and assault crime rates. Marvell and Moody's (1996) outcomes support the

suppressible crimes theory discussed in section 3.2. An alternative analysis testing for

the effect of sworn officers on total crime, rather than the total number of police,

resulted in an elasticity of -0.27 excluding assault, which was statistically insignificant.

Thus, although the results are only the estimate of the average impact of police over

many cities and states, Marvell and Moody's (1996) study provides substantive

evidence that there is a deterrent effect of police on crime rates.

Kovandzic and Sloan (2002) used county-level data from Florida, whose crime

rates were among the hightest in the nation, from 1980 to 1998 to test if increased police

levels (including sworn and civilian) Granger-caused crime. They found crime rates had

a relatively small impact on police levels, and that increased police levels reduced

crime, specifically: robbery, burglary, and larceny. Although homicide, rape, assault,

and auto-theft were not statistically significant, a SUR F-test suggested that police levels

affect these crime types (except rape and assault) in a similar way that police levels

affect the statistically significant robbery, burglary, and larceny crimes. Because rape

and assault rejected the null hypothesis that police levels affect rape and assault

similarly to the way that police levels affect other crime types, the suppressible crimes

theory—which cites rape and assault as difficult to deter because they are crimes of

passion—is again supported. However, while Marvell and Moody (1996) estimated that

six times as much crime is prevented per officer for cities relative to all places nationally

on average, Kovandzic and Sloan's (2002) Florida study had lower elasticities for large, urban counties (highly populated and high crime counties), suggesting that police are less effective at deterring crimes in urban counties relative to other counties, although the authors agree from F test results this is likely due to chance. Another difference between this study and the previously discussed Granger causality test study (Marvell and Moody 1996) is that this study did not find statistically significant evidence that increased police levels reduced homicide rates; this could be due to Florida's release of prisoners in the late 1980s from overcrowded prisons, which would obviously not be significant in a nation-wide study like Marvell and Moody's (1996). However, I find this explanation weak since there is no reason to assume that the release of prisoners from overcrowding in Florida in the late 1980s would have a significant effect on homicide while not significantly affecting other types of crime. Nonetheless, Kovandzic and Sloan (2002) provide more evidence that for certain crimes, increased police levels have a deterrent effect. Citing studies with similar results (Marvell and Moody 1996; Levitt 1997), the authors suggested that prior research showing no relation between police levels and crime, such many of the studies reviewed by Cameron (1988) and Marvell and Moody (1996), should be reconsidered.

Granger Causality Methodology: Analysis

The literature on police shows high approval for the Granger causality test. Both studies found that crime has a small but significant effect of police levels, and that police levels had a significant, substantial effect on crime. More specifically, robbery, burglary, and larceny were strongly significant for both studies, and rape and assault were *not* significant for either study; homicide and auto theft were significant for one study, and likely to be affected by police in the same way as the significant crimes in the other study. The fact that both studies' rape and assault statistics were clearly affected very differently by police levels than the other crime types provides strong support for the suppressible crimes theory. Although it is likely that police are more effective in cities than elsewhere, the Florida county-level data, which is potentially coexperimental, brings this theory into question.

The limitations of the Granger causality test hardly inhibit economists; on the contrary, this very method circumvents the police-crime endogeneity problem, and clearly shows the existence and direction of the police's effect on crime. Futhermore, the fact that potential same-period effects are not caputured and knowing the Granger causality test finds *minimum* estimated effects, it is very possible that these results underestimate the effect of police on crime. Although the true magnitude of the deterrence effect is unknown for these studies, the elasticities of both studies are

visually proportional with larceny being affected least, burglary affected more, and

robbery affected the most in both studies. Overall, the Granger causality test studies

provide convincing evidence that crime slightly affects police levels, and that police

substantially deter suppressible crimes.

3.1.2   Panel Techniques Methodology

Applying appropriate panel techniques and using controls and other methods to

prevent bias in order to test the deterrent effect of police on crime is another way to

address the police-crime endogeneity issue. Each study below uses different and

creative specifications within panel techniques to test the police-crime relationship.

After I discuss the studies individually, I will juxtapose their results, and analyze their

role in the police-crime literature.

Panel Techniques Methodology: The Studies

Benson and Rasmussen (1998) empirically critiqued early studies (Cameron

1988), arguing for the use of appropriate panel techniques rather than biased and

inefficient OLS and simultaneous equations estimates as a way to properly test for the

deterrent effect of police on crime. They used cross-section data on Florida at the

county-level from 1983 to 1987, a period of time where sentencing guidelines and

severity of punishment were fixed in Florida state law. Using carefully constructed

panel techniques, Benson and Rasmussen (1998) indirectly tested the deterrent effect of

sworn officers and total police capital expenditures on Part I crime rates by using the increase in drug arrests from the "War on Drugs" to represent the allocation of police resources away from Part I crimes. Indeed, a steep increase in drug arrests relative to total arrests in the 80s led to an increase in the rate of Part I crimes[5], supporting the deterrence hypothesis, and the fact that all police activity (i.e. Part I *and* Part II crimes) should be taken into account when testing for the deterrent effect of police on crime. As previously discussed in the misspecification section, police capital and crime are positively and significatly correlated, supporting arguments that police are strongly incentivized to be reactive and arrest criminals post-crime (capital-intensive) and weakly incentivized to be proactive and deter crime (labor-intensive) because higher arrest rates help police agencies lobby for higher budgets. Futhermore, the hypothesis that drugs cause crime is not supported by this study (Benson and Rasmussen 1998). Thus, Benson and Rasmussen provide convincing evidence that police officers deter crime through their sound empirical testing and a creative test of deterrence.

Corman and Mocan (2000) are the first to use high-frequency (monthly) data of individual crime categories, evading many empirical problems in other time-series (and cross-sectional) studies. This is one of the few papers that, like Benson's and Rasmussen's study (1998), acknowledges potential effects of increased police resources devoted to drug crimes because of the War on Drugs beginning in the 1980s. Through

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[5] Specific crime classifications (i.e. homicide, robbery, etc.) were not discussed in this study.

including drug proxies, this study shows that while drug use slightly increases

robberies and burglaries, police are far more effective in preventing these crimes in

comparison to allocating police efforts towards drug use. Corman and Mocan took

Benson's and Rasmussen's advice (1998) to consider how police resources are allocated

among activities other than Part I crimes. They noted that although the NYC police

force decreased by a third in the decade following 1970, felony arrests were increased

by 5% because their arrests for less serious crimes and violations were reduced by 40%

and 80% respectively, allowing scarce police resources to be allocated towards Part I

crimes. Their results show that murders, robberies, burglaries, and motor-vehicle thefts

decreased in response to increased arrests; an increase in the number of sworn police

officers only had a deterrent effect on robberies and burglaries. There was no evidence

of a deterrent effect of police or arrests on assault, although the contemporaneous value

of sworn police officers on assault is negative and significant, which supports the

suppressible crimes theory (rape and larceny were not included in this study[6]). In this

way, the unique, high-frequency data and careful execution of Corman and Mocan have

provided support for the deterrent effect of police on supressible crimes.

After Levitt (2004) wrote his analytical article analyzing why crime fell in the

1990s, Shoesmith (2010) responded with an empirical study with countering evidence.

In attempt to explain the sharp drop in crime that happened in the 1990s that shocked

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[6] Rape was not included in this study because of varying frequencies of reporting over time. Larceny was not included in the study because the definition has changed over time.

leading criminologists, Levitt purported that, while the drop in crime rates was advertised on the news as a partial result of better policing strategies, improved policing strategies likely had no effect on crime rates (Levitt 2004). He argued that crime rates began dropping before targeted policing strategies were implemented[7], that new policing strategies were not a nation-wide implementation (only an unmeasurable media sensation), and that there was scant empirical literature on the subject (Levitt 2004). Rather, he suggested that one reason crime rates dropped in the 1990s was because police officers increased nationally by 14%, citing studies that provided empirical evidence (Marvell and Moody 1996; Corman and Mocan 2000; Levitt 2002) that more police decreased crime. However, as Levitt admits, although this and other explanations he analyzed in his paper may explain the reduction of crime in the 1990s, they do not explain the crime patterns from 1970 to 1990 (Levitt 2004). On the contrary, applying Levitt's logic from the 1990s to the 1970s-1990, violent and property crimes should have decreased by 31% and 35% when in reality, they increased by 83% and 38%, demonstrating Levitt's (1997) ignorance of previous research and trends related to drug enforcement (Shoesmith 2010). With this in mind, Shoesmith (2010) found empirical evidence that explained both the unexpected drop in crime in the 1990s *and* the preceding two decades of crime. Using cointegration tests, Error Correction Models (ECMs) which are similar to Granger causality tests, and common long-memory

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[7] Police Commissioner William Bratton and Mayor Rudy Guiliani implemented new strategies for policing in 1993 when crime rates started falling in 1991 (Levitt 1997) .

components procedure to model the time-series data on national crime (Shoesmith 2010). Shoesmith (2010) made sure to emphasize that this study, unlike Marvell and Moody (1996) and Corman and Mocan (2000) whose studies focused on lags, focused on the error correction in order to get more accurate results. Among one of the reasons found for the crime trend in the US from 1970 to 2003 was arrest rates (Shoesmith 2010). This suggests that arrest rate may be a more appropriate instrument for measuring police deterrence (by focusing on police effectiveness) in deterring crime than using the size of the police force (Shoesmith 2010). Regardless, the allocation of scarce police resources towards fighting drug crime (and alcohol consumption) is estimated to account for much of the variation in violent and property crime from 1970 to 1991 (Shoesmith 2010). From 1991 to 2003, an increase in violent crime arrest rates acted as a deterrent effect of violent crime, contributing an estimated 6.3% out of a total 35.9% decline in violent crime. Conversely, property crime arrest rates declined, leading to an additional 6.2% of property crimes (Shoesmith 2010). It appears that police concentrated more of their effort towards drug and violent crime after 1991, increasing property crime by 12% (Shoesmith 2010). As iterated in Benson and Rasmussen (1998), the War on Drugs diverted police resources towards drug offenders (supposedly to reduce violent and property crime), which only led to more nondrug crime.

Panel Techniques Methodology: Analysis

All three studies took into account how police resources were allocated through acknowledging the legal changes that came with the War on Drugs in the 1980s. Benson's and Rasmussen's 1998 paper provided a baseline for misspecifications that need addressing while testing the deterrent effect of police on crime. Corman and Mocan (2000) focused on lags and the value of high-frequency data while Shoesmith (2010) focused on error correction to attain more precise estimates, which are both important and effective innovations for using panel techniques to test police deterrence.

Each study supports the hypothesis that police deter crime, and more specifically that crime rates are sensitive to how police allocate their resources towards and/or away from specific crimes. This concept fits with what Shoesmith's modern study (2010) found: that arrest rates were a good predictor of the change in crime rates for both the predictable (1970-1990) and surprising (1990s) periods, suggesting criminals for certain crimes are responsive to arrest rates for corresponding crimes through general deterrence, and potentially that criminals may substitute from one crime to another in response to changing arrest rates. For example, larcenists respond to rising or falling larceny arrest rates, and larcenists may switch to burglary if arrest rates for larceny increased and arrest rates for burglary were lower, or decreased. Intuitively, this substitution only works for crimes with similar motivations; for example, larceny and

rape are unlikely substitutes as larceny is likely driven by an economic motivation while rape is likely driven by a motivation to assert dominance and power over another. Another way Shoesmith's study (2010) was particularly contributory was because it showed that, contrary to the suppressible crimes theory, declines in violent crime *are* partially due to an increase in violent crime arrest rates through general deterrence. For instance, 17.5% of the decline in violent crime in the 1990s can be attributed to an increase in violent crime arrest rates. The methodological care the authors took in each panel technique study provides very convincing results for both the existence of and magnitude of police deterrence on crime. Shoesmith's national study explaining both the 1970s-1980s as well as the confounding 1990s using rigorous error correction provides especially strong evidence of police deterrence on crime rates, as well as further proof of the importance of acknowledging how police resources are dispersed among crime types as criminals respond to changes in arrest rates of specific crimes.

3.1.3   Natural Experiment Methodology

Natural experiments include studies that use an event in a specific time and place that causes a change in police force size while simultaneously *not* causing a change in crime rates. The strength of natural experiment studies depend on the authors' ability to discern that said experiment does not affect crime directly. Natural

experiment studies are controversial as some see them as a superior solution to the police-crime endogeneity problem since said problem is not inherent to the natural experiment methodological design while others see them as methodologically weak because of their lack of generalizability. Here, I will discuss studies that use terrorism, budget cuts, and racial profiling scandals as an exogenous change in police force size, and determine how their results contribute to the question of police deterrence.

Natural Experiment Methodology: The Studies

Andenaes (1974) produced one of the first natural experiment studies testing the effect of police on crime rates. During Germany's occupation in Denmark in 1944, the arrest of the entire Danish police force resulted in an immediate rise in crime with street crimes, such as robbery, increasing the most prominently. Although this case is severe as the exogenous shock in the police force was the detainment of the *entire* police force for a large geographic area, it is still not appropriate to assume that the atmosphere in Denmark during WWII played no part in the rise in street crimes. In other words, it is not safe to assume this case study is transferrable through neither time nor necessarily space (i.e. it is possible there would have been a different change, or lack of change, in crime given the Danish police force disappeared under peaceful political and socioeconomic conditions). This shows why it is difficult to prove that the exogenous

change in police force size is not correlated with crime. Below are detailed more recent

natural experiment studies, grouped by the instrumental variable utilized.

Three studies used terrorist attacks and terrorist alerts as an exogenous shock of

increased police presence. Di Tella's and Schargrodsky's 2004 study used a terrorist

attack on the main Jewish center in Buenos Aires, Argentina in 1994. They measured the

location of car thefts before and after the terrorist attack, and in relation to Jewish

institutions, which received police protection after the attack. They found that in the

blocks with protected institutions (relative to the control group), car thefts fell 75%. This

study has the advantage that it is likely police deterrence, rather than incapacitation,

that is the result of the decrease in crime because of the high specificity of time and

space, and considering that incapacitative effects would theoretically effect all blocks

equally, not just those that are protected. Thus, despite that police had little to no

impact outside of the protected block, police visibility exerted a large and negative

effect on auto theft on protected blocks. Klick and Tabarrok's 2005 study used repeated

rise and falls in terror alert levels in Washington D.C. for its corresponding exogenous

shock in police to test the causal effect of police on crime, including the seven Part I

crimes and arson. A 50% increase in police led to a 15% decrease in non-violent crime,

resulting in an elasticity of -0.3 for a total of four rounds of rising and falling terror

alerts. Most of the crimes deterred are street crimes such as auto theft and theft from

cars, which has its own elasticity of -0.86. However, the authors used midday Metro

ridership as a proxy for tourism (as they are correlated) in order to dispel the possibility

that crime may have decreased because tourism to the area also decreased during terror

alerts. If the most prominent thefts are associated with automobiles, then using Metro

ridership as a proxy for tourism may not reflect tourists in the city with automobiles,

and thus it is possible automobiles to steal from decreased during terror alerts. In this

way, I am not confident in their analysis that changing tourism plays no part in

decreased crime, or at least a decrease in auto-related crimes; it is more likely their

numbers are possibly overestimated, not necessarily invalidated. Despite the

uncertainty of tourists, the fact that this study used data from four separate terror alerts

and since burglary alone had an elasticity of -0.3—a resident-specific crime—this study

still provides considerable evidence that police do deter crime, at least for economically

motivated (or non-violent) crime. Similarly, Draca, Machin, and Witt's recent 2011

study used increased police from terror alerts, this time following the bombing of

London in 2005. "Operation Theseus" increased police activity in London by over 30%

for six weeks—a substantial amount of combined time and space relative to other

studies—which caused crime to fall significantly in London as compared to London's

outskirts where police force levels were held constant. Crimes sensitive to police

visiblity such as street-level thefts and street-level violence, or "susceptible crimes,"

were the most impacted , such as thefts, violent crimes, and robberies. The elasticity of

susceptible crimes with respect to police was -0.38. After police levels reduced to their

pre-attack level, crime rates also returned to their pre-attack levels—an important detail, providing strong evidence for the legitimacy of the study's experiment. As we can see, exogenous police increases all over the world—from Buenos Aires to Washington D.C. to London—all resulted in a similar decrease in crime. These studies also show the effect of police on crime is highly localized, and that crimes that occur in public places, whether violent or non-violent, are deterred by police with an elasticity of at least -0.3. The effect of police on robberies differed for different studies with one theory that dictates because it is an economic crime, it is deterred, and another theory arguing that because it occurs in private dwellings rather than public, it is not deterred. Nonetheless, these studies provide strong evidence that an increase in police presence reduces public crimes.

DeAngelo and Hansen's 2010 study uses the layoff of 35% of the Oregon State Police force in 2003 from budget cuts due to Measure 28 to estimate the effects of an exogenous decrease in police on highway injuries and fatalities. The elasticity of injuries and fatalities with respect to police was estimated between -0.29 and -0.57. They also estimated the effect of trooper employment on fatalities from 1979 to 2005 in Oregon, Idaho, and Washington and found a similar trend with an elasticity of -0.18 for all roads, and -0.49 for highways outside of city limits under pleasant weather. Although this only applies to roadway regulations, this study is particularly important as the decision to speed or violate traffic laws applies to a different group of criminals than

studies that test Part I criminals, like most studies presented in this paper. Besides

contributing to the police-crime deterrence literature, this study and ones like it have

strong implications for public policy involving roadway safety and fatalities.

Two recent racial profiling scandal studies used a decrease in the number of

arrests as a measure for an exogenous decrease in police activity, rather than an actual

increase (terrorist attack studies) or decrease (budget cuts) in police force presence.

Thus, these studies are interesting because the police force size and hours remained

constant, meaning it was police discretion rather than exogenous factors (hiring/firing,

increase/decrease in work hours) that caused the change in arrest rates. Not only is this

important to test in its own right, but it reminds us of the discretion police have on the

job, which inevitably affects all studies done on the police-crime relationship. Shi's 2009

study uses a riot that resulted in Cincinnati after a white police officer shot dead an

unarmed black adolescent. Following the riot, media coverage, a Justice Department

investigation, and a racial profiling lawsuit resulted in a rise in police officers' expected

penalty from policing errors. Using January 1999 to March 2001 as a comparison group,

arrests dropped significantly through the remainder of 2001, especially for crimes

where police had to be proactive, where there was more room for potential policing

error. Importantly, black arrest rates fell at a greater rate than white arrest rates. Felony

crimes rose substantially. Heaton's 2010 study used a racial-profiling scandal in New

Jersey with the intention of estimating the effect of the scandal and subsequent

antiprofiling reforms on policing. The scandal began in 1998 when a white police officer shot four black men and one Hispanic man driving, all unarmed, causing a state investigation. Furthermore, the New Jersey State Police Superintendent at the time was fired after publicly stating that minorities were more likely to be involved in cocaine and marijuana drug crimes, signaling to officers that new reforms would mean zero-tolerance of racial profiling. Before the scandal, arrests for motor vehicle theft for blacks and whites were comparable while after the scandal, arrest rates for motor vehicle thefts by blacks decreased by a statistically significant 31%, and continued decreasing through at least 2003, while motor vehicle thefts in neighboring Connecticut remained constant. Heaton's lower estimates of elasticities for auto theft by blacks after the scandal, -0.20 to -0.57, show that decrease in police presence towards blacks led to a substantial increase in auto thefts by blacks. Thus, profiling policy walks a fine line between unintentionally encouraging crime in minority areas and violating minorty rights through wrongful stops. Both of these studies not only creatively support the police-crime deterrence hypothesis, but also reveal that police are sensitive to racial scandals and their specific contexsts.

Natural Experiment Methodology: Analysis

The natural experiment literature has come a long way since Andenaes' initial study. Studies using terrorist alerts, police layoffs, and racial profiling scandals all

reflect some degree of criminal reaction to changes in police levels consistent with the police deterrent hypothesis. Despite those that criticize natural experiment studies for their lack of generalizability, the consistency of results, the variety of experiments, and the increasing number of geographic locations included in these studies over time arguably make these studies a stronger case for deterrence than those that must empirically grapple with the police-crime endogeneity problem. However, natural experiment studies generally use large—rather than marginal—changes in police force size. Thus, these studies may not be the best indicators for the magnitude of deterrence.

3.1.4   Instrumental Variables Methodology

In between panel technique studies and natural experiment studies, we have instrumental variables studies. Similarly to natural experiment studies, the validity of the instrumental variable methodology depends upon the ability to prove the instrument's ability to affect police and not crime. Here I will review studies using gubernatorial elections, firefighters, police-hiring grants, and state tax rates as instruments for police.

Instrumental Variables Methodology: The Studies

Levitt's famous 1997 study creatively used the timing of mayoral and gubernatorial elections as an instrumental variable for exogenous increases in police force size, as there is a disproportionate amount hiring of police during said elections.

Although Levitt's 1997 paper found that increases in police do reduce crime, McCrary (2002) found that the crime classification variables had severely biased standard errors because of a weighting error. McCrary concluded that, while police force size is correlated with electoral cycles, his replication of Levitt's study with correct weighting errors showed that using elections as instrument for exogenous increases in police did not show correlating changes in crime; however, this is because elections do not provide enough of an exogenous increase in the police force to be used to estimate the effect of police on crime, making it an ineffective instrument. In 2002, Levitt published another study in reply, using the number of firefighters and other municipal employees as an instrument for the number of police officers. Using the same two-stage least-squares method, Levitt found elasticities of approximately -0.44 violent crimes and -0.50 for property crimes, thus falling within range of most other studies of this paper, despite the fact that firefighters may not be the most precise instrument.

Interestingly, two studies (Evans and Owens 2007, Worrall and Kovandzic 2007) both measuring the effect of the Community Oriented Policing Services (COPS) program that provided almost $5 billion in grants for police hiring as a result of the Violent Crime Control and Law Enforcement Act in 1994 were both published in journals in Februrary 2007 with differing conclusions. While Worrall and Kovandzic used the grant expenditures to test COPS' effect on crime, Evans and Owens first calculated how many officers were actually hired as a result of COPS, and used the

increase in the number of hired police officers (which is half of what it should have been

nationwide, given the grant's legal stipulations) to test COPS' effect on crime. While the

study using hired officers as the instrument found elasticities of about -0.8, -0.5, -1.2,

and -0.9 for auto theft, burglary, robbery, and aggravated assault , the study using

expenditures as the instrument found that COPS grants had little to no effect on crime.

Worrall and Kovandzic produced another study in 2010, this time using hired police

officers for the instrument like Evans and Owens (2007) did, rather than expenditures,

to test the effect of COPS grants on crime. They over-identified their model so that they

could use both relevance *and* validity testing to ensure that hired police officers were a

sufficient instrument, which other instrumental variable studies in this literature (Levitt

1997; Levitt 2002; Evans and Owens 2007) did not do, and found similar results to

Evans and Owens with elasticities of -0.76, -0.98, -0.14, and -0.36 for homicide, robbery,

assault, and burglary (Worrall and Kovandzic 2010). This not only set a precedent for

over-identifying instrumental variable models in the future for this literature, but also

further shows that expenditures are not a worthy predictor of police force size.

Lin (2009) used variations in state tax rates after 1980 as an instrumental variable

for the size of the local police force. Because state sales tax leads generates state

revenue, which is transferred to local governments, lagged state sales taxes reflect a

budget constraint on police, which directly affects how many police officers can be

employed at any given time. Over-identified two-stage lease square results, which are

significant and more negative than OLS results from the police-crime endogeneity problem, showed that police do have a deterrent effect on property and violent crime, with elasticities of -0.9 and -1.1 respectively.

Instrumental Variables Methodology: Analysis

Finding an adequate instrument is difficult. The COPS grants studies (Evans and Owens 2007, Worrall and Kovandzic 2010) and the state tax study (Lin 2009) are the strongest since the instruments are proved as both relevant and valid, and because the change in police force size is relatively marginal over a large area. Because a real change in the size of the police force as a function of policy is likely to be marginal, just as the COPS grants and state tax studies show, these studies provide policy-relevant magnitudes, especially when juxtaposed against natural experiment studies, which are typically characterized by large and unusual changes.

3.2   Explaining Change in Police Force Size

In the U.S., municipalities range from having less than one officer per 1000 residents to having up to ten officers per 1000 residents (Ruddell and Thomas 2009). Given this precedent along with the general knowledge that police do reduce crime, it is natural to ask: *What causes the change in police force size?* Answering this question could help policymakers can make informed legislation with the goal of increasing the police force size to reduce crime. The most common theories for variation in police force size

are rational public choice theory, conflict theory, and organizational theory. Below, I

discuss these three theories, dividing conflict theory into the economic and the social,

and the more recently tested local politics theory.

3.2.1 Rational Public Choice Theory

Rational public choice theory states that public demand for governmental action

and/or resources influences government policies. It expects that population and crime

rates are good predictors of changes in police force size. However, research of this

theory has mixed results. In a 2001 report to the National Institute of Justice, the authors

concluded from reviewing available literature that while rational public choice theory

may factor in with administrative rules of thumb, this theory is too simple; other

factors, such as social and political variables, need to be present (Koper, Maguire and

Moore 2001). A recent 2012 study by McCarty conducted a fixed-panel effects analysis

to determine which factors affected police force size in the 1990s in the U.S., and found

no support for the rational public choice perspective. However, it is very possible that

private security officers, who are more likely to be deployed in high crime counties than

the police are, and even outnumber police in some jurisdictions (Ruddell, Thomas and

Patten 2010), may have an effect on the public demand for public police and crime rates.

This suggests that it would be more useful if studies that measure changes in police

force size also included private police as a variable.

3.2.2 Economic Conflict Theory

Economic conflict theory assumes resource scarcity causes competition among economically unequal groups. The idea is that the wealthy have more influence over the government than their poor counterparts, enabling them to protect their wealth and interests through the government from the poor. Taking police into account, this means that the size of the police force would be dependent upon the perceived level of threat from the poor towards the wealthy. Despite that the evidence is not entirely consistent, there is strong evidence for economic conflict theory (Koper, Maguire and Moore 2001). Both domestic and cross-national studies show economic inequality resulted in more police; some studies even showed that economic inequality was consistently more correlated with police than crime rates, and that higher income per capita is associated with more police per 10,000 residents; private police follow the same pattern (Ruddell, Thomas and Patten 2010). One recent study testing the 1990s concluded that social conflict (economic and racial) theory was the best predictor for police strength in addition to police budget constraints (McCarty, Ren and Zhao 2012).

3.2.3 Racial Conflict Theory

Racial conflict theory has the same structure as the economic conflict theory except replacing the poor in economic conflict theory with racial or ethnic minority groups. Thus, the size of the police force would be dependent upon the perceived level

of threat from racial or ethnic minorities towards racial or ethnic majorities. Evidence

has been found that the presence of non-whites is correlated with fear of crime for

people regardless of their own race and actual crime rates (Stucky 2005). Research

shows that blacks and the size of the police force have a curvilinear relationship,

meaning that the threat associated with a minority black population will increase until

the black minority becomes the majority, at which point the threat level associated with

blacks decreases (Stucky 2005). One study used regional news stories across 66 U.S.

cities to find that police force size is highly correlated with cities that experienced race

riots from 1980 to 2000 (Sharp 2006). Although the majority of the racial conflict

literature is about blacks as the minority group because of their unique history in the

U.S., other minority races are increasingly included in the literature. A review by Sever

(2003) of the racial conflict theory shows that police employment is related to racial and

ethnic minority presence in 23 out of 28 studies; the remaining five studies found no

relationship (Sever 2003). Furthermore, the report to the National Institute of Justice

shows—out of all the independent variables used in 59 studies that addressed the

police-crime endogeneity issue—percent nonwhite is the second best predictor of police

force size, only behind violent crime (Koper, Maguire and Moore 2001). Even though

only 48% of those 27 studies found a positive correlation and 15% found a negative

correlation (Koper, Maguire and Moore 2001), percent nonwhite is still one of the best

predictors in the police strength literature, which is supported by more recent empirical

studies (McCarty, Ren and Zhao 2012). Recent literature also showed that blacks (and the underclass) are a better predictor of police strength and private security strength than crime rates (Ruddell, Thomas and Patten 2010).

3.2.4 Organizational Theory

Organizational theory posits that the internal organization of police agencies is responsible for changes in police force size. This theory argues that changes in police force size are marginal from the previous year. Expectantly, research concludes that previous police strength is shown to be the best predictor for current police strength (Stucky 2005). The report to the National Institute of Justice stated that of 15 studies that used police employees as an independent variable, 93% of the studies found a positive correlation (Koper, Maguire and Moore 2001). They also found that of 13 studies, police expenditures were positively correlated to police strength 54% of the time (Koper, Maguire and Moore 2001), supporting that police expenditures is a subpar measure for police strength in comparison to police officers. While the marginal changes of police strength make organizational theory strong, it is not surprising. However, supportive evidence for this theory confirms that the police force size studies measuring marginal effects may be better estimates of magnitude of how police affect crime for policymakers. For example, organizational theory tells us that the COPS grant studies

are more helpful for policymakers than most of the natural experiment studies

concerning magnitude of the deterrent effect of police.

3.2.5   Local Politics Theory

A relatively new addition to this literature is local politics theory, which dictates

that local forms of government and local politics are able to predict police force size.

Although early measures of local government form found that local government form

did not affect police strength (Stucky 2005), more recent and thorough studies testing

for multiple political variables have found evidence that police strength is affected by

local politics. For example, Stucky (2005) found from a sample of over 945 cities that

cities with unreformed political systems—such as mayor-council governments, district-

based city councils, and partisan elections as defined by urban politics literature—had

more police per 1000 residents than cities with reformed political systems. Ruddell and

Thomas (2009) used cross-national data to find that political factors—namely durability

of the political regime, corruption, a black market, and state formation—are all

significantly correlated with police strength. Conversely, a recent empirical study

countered Stucky's 2005 study with results showing that the local politics theory fails to

explain police strength while socioeconomic factors, such as local crime rates and

minority populations, was the better predictor (Zhao, Ren and Lovrich 2012). More

research needs to be done on the local politics theory to get a more consistent idea of its predictive power for police strength.

3.3   Police Force Size Conclusions

The evidence is consistent that an increase in the police force size does reduce crime. Figure 2 shows the range of elasticities by crime type across methodologies for studies that reported their elasticities. Elasticities for total crime range from -0.14 to -0.4, with most near -0.30. Rape was statistically insignificant for a majority of the studies, which is not surprising given that incapacitation dominates deterrence for rape (Levitt 1998). Similarly, assault was only statistically significant for two studies, both testing the effect of COPS grants. Violent crime rate, minority presence, and economic inequality are the top predictors in police force size.

Because an increase in the police force size deters crime, an increase in the police force size would also lead to decreased arrest, court, prison, and victimization costs. A cost-benefit analysis per crime type would have to be assessed to find the optimal amount of money that should be allocated towards police officer hiring. Right now, about 60% of the criminal justice budget goes towards policing (U.S. Census Bureau 2011).

While violent crime rates lead to an increase in the police force size, an increase in the police force size does not necessarily lead to a decrease in violent crimes,

particularly rape and assault; about half of the studies showed a deterrent effect on homicide, and a majority did for robbery. Evidence shows that economically motivated criminals respond more to police deterrence than do violently motivated criminals. If we want to live in a democratic society, the police force size should not be fluctuating with minority presence or inequality. Thus, police force size is not correlated with any factors that would be theoretically rational nor socially responsible. This suggests that policies could be written to help mitigate this fluctuation. Because we know that the police sentinel role and police apprehension role are the two most important deterrence mechanisms in the criminal justice system, policymakers could allocate money away from other justice system costs and towards policing costs during economically difficult times in order to minimize fluctuation of the police force size. More reasons to mitigate this fluctuation are presented in the next section.

4   Police Deployment Strategies

This section reviews two literatures concerning police deployment strategies. The first literature answers the question: *Which police deployment strategies effectively deter crime?* Because police exercise a substantial amount of discretion in their activity, section 4.2 addresses the question: *What affects street-level behavior of police?* If policymakers want to implement effective policing strategies, they need to be aware of

what incentives are in place currently and how they affect police behavior so that they

can increase the likelihood that effective policing strategies will be implemented.

4.1   Literature by Strategy

There is controversy around police deployment strategies and their effects on

crime. Because strategies are more empirically difficult to test than a rise or fall in police

levels, there is much speculation on whether certain strategies have a significant effect

on crime or not. Because the studies testing strategy are limited in time and

geographical scope because they must verify that the strategies were actually

performed in order to make the results valid, this makes the results of individual

studies difficult to generalize. However, consistent evidence for a policing strategy
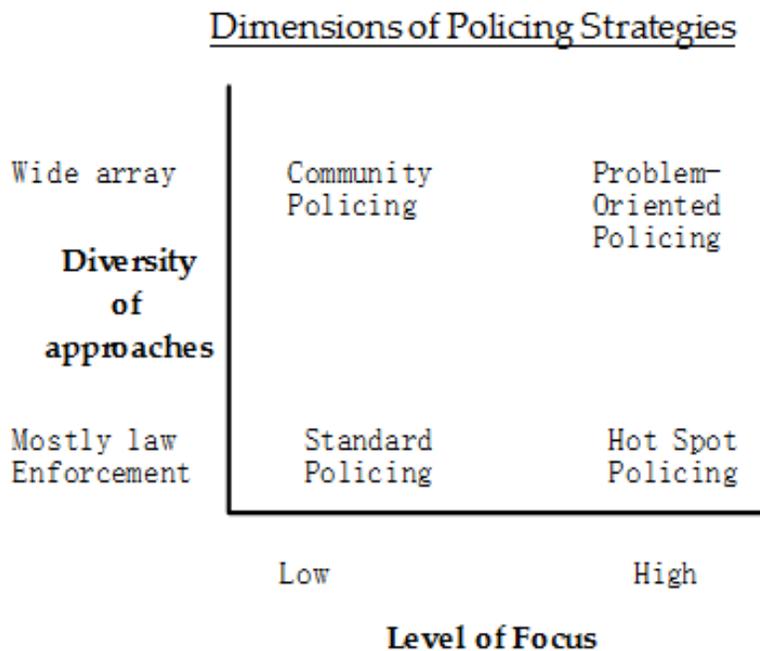
Dimensions of Policing Strategies

Wide array	Community Policing	Problem-Oriented Policing
Diversity of approaches		
Mostly law Enforcement	Standard Policing	Hot Spot Policing
	Low	High

Level of Focus

Figure 3

across different areas and time periods from many studies can help us see which strategies are effective.

Allocating police resources in a way that heightens the perceived risk of apprehension is an efficient use of police resources. Using Weisburd and Eck's (2004) dimensions of policing strategies, we can compare strategies by the diversity of approaches, or practices police use, as well as by the level of focus, which is either widespread or targeted, as seen in Figure 3. Although broken-windows policing is really a subsection of standard policing, its controversial nature warrants its own subsection. Furthermore, crackdowns will be discussed under the similarly defined hot spot policing section, and focused deterrence strategies will be discussed under problem-oriented policing.

4.1.1   Standard Model

Standard Model: Theory and Background

The standard model of policing began with the professionalization of the police force in the 1930s in the U.S., which mainly consists of reactive strategies spread over the entire public (Telep and Weisburd 2012). Despite the fact that the standard model of policing has been consistently criticized by scholars over the last three decades, it still remains the main form of policing today (Weisburd and Eck 2004). Here, I will discuss three strategies that fall under the standard model umbrella that are the most relevant

to police deterrence including reactive arrest rates, rapid response to emergency calls, and random patrols.

The theory behind reactive arrest rates is that the more arrests police make of criminals reported by citizens, the less crime there will be overall. Intuitively, this threat of being reported to the police to all people results in a thinly spread risk for criminals, especially knowing that police choose not to arrest suspects that they legally could have a majority of the time (Sherman, et al. 2002). This fact revealed a divide between upset crime victim advocacy groups who argued that more arrests would lead to less crime and some police whose experience led them to argue that arrests, particularly for misdemeanors, make criminals more likely to reoffend than if they had not been arrested.

The theory that the faster police arrive in response to emergency calls leads to less crime has garnered much attention. The idea is that rapid response to emergency calls will reduce harm done to the victim through police intervention on the scene, act as a deterrent effect through increasing the certainty of arrest for the criminal for response-related crimes, and will increase the risk of incapacitation of the criminal through time-sensitive evidence from response-related arrests (Sherman, et al. 2002). However, these hypotheses all assume that victims or bystanders call police during or directly after a crime, meaning that testing for the effectiveness of rapid response to

emergency calls requires precise knowledge of when a person at the scene called related to when the crime occurred, and how long it took police to respond.

Random patrols policing was put into practice as police moved away from beat schedules of specific times and places and towards rapid response to emergency calls. The idea is that unpredictable patrols construct a sense of police omnipresence, thus raising the risk of committing crime anywhere for criminals (Sherman, et al. 2002).

Standard Model: Evidence and Analysis

There is little evidence to support neither general deterrence nor specific deterrence for reactive arrests. For juveniles and the unemployed, reactive arrests only serve to increase the likelihood of their reoffending, as experienced police officers had argued (Sherman, et al. 2002). On the other hand, reactive arrests for the employed decrease the likelihood of their reoffending (Sherman, et al. 2002). This is potentially because adolescents and the unemployed have more economic incentives to commit crime, and low opportunity costs, whereas the opposite is true for employed individuals. Thus, Bayesian updating may occur after the arrest cost is incurred: for adolescents and the unemployed, the arrest cost is found to be low for the net reward from offending whereas the arrest cost for the employed is found to be high compared to the net reward from offending.

The first studies on rapid response to emergency calls produced strong support for the hypothesis. However, the weak design and small scope of the studies led to the famous Kansas City study in 1977, which divided crimes by involvement so that they studied only victim-offender involvement crimes, and divided the response time into reporting time, dispatch time, and travel time (Sherman, et al. 2002). The study found that there was no correlation between the probability of arrest and the total response time once the total time exceeded 9 minutes. Because it was found that the reporting time takes 41 minutes on average, this study suggested that focusing on rapid response to emergency calls was a waste of tax dollars for crime prevention. When the police chiefs of the Police Executive Research Forum announced that they did not think people would take so long to call the police in their communities, the study was replicated in four other cities. In that study, almost half of involvement crimes were reported 5 minutes or more after the crime occurred. Thus, focusing tax dollars on decreasing travel time of the police to the scene when almost half of those crimes were reported at least 5 minutes after the crime occurred for the small proportion of crimes that are involvement crimes would likely result in a large net cost.

There is weak evidence for random patrols. While one study shows an effect but with no significance tests and two studies show no effect of crime from increasing foot patrol and police cars, all of the studies have a poor methodological design since it is difficult to measure far-spread patrols, and because the patrols were not randomized

(Sherman, et al. 2002). Measuring patrols accurately is particularly important for foot patrol studies as police have less incentive to patrol by foot as it takes more work, it may be unpleasant depending on the weather (Sherman, et al. 2002), and because the proactive arrests that would be potentially done by foot patrolists are more high-risk than reactive arrests are. For example, the racial-profiling scandals discussed in section 4.1.3 (Shi 2009, Heaton 2010) provide examples of the types of risk associated with proactive policing.

Thus, it is easy to see why the standard model of policing is continually criticized by scholars. Reactive arrests, rapid response to emergency calls, and random patrols are the norm despite evidence that they do not increase the risk of apprehension for criminals.

4.1.2   Broken-Windows Policing

Broken-Windows Policing: Theory and Background

The most recent policing strategy falling under the standard model is James Q. Wilson and George Kelling's broken-windows theory, which implies that an increase the certainty of punishment for minor offenses will reduce the number of more serious offenses as a result of police signaling social and physical order and control. The theory was made famous from its implementation by New York City Mayor Giuliani and Police Commissioner Bratton in the early 1990s. Bratton believed that the significant

decrease in crime in New York in the 90s was a result of the broken-windows theory in practice (Corman and Mocan 2005). From the reactive arrest strategy discussed in the last subsection, we know that the more legalized processing of juvenile suspect, the more likely a juvenile will have a higher the official recividism rate, which potentially contradicts this theory for juveniles.

Although the national media gave New York City policing strategies credit for the falling crime rates of the 1990s, Levitt (2002) explains how crime rates decreased *nation-wide* in the 1990s, the NYC police force grew 45%—three times the national average—between 1991 and 2001, and crime began to fall years before broken windows implementers Mayor Giuliani and Police Commissioner Bratton were in their respective positions[8]. Furthermore, although Bratton described the broken-windows theory as implementing psychological, law-and-order signal to criminals, the fact that this theory and its implementation in New York City were widely advertised might have signaled to criminals that a greater proportion of police resources were going to be devoted to less serious crimes, decreasing the probability that a criminal would be apprehended for a more serious crime. For instance, there is evidence that the allocation of police resources towards drug crime and away from property crime resulted in an increase in property crime (Benson 1992). If the scarce-resource theory of police holds true for other

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[8] The drop in crime in NYC began in 1990 while the implementers of the broken-windows theory, Mayor Guiliani and Police Commissioner William Bratton, were not appointed until 1994; homicide declined sharply in 1993, and is the only exception of a change in pace (Levitt 2004).

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crime classifications, it is possible that broken-windows policy plans intended to decrease serious crimes may actually increase them, ceteris paribus. In addition to potentially allocating police in an inefficient way through the broken-windows theory, there are other potential social costs of the broken-windows theory, such as excessive misdemeanor arrests diminishing future labor market opportunities for misdemeanor-criminals, and potentially violating civil rights of minorities (Corman and Mocan 2005). It has been recently argued that the political elite continually support broken-window policing—despite the lack of evidence—because it serves their interest to commodify and exploit urban areas (Kramer 2012). Thus, since its founding, the broken-windows theory is highly controversial.

Broken-Windows Policing: Evidence and Analysis

In 2001, Sousa, along with one of the founders of the broken windows policing strategy, Kelling, conducted a study using a multilevel research design and mid-to-late 1990s New York City data, and found a strong relationship exists between minor crime arrest rates and crime rates (Harcourt and Ludwig 2006). However, Harcourt and Ludwig (2006) argue that Sousa and Kelling's 2001 study suffers from mean reversion, meaning that the precincts whose crime rose the most during the 1980s crack epidemic were the same precincts that received intensive broken windows policing in the 1990s; evidence shows that the precincts with the greatest increases in crime also showed the

greatest drops in crime later. Most of the studies conducted on broken windows

policing use New York City data in the 1990s, and thus mean reversion inherently

affects them all. In order to circumvent this mean reversion problem, Harcourt and

Ludwig (2006) used a natural experiment from the U.S. Department of Housing and

Urban Development (HUD) called Moving to Opportunity (MTO), which randomly

assigned 4,600 low-income families from high-crime public housing to more orderly

and advantaged neighborhoods in New York, Chicago, Los Angeles—the three biggest

implementers of broken windows—as well as in Baltimore and Boston. They found

from MTO data that people moving from less orderly areas to more orderly areas did

not lead to a reduction in their criminal behavior, which directly contradicts the broken

windows theory of how social and physical orderliness of places affect people's

individual criminal behavior. This is the strongest evidence in the broken windows

literature, as it randonly and exogenously tests the broken windows theory in multiple

cities.

Similarly to Kelling and Sousa (2001), Corman and Mocan (2005) used

misdemeanor arrests to measure New York City's broken-windows strategy on all

seven Part I crimes using monthly data from 1974 to 1999. They found that, when

controlling for economic conditions and deterrence[9], misdemeanor arrests have a small

and significant effect on reducing certain crimes. They found elastitices of -0.16 to -0.21

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[9] The authors controlled for real minimum wage, unemployment rate, felony arrests, prison population, and the size of the police force.

for motor vehicle theft, -0.25 to -0.32 for robbery, and -0.05 to -0.06 for larceny; ther was

no impact on murders, assault, rape, or burglaries. Although this study technically

supports the broken windows theory because misdemeanors *do* have a small effect on

some serious crimes, the largest effect on felonious crimes are felony arrest rates. This

suggests that, if the goal is to reduce felonies, police resources are better spent on

increasing felonious arrest rates rather than misdemeanor arrest rates. Despite the fact

that Corman and Mocan conclude that broken windows is not an effective use of scarce

police resources, their results were still attacked by Harcourt and Ludwig (2006), who

argued that times series data covering one city is not enough to prove causal evidence

of broken windows. For example, they graphed times series data of New York City

homicides with Yankee championships to show the relationship between homicide

rates and city-wide sentiment which was either positive with Yankee wins, or negative

with Yankee losses. This so-called Broken Yankee Hypothesis was not rigorously tested,

but showed that there are other trends that correlate with crime rates, particularly in

New York City in the 1990s. This suggests the small numbers Corman and Mocan did

find concerning broken windows are questionable in their validity.

For more recent studies conducted testing the broken windows hypothesis both

in New York City and elsewhere, mixed results have been found with supportive

results being modest at best. Jang, Hoover, and Lawton (2008) conducted a study

measuring the effect of broken-windows policing on clearance rates, or the proportion

of crimes solved the by the police relative to total crimes committed, of Part I crimes. Using Texas data from 1990 to 2004 and a multivariate linear model, they found that broken windows positively affected burglary and auto theft clearance rates, and negatively affected larceny clearance rates. One study using New York City data from the 1990s to test the broken-window theory on homicide rates through Bayesian heirarchical models found that misdemeanors did have an effect on gun-related homicide (Cerdá, et al. 2009). A 5000 increase in misdemeanor arrests was significantly associated with a drop of 3.5 homicides despite the fact that misdemeanor arrests were also associated with *less* physical order (measured in the study by sidewalk cleanliness), which combats the general premise of the broken-windows theory. A very similar study conducted by many of the same authors, also using 1990s New York City data and Bayesian heirarchical models to test the effect of broken-windows policing and other theories on gun-related homicides found that while increase in crack cocaine use and gun availability was associated with specific gun-related homicides, no evidence was found to support the broken-windows theory (Chauhan, et al. 2011).

There is evidence that criminals respond to allocation of police among different crimes. For example, Benson and Rasmussen (1998) found that when more police shifted towards drug crimes and away from Part I crimes, Part I crimes rose in response to a reduction in police enforcement on those crimes. This suggests broken windows could potentially have the opposite effect intended: if criminals learned that police were

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spending more of their time on misdemeanors and less of their time on Part I crimes, that actually decreases the risk of apprehension for committing a more serious crime.

In this way, the little evidence there is for the broken windows theory is extremely weak in validity and small in magnitude. The two studies (Harcourt and Ludwig 2006, Cerdá, et al. 2009) that directly tested the idea that social and physical order reduces individuals' propensity to commit crime produced no evidence of support. Thus, even if broken windows does have a small effect on more serious crimes, the effect is too small to warrant further testing of this theory or the continued practice of broken windows policing.

4.1.3   Hot Spot Policing

Hot Spot Policing: Theory and Background

Before hot spot policing became prominent, police crackdowns were nationally popular in the 1980s in the U.S. where sudden increases in policing resources are allocated either towards specific crimes, or towards specific geographical areas with the intention of increasing the perception of the certainty of punishment. The latter half of the crackdown definition overlaps with the more modern hot spot policing, a strategy where police focus on patrolling high-crime areas at high-crime times in order to effectively reduce crime.

Hot spot policing makes sense given that on average, 50% of calls to the police or experiments are from less than 5% of streets (Telep and Weisburd 2012). Because crime is not proportionately spread out among a city, or even a neighborhood, it follows logically that hot spot policing would be more effective than if police were evenly distributed around a city or neighborhood. Sherman, Gartin, and Buerger (1989) found evidence supporting the difficult-to-test sociological 'routine activities' theory which posits that criminal activity is the culmination of likely offenders, suitable targets, and the absence of capable guardians against crime in a nonrandom space or time. Using spatial data such as addresses and intersections of police calls in Minneapolis over a year, the authors found that 50% of the calls came from the same 3% of places. Specifically, all robberies came from 2.2% of places, all rapes came from 1.2% of places, and all auto thefts came from 2.7% of places within the city. This early study provides evidence that hot spot policing would be more effective than random or dispersed policing. Although the call data is limited, local, and may be imperfect due to underreporting or over-reporting, this study was an important first step using economic analysis to test a sociological theory that reminds us micro-level spatial data (i.e. blocks rather than neighborhoods or cities) is essential to utilize for efficient policing. Similar results have been found in other cities; for example 50% of crime happened in 4-5% of street segments in Seattle, Washington (Durlauf and Nagin 2011). Thus, crime can theoretically be deterred by increasing the risk of apprehension in high-crime areas.

Because crackdowns evolved into hot spot policing in both practice and in the literature, I will review the evidence for crackdowns, and then the more plentiful and recent evidence for hot spot policing.

Hot Spot Policing: Evidence and Analysis

Sherman's 1990 paper found that fifteen of eighteen crackdowns studied had initial deterrent effects. Only two of the crackdowns had long-term effects, which began to dissipate after a short time, sometimes even when crackdowns through police presence or increased arrests continued. This suggests criminals may adapt to increased policing levels if the crackdown is too long in duration. However, five studies showed continued deterrence, or 'residual deterrence,' after the crackdowns had ceased. In fact, two of those five crackdowns had residual deterrence lasting longer then the crackdown itself. This evidence shows that crackdowns can be effective. The author suggests short-term, rotating crackdowns may be an effective deterrent method, and that more research needs to be done to distinguish what crime classifications crackdowns work on, and in which geographical areas crackdowns are effective.

Using a panel technique for its temporal sequencing advantage, Kane's 2006 study tested apprehension threat on crime using both raw arrests as well as arrests per officer, which theoretically reflects crackdowns. For New York City from 1989 to 1998, Kane found that raw arrest counts were largely not significant unless they were

controlled for the structural, spatial, and squared arrest count variables. Arrests per officer did not predict assault, supporting the suppressible crimes theory in that crimes that are not economically motivated or committed in public be difficult to deter through increased risk of apprehension. Conversely, using arrests per officer, robbery and burglary initially decreased; then, when an upper threshold of arrests per officer was reached, robbery and burglary rates increased. Similar to a majority of the case studies covered by Sherman (1990), crime was initially deterred, and then returned to its previous levels. This pattern even emerged in the early literature plagued by the police-crime endogeneity problem. Although it is clear from section 3 that police expenditures are not a good measure of police force size or police force arrest rates, Cameron's (1988) review of early studies showed that increases in police expenditures deter crime in the short-run before crime returns to its previous equilibrium. However, it is important to note that Kane's (2006) study did not directly test crackdowns, as the study did not have adequate information to tell if increases in arrests per officer was the result of standard patrols or though intentional police crackdowns, which is why this—and other policing strategies—are difficult to empirically test and quantify. Despite this, Kane's (2006) study also shows the importance of examining the types of arrest strategies rather than just measuring the quantity of arrests.

Strong evidence for hot spot policing began with the implementation and excellent record-keeping of The Minneapolis Hot Spots Patrol Experiment. In the

experiment, police patrolled 55 hot spots randomly picked from 110 identified hot spot blocks, which were then patrolled 2-3 extra hours during high crime hours for ten months (Sherman and Weisburd 1995). They found that the hot spots relative to control hot spots received statistically significant fewer calls (6-13%) to the police and less observed disorder, confirming increased policing in hot spot areas moderately deters crime. They found a strong relationship between length of police patrol presence, which was 14 minutes on average, and the amount of time the hot spot was crime-free after the police left. The longer police were present, the longer it took a crime or disorderly act to occur after the police left up to 15 minutes, after which point the relationship reversed (Telep and Weisburd 2012). The "Koper curve" suggests optimal hot spot patrol time is 15 minutes. Koper's correlational analysis is comparable with Sherman and Weisburd's: about twice as much patrol presence and half as much crime in extra-patrolled hot spots (Sherman, et al. 2002). Furthermore, Koper's analysis of hot spots and Sherman's analysis of crackdowns promote a similar random rotation of policing high-crime areas.

Braga, Papachristos, and Hureau (2012) reviewed 19 studies that provided 25 tests of hot spot policing in 16 different U.S. cities and one in Buenos Aires (reviewed in section 3.1.3) ranging from 1989 to 2011. They found that 20 of the 25 studies showed significant decreases in crime in treatment hot spots as compared to control hot spots for violent crime, property crime, drug offenses, and disorder offenses.

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A recent implementation of Koper and Sherman's recommended 15 minute

rotating hot spot strategy occurred in 2011 by the Sacramento Police Department in

which police officers randomly patrolled hot spots for 15 minute intervals for 3 months.

Treatment hot spots received significantly fewer calls to police for service and Part I

crimes as compared to the control groups and as compared to the same time period in

2010 (Telep and Weisburd 2012).

Most empirical studies show no displacement of crime to places near patrolled

hot spots, and some even report diffusion of crime control benefits, meaning that crime

decreased in areas immediate to treated hot spots. For example, Weisburd and Eck

(2004) reviewed evidence that no significant displacement effects occurred near policed

hot spots, such as in the Jersey City Drug Market Analysis Experiment, the New Jersey

Violent Crime Places experiment, the Beat Health study, and the Kansas City Gun

Project. They found one report of direct displacement of crime occurring in the

immediate area of the hot spots. Similarly, of 17 studies that included displacement

analyses in Braga, Papachristos, and Hureau's review (2012), six studies reported no

displacement effects, and eight reported significant diffusion effects.

Routine activity theory implies that crime would be displaced to other hot spots

as crime is likely to only happen in certain times and in certain places, limiting the

number of alterntives for criminals (Sherman, et al. 2002), although this may not hold

for drug crime, which as mixed results of displacement. One article (Betteridge 2004) reviews evidence from a case study that cracking down on drug users and drug dealers only displaced the market, and may have increased health and social costs, showing that crackdowns may only work for specific crimes; Sherman (1990) found mixed effects of police crackdowns on drug markets. It is possible crackdowns would work most effectively on crimes included in the suppressible crimes theory. However, the mixed results for drug crime could be the result of different policing tactics used at the hot spots concerning drug crime. Nonetheless, a majority of the studies show no displacement effects, or diffusion of crime control benefits in surrounding areas.

In this way, the evidence for random, rotating crackdowns and hot spot policing of about 15 minutes in duration are strong given the concentration of crime at specific areas, and given that most evidence shows either no displacement of crime or a reduction in crime in immediate areas.

4.1.4 Problem-Oriented Policing

Problem-Oriented Policing: Theory and Background

While problem-oriented policing is often used within hot-spot policing, it is a strategy that can be applied in other settings. Problem-oriented policing is a proactive strategy where police find the root of the cause of crime patterns to prevent them from occurring, rather than treating the symptoms. This concept was introduced by Herman

Goldstein in 1979 who thought that police had become too focused on the means of policing, and not enough on the goals of deterring crime (Weisburd, Telep, et al., The Effects of Problem-Oriented Policing on Crime and Disorder 2008). Problem-oriented policing was not widely adopted until the 1990s (Weisburd and Eck 2004).

The problem-oriented process can be identified as the SARA model where police first 'scan' to identify and prioritize problems, 'analyze' to develop and appropriate response to the problem, 'respond' to the problem, and then 'assess' the effectiveness of their response (Telep and Weisburd 2012). Nonetheless, its creative approach makes it difficult to define. Some common strategies within problem-oriented policing include removing or controlling criminogenic commodities, such as guns, cash, or moveable property, and preventing the convergence of offenders and victims in time and space (Sherman, et al. 2002).

Another more specific creative approach to crime is focused deterrence strategies, popularly known as 'pulling levers' from its implementation by Operation Ceasefire in Boston, Massachusetts. Gangs were notified that violence would not be tolerated, and that if violence did occur, every legal lever would be pulled against them for certain and immediate apprehension (Telep and Weisburd 2012). Kleiman has termed a similar approach 'dynamically concentrated sanctions,' which also uses announcing to potential criminals in order to deter them from crime. In this strategy,

police announce sanction priority—say on Al—which then leads to compliance by the Al since the risk of apprehension for Al is almost certain. Bob, who sees Al complying, then realizes that the police are freed up from policing Al, and could now focus all of their attention of Bob, which raises Bob's risk of apprehension, and thus Bob also complies (Kleiman 2009). Thus, 'whoever steps forward first dies' is the threat implemented, which increases the risk of apprehension for everyone, leading to a low-violation equilibrium (Kleiman and Kilmer 2009). As we can see, there are powerful theoretical grounds for announcing warnings of certainty of apprehension to potential criminals in a small hot spot area that could lead to lower arrest rates (and thus, lower incarceration rates) and higher deterrence of crime.

Problem-Oriented Policing: Evidence and Analysis

Weisburd and Eck (2004) reviewed evidence that problem-oriented policing can moderately reduce fear of crime, both violent and property crime, youth homicides by firearms, prostitution, and drug dealing. A 2010 review of ten studies with randomized experiments or with control comparisons showed 8 out of 10 had results with statistically significant reductions in crime (Durlauf and Nagin 2011). A review of problem-oriented policing studies following the SARA model showed that 10 experimental and quasi-experimental studies—included in the review for their methodological rigor—had a significant yet modest impact in reducing crime and

disorder (Weisburd, Telep, et al., The Effects of Problem-Oriented Policing on Crime and Disorder 2008). Studies using weaker methodologies because of the lack comparison groups were found to have consistently positive results, showing the persistence and strong positive impact of this policing strategy (Weisburd, Telep, et al. 2010).

Furthermore, using problem-oriented policing within hot spots is shown to be effective at reducing crime (Weisburd and Eck 2004). For example, a recent study in Florida compared standard patrol to problem-oriented policing at violent crime hot spots (Taylor, Koper and Woods 2011). They found that while the standard patrol hot spots resulted in a decrease in crime in the area, this only lased during the 90 days in which policing saturated the area. Conversely, the hot spots using problem-oriented policing did not experience a significant drop in crime during the 90 days of the experiment, but the following 90 days after the experiment showed a 33% decrease in violent crime. Following Weisburd and Eck's (2004) strong evidence for problem-oriented policing in conjunction with hot spot policing, a recent review of 25 studies testing the effect of hot spot policing by Braga, Papachristos, and Hureau (2012) show that problem-oriented policing at hot spots is more effective at crime reduction than standard model tactics at hot spots. Thus, hot spot policing combined with problem-oriented policing is consistently shown to have strong deterrent effects on crime.

Focused deterrence strategies, a specific type of problem-oriented policing used in hot spots, use enforcement announcements of warnings to increase the risk of apprehension for would-be criminals in order to deter crime. Operation Ceasefire was associated with significant drops in the homicide rate for young adults in Boston (Telep and Weisburd 2012). Although the study was not randomized, comparing Boston to other U.S. cities and other cities in Massachusetts showed that the decline in homicide in Boston was distinctive (Telep and Weisburd 2012). Because focused deterrence strategies are a type of problem-oriented policing, they still must be tailored to the situation, and not simply replicated. For example, a focused deterrence strategy similar to Operation Ceasefire was implemented in Lowell, Massachusetts, except it had to be tailored because the Asian youth gangs that were the targets were well organized and secretive, and thus had low street presence, making police signaling more difficult. Because these gangs were connected to gambling operations run by older Asians, the task force signaled to the gaming operators that gaming would be shut down if youth violence occurred, resulting in a strong deterrent of violent crime (Telep and Weisburd 2012). Kleiman and Kilmer (2009) cited an example of the dynamically concentrated sanction strategy being used in a hot spot for drug dealing, although they did not explicitly use these terms. Police had been combating a crack market in High Point, North Carolina for two decades, finding that arresting dealers randomly only led to their replacement, and the market remained stable. Instead, police developed felony

cases against all active dealers, prosecuted those involved with violence, and met the non-violent dealers to tell them they would go to prison if the continued selling drugs. Not only did the crack market in the area disappear, but it did not return, showing the potential strength of dynamically concentrated sanctions. They key to this strategy is to distinguish the most threatening criminals from those who are just 'color-wearers,' and to announce sanction priority on them (Kleiman 2009). In a review of studies using focused deterrence strategies, the ten of eleven studies focused on policing showed significant reductions in crime (Telep and Weisburd 2012). Thus, problem-oriented policing in hot spots, in addition to police announcing warnings to specific groups in order to raise the risk of apprehension to a high level—potentially along with other costs—is shown to be highly effective at deterring crime.

4.1.5   Community Policing

Community Policing: Theory and Background

Although community policing takes many different forms, the central idea is that involving the public in public safety through implemented programs will create a safer community. Global research in the late 1980s found that community-based crime prevention, reorientation of patrol activities to emphasize nonemergency serving, increased accountability of the public, and decentralization of command can all be considered as community policing (Skolnick and Bayley 1988). Its elusive definition can

make it difficult to test and compare studies. For example, foot patrol used to be an

essential part of community policing in the 1980s, but not necessarily today (Weisburd

and Eck 2004). In the U.S., community policing can include neighborhood watch, police

storefronts, dissemination of information from the police to the public, and community

accountability conferences (Sherman, et al. 2002).

Community Policing: Evidence and Analysis

From a review of case studies of community policing from around the world,

Skolnick and Bayley (1988) have concluded that community policing can benefit the

community through better crime prevention, increased public scrutiny towards the

police, greater accountability of police towards the public, and encouragement of

women and minorities to work with the police. The authors found that community

policing also benefits police politically because it helps police meet the needs of the

community, and increases police morale and work satisfaction. Because community

policing is a drastic step in the opposite direction of today's accepted police

professionalism, and because it requires systematic change, it can be difficult to adopt

politically, organizationally, and intellectually, and could potentially make room for

corruption. Conversely, Weisburd and Eck (2004) reviewed that the evidence shows

that community policing, such as neighborhood watch, community meetings, storefront

officers, foot patrol, and coordinated community policing do not reduce crime, although they may reduce the fear of crime.

Sherman and Eck reviewed studies of many community policing strategies (Sherman, et al. 2002). They found that neighborhood watch did not reduce crime. Neighbors in high-crime areas distrust each other, and thus are less likely to mobilize, although having meetings in public places are shown to be an effective way to combat this problem, even though it does not reduce crime. Four of seven door-to-door studies, which test the effect of police going door-to-door to collect and disseminate criminal information, found moderate crime prevention, namely for minor property crimes. While police storefronts are popular, studies testing the impact of police storefronts in Houston, Texas, Newark, New Jersey, and Birmingham, Alabama are showed no evidence of crime reduction. The flow of information from the police to the public, whether or not including specific data about recent crime in the area, showed no impact on crime rates. Thus, most community policing strategies do not reduce crime, and there is weak evidence and small magnitude for door-to-door policing.

However, there is a growing body of literature that suggests that the perception of police legitimacy by the public does deter crime. Skogan (1994) found that six of six community policing evaluations found a positive or improved perception of the police by the public. Sherman and Eck reviewed studies that showed evidence that domestic

violence arrestees who were treated respectfully by the police were the lowest repeat

offenders for domestic violence, and that there was lower recidivism rates for arrestees

if police listened to their side of the story (Sherman, et al. 2002). Furthermore, Sherman

and Eck reviewed evidence that community accountability conferences led by trained

police and involving friends and family of both the victim and the offender are

conducted as a mediation to come up with a repayment of the crime's costs from the

offender to the victim, which increases the public's perception of police and justice,

regardless of the outcome (Sherman, et al. 2002). Consistent evidence supports that the

more respectful police are towards suspects and citizens, the more likely people are to

comply (Sherman, et al. 2002). Thus, increasing police legitimacy through respectful

police manners and positive interactions with the public may work to indirectly reduce

crime.

4.2   Explaining Police Behavior

If we know which policing strategies are effective and which are not, learning

what affects police behavior is the logical next step. In order to make police institutions

effective, it is necessary to know what incentives police respond to.

Police have a large amount of control over the allocation of resources and police

officers over time, space, and crime classification. They have the power fulfill their

sentinel role or their apprehender role and the capability of poor performance and

corruption. They decide when to file reports, when to confront suspicious persons, who to prioritize assistance to, and how aggressive to be. In this way, if policing strategies other than the current standard are to be put into place, incentives play an essential role in making policing strategy policy a reality on the streets.

4.2.1   Economic Incentives

Mas (2006) shows how police are no exception to the labor studies theories that job performance declines with pay raises below a certain reference point. The author found that after police officers in New Jersey lost arbitration, arrest rates and average sentence lengths declined while crime reports rose as compared to when they won. In fact, police officer performance declines in proportion to size of the gap between requested wage and actual wage. The number of crimes cleared through arrest increased by 12% following arbitration when the police received higher wages. However, this study only measured the effectiveness of police in their apprehension role, so the impact of wage is unclear on how it affected sentinel policing.

Cooper's (2005) model explaining the variation in police wages using economic, political, and demographic variables shows that policymakers are responsive to the public's opinion on police wages, and that collective bargaining does result in higher police wages. Wealth of an area, measured by the median house price, strongly affects police wages, showing that policymakers are constrained by the capacity to generate

revenue. However, cities with higher tax rates do not necessarily translate into higher police pay. Crime, measured as motor vehicle theft, strongly affects police wages. This makes sense given that police use Part I crime rates as the primary statistics to lobby for larger budgets (Benson and Rasmussen 1998). Cooper's (2005) model shows that population density, population growth, and calls for services do not directly affect police wages. Thus, wealth and crime rates are found to strongly affect police wages, which in turn affect police performance.

The fact that police wages are heavily influenced by crime rates (Cooper 2005) suggests that police have a disincentive to deter crime. Similarly, Benson and Rasmussen (1998) found that police are incentivized to be reactive and wait for calls rather than to be proactive and deter crime not only because reactive policing is less prone to error and is less energy intensive, but because higher crime rates are used to show a demand for police for larger police budgets, and arrest rates are used to measure police effectiveness. Police agencies use budget-maximizing techniques, such as utilizing crime data, in order to gain a larger budget (Ammons and Edwards 2008). This implies that police may be more likely to gain a higher salary based on reactive policing, and that proactive policing may actually hurt their salary, or even lead to police layoffs from decreasing the crime rate through deterrence. A radically different method for allocating the police budget and wages could not only be more efficient, but

could be designed to incentivize proactive deterrence rather than to incentivize reactive

arresting as is the incentive structure now.

Mast, Benson, and Rasmussen (2000) confirm through a robust empirical model

that policies that allows police to keep seized assets increases proportion of drug arrests

to all other arrests by about 20% while drug arrest rates themselves increase 18%. This

shows that police have a substantial amount of discretion in resource allocation, and

that incentives for increased wage do drive policing discretion. The Comprehensive

Crime Act of 1984 began this incentivizing toward drug crimes (Benson and Rasmussen

1995). Thus, it is important for policymakers to keep monetary incentives in mind when

prioritizing crime types and strategies.

4.2.2   Neighborhood Effects

Many researchers have speculated that neighborhood characteristics may

influence police behavior on the job. Smith (1986) used bivariate and multivariate

analyses to study sixty neighborhoods from three large U.S. cities to test their

correlation with police officer behavior. The author found that police officers in racially

heterogeneous neighborhoods offer more assistance to residents and make more contact

with potential suspects or suspicious persons. While suspicious persons are less likely

to be stopped by police officers in high-crime areas, they are three times as likely to get

arrested in lower-status neighborhoods despite the crime, race, and demeanor of the

offender, and victim preferences regarding criminal arrest. Likewise, police are less

likely to file reports in high-crime neighborhoods; it is possible that offenses must reach

a higher threshold of seriousness in high-crime areas in order to merit being reported. A

more recent study found that for burglary, race, and social disorganization negatively

impacted police recording decisions, potentially because police find the victim

unworthy or because poor victims are less likely to be insured (Varano, et al. 2009).

Smith (1986) found that coercive authority is more likely to be used by police in high

crime areas, lower-status neighborhoods, and in primarily black or racially mixed

neighborhoods. A recent study (Smith and Holmes 2014) found evidence for the

minority threat hypothesis which states that the greater the proportion of the minority

population, the greater the use of coercive tactics by police.

An increasing number of studies find that disrespectful policing leads to less

compliance (Gottfredson, et al. 1997). Weisburd and Eck (2004) cite two studies that

used systematic observation of police-citizen interactions in three cities showed that

citizens likelihood of compliance was reduced with disrespectful police officers. This

implies that if there is less compliance in high-crime areas, it is likely disrespectful or

aggressive policing plays a role. Furthermore, citizens are less likely to call the police in

nonemergency situations if citizens were forcibly searched or searched without arrest

(Lerman and Weaver 2014). Therefore, it's important to address these behaviors when

implementing policing strategies.

4.2.3 Corruption and Caution

The discretion police wield on the street, which is extremely difficult to monitor and control, can result in corrupt police and overly-cautious police. New policing strategies such as problem-oriented policing and community policing, which require contextualization and discretion, mean that police organizations are moving towards police officer autonomy rather than stricter police management (Skogan and Meares 2004). This can be a problem as it was found in the late 1990s that three-fourths of officer on-duty time was spent doing activities that their superiors had not instructed them to do (Matrofski 2004). While most officers stay out of trouble over the course of their career, proactive tactics require a high amount of discretion, making them prone to error (Skogan and Meares 2004). Corruption for personal gain is a problem that is particularly difficult to study and control because of the range of activities and potential corruption network that may exist. The high level of discretion combined with a low-visibility decision-making in an environment with tempting gains makes it easy for police to do things like accept bargains from or rob drug dealers, prostitutes, or others that police routinely interact with (Skogan and Meares 2004). While police have argued that statistically it makes sense to include race in the myriad of reasons to stop someone, others have replied that this bias proved that the criminal justice system unfairly targets black males (Skogan and Meares 2004). It is difficult to gain the benefits while

minimizing the costs of police discretion, and so far there are no easy answers on how to accomplish this.

While there are ample opportunities for police error and corruption, scandals can be an effective tool against them, although they may result in overly-cautious police. For instance, a corruption scandal can reduce organized corruption in the short-run; the long-run effects depend upon if policy reform is made or not (Skogan and Frydl 2004). Likewise, racial-profiling scandals are shown to reduce police's use of proactive, or discretion-heavy, policing techniques, and to reduce arrests of minority groups (Shi 2009; Heaton 2010). However, this reduction in minority arrests led to significant increases in crime rates by minorities (Shi 2009; Heaton 2010). Therefore, while racial-profiling scandals may be beneficial for civil rights, it may make police overly-cautious towards proactive policing strategies, which are shown to be the most effective policing strategies. It is possible hot spot policing data can help mitigate racial-profiling issues.

Some scholars are beginning to use an integrity measurement through police survey data in order to identify which police organizations have high integrity levels, and if they correlate negatively with corruption levels (Skogan and Frydl 2004). Similarly, some advocate studying police culture to control police discretion, which includes ideas such as exercising control over police through police legitimacy and understanding internalized beliefs and norms of police (Matrofski 2004). However, the

empirical research done to measure police agencies is small and weak. One large

obstacle is that we have yet to set standards for measuring police discretion, which

makes it difficult for researchers to judge what is helpful and what is not helpful in

controlling police discretion (Matrofski 2004). Most funding for studies concerning

criminal justice goes towards studies focused on what prevents crime or reduces the

fear of crime, but little has been allocated towards how to control police discretion

(Matrofski 2004). The lack of research in this area presents a huge problem for

implementing policing strategies, especially error-prone proactive strategies, effectively.

4.3   Police Deployment Strategies Conclusions

Rotating, problem-oriented policing at hot spots for 15 minutes is shown to be

the strongest policing strategy; problem-oriented policing and hot spot policing are also

moderately effective used separately. As we can see from Figure 2, the more focused the

policing strategy, the more effective deterrent they are likely to be. This means

geographically measuring hot spots and allocating more police to under-policed hot

spot areas, as well as training police to use SARA, focused deterrence, and dynamically

concentrated sanction strategies is ideal. In order to conduct dynamically concentrated

sanctions effectively, police must learn to collect information in order to identify the

more threatening criminals from the mere 'color-wearers,' and prioritize sanction on

them publically. Just as hot spot policing focuses on high-crime areas, dynamically

concentrated sanctions focus in on high-crime criminals. The reason problem-oriented

policing is a more effective deterrent strategy than standard policing—even if they are

both implemented in hot spot areas—is because problem-oriented policing focuses on

eradicating the roots of crime while standard policing is more focused on arrests. In

other words, problem-oriented policing forces police to take on their sentinel role

whereas standard policing is more focused on filling the apprehender role. In fact,

reactive arrests for juveniles and unemployed people can actually be criminogenic.

Because a majority of offenders are repeat offenders, proactive arrests towards repeat

offenders would be an effective use of police resources. Furthermore, while community

policing is not an effective crime deterrent in itself, it may be indirectly as a budding

literature suggests that increasing police legitimacy decreases crime.

It is also important to train and incentivize police to focus on deterring Part I

crimes rather than focusing on arrest rates. Because police agencies use crime rates and

arrest rates to lobby for larger budgets, this provides a disincentive to deter crime, and

an incentive to remain reactive apprehenders. Giving police more job security through

ensuring less police fluctuation from changing crime rates and arrest rates is important.

Because we know that police are economically incentivized, it may be possible to set up

within police agencies a way for police to gain bonuses through deterring crime rather

than through drug busts. At the very least, the government needs to stop using crime

rates and arrest rates as the only measures for police demand and police effectiveness.

This is problematic because, for instance, if the police force size was reduced in response to falling crime rates, crime rates will rise in response because there are less police sentinels and apprehenders present. Thus, greater police force size is partially responsible for a drop in crime rates because of their deterrent ability, and removing police would increase the probability of success for the criminal and lead to more crime. It would be better to include a measure to determine how effective police are in their sentinel role rather than solely measuring the effectiveness of police in their apprehender role. In this way, in order to implement focused, proactive strategies, the economic incentives surrounding police need to encourage the sentinel role, which is another reason why minimizing the police force size from fluctuating is important.

The fact that police are less likely to write reports and are more likely to use coercive authority in high crime areas and towards minority populations is problematic, particularly if we want to implement problem-oriented and hot spot policing tactics. Focusing on deterring crime rather than arrest rates must first take root in police officers' minds before we can expect results.

5   Conclusions

A radical reconstruction of police agencies towards problem-oriented hot spot policing with minimized police force size fluctuation and the appropriate incentives in place could drastically reduce crime, and thus the total social costs of crime. This

evidence shows that increasing sentence lengths and policies like mandatory minimum sentencing cannot be supported by deterrence theory alone. Structurally incentivizing police to take on the sentinel role will help reduce overcrowded prisons, and will subsequently help the criminal justice system regain its sanction capacity, an important piece of deterrence theory. We can agree with Mark Kleiman that police have the greatest potential of all the actors in the criminal justice system to reduce crime because, as the old chess maxim goes, "the threat is stronger than the execution."

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