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Is New York City Safer After the 9/11 Terrorist Attack?

Evidence from examining the effect of police presence on crime.

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'Ubi societas, ibi lex'

"*Where there is society there is law*"

I. Introduction

Does increased law enforcement personnel deter crime? In his famous theory established in 1968, Becker[1] argued that criminal activity is determined by the relevant costs and benefits of such an action. In other words, a person will commit a crime if his expected utility from doing so is larger than the expected cost of getting arrested. Hence, it would be reasonable to argue that when the society increases the amount of monitoring and/or the penalties for crime, the crime rate should go down. The majority of the early studies however, found no support for the hypothesis that more police reduce violence, creating an environment of suspiciousness among most economists[2]. In particular, Cameron's survey indicates that 18 out of the 22 papers examined are not capable of capturing the negative relationship between the variables. The significant challenge in the crime literature is therefore, to identify and study the causal effect of observed police presence on crime using empirical evaluations. The reason behind this, is the deep reverse causality problem involved, according to which, it is not unreasonable to assume that societies employ more police when higher crime rates are, or expected to be, observed.

Societies' cardinal interest to build a safer and healthier environment is mainly associated with the expenditure of huge amount of money on policing. Particularly in the United States of America the annual bill is over $65 billion[3], making the identification of public policy

[1] Gary Becker (1968). "Crime and Punishment: An Economic Approach". *The Journal of Political Economy* 76: 169-217.
[2] For the relevant survey see; Cameron, Samuel (1988). "The Economics of Crime Deterrence survey of Theory and Evidence". *41 Kyklos 301*, 323
[3] Gifford, Silva Lea (2002) "Justice Expenditure and Employment in the United States, 1999". Bulletin No.NCJ 191746. Washington, D.C.: US Department of Justice.

consequences a crucial issue. In this paper I will use a different approach to address this problem and strive to identify the correct direction of the causal effect.

This paper uses a natural experiment to break the endogeneity circle. On September 11th, 2001 the terrorist attack in New York City led to the collapse of both buildings of World Trade Centre causing the death of a large amount of people and putting pressure on the homeland security. USA's government response was immediate, part of which was the instant, and later on lasting, police allocation around the institution. This ground-shacking event therefore, induced a distribution of police forces that is believed to be completely exogenous to crime and thus uncorrelated within a crime regression. The approach diverges from the commonly used method so far, since it enables me to examine and estimate the effect of police presence on crime without having direct data on police recruitment and allocation, due to public confidentiality and unavailability.

The rest of the paper is organised as follows. In section II, I will discuss the relevant literature to which my paper contributes. In section III, I will describe the collected data and in section IV will present my empirical strategy as well as the main results drawn. Finally, section V concludes, among others, that New York is safer.

II. Literature Review

In 1997, Levitt[4] was the first to do a sensible analysis on examining the effect of police presence on crime. He showed that the endogeneity problem involved in such studies could be broken by identifying variations in police presence that were not caused by variations in crime. He stated that police presence actually increased in mayoral and gubernational election years but the same is not true for the off-election years. Additionally, he argues that since crime is unlikely to be correlated with election timing, this identification and empirical strategy can in principle break the specified 'vicious' circle. In the case of OLS, Levitt finds the same results as the previous literature i.e. that increased policing leads to more crime. However, when running a Two Stage Least Squares (2SLS) regression using elections as an instrument for policing, it is concluded that observed police presence significantly reduces violent crime[5].

On July 18, 1994 terrorists exploded a bomb that destroyed the main Jewish Centre in Argentina. The consequences were severe since eighty five people died and many more were seriously wounded. Argentina's government responded immediately to the event by assigning police protection to every Jewish and Muslim institution in the country. Since this event can be assumed to be entirely exogenous to crime, Di Tella and Schargrodsky[6] use a natural experiment

[4]Levitt, Steven (1997), "Using Electoral Cycles in Police Hiring to Estimate the Effect of Police and Crime", *American Economic Review*, 87:270-290

[5] McCrary in 2002 in a paper called, "Using Electoral Cycles in Police Hiring to Estimate the Effect of Police and Crime: Comment", *by Justin McCrary*, points out that there were some computational errors when using the 2SLS method in the Levitt paper, which weakens the results. He argues that "It turns out that the precision of the murder estimate is due to a weighting error. The weighting procedure was designed to give relatively more weight to crimes with lower year-to-year variability. However, an error in Levitt's computer program accomplished exactly the opposite." Levitt in return, through his paper, "Using Electoral Cycles in Police Hiring to Estimate the Effect of Police and Crime: Reply", acknowledged these mistakes and thanked McCrary for his careful work.

[6] Di Tella, Rafael and Schargrodsky, Ernesto (2004), "Do Police reduce crime? Estimates Using the Allocation of Police Forces After a Terrorist Attack." ,*American Economic Review*,94:115-33.

to address the problem of the endogeneity involved and study the effect of police presence on crime, in particular on car thefts.

They use the blocks closest to the Jewish and Muslim building as a treatment group and blocks further away as a control group. They then implement a difference-in difference model to study if there is a change in the blocks with an increase in policing. They actually show that blocks around an institution receiving additional police protection, experience significantly fewer car thefts than the rest of the neighbourhoods. The difference-in difference estimator indicates a reduction of 0.081 car thefts per month in the specific protected blocks .Relative to the average number of car thefts per month and block, car theft decreased by a significant 75 percent. The effect is however extremely local as police does not reduce car theft one or two blocks away. It is also argued that any incapacitation effect should affect all blocks, not only the Jewish-Muslim blocks, so they believe they study deterrence.

The problem with crime is that it is often not reported. The authors argue however, that car theft is reported on a usual basis of approximately 87 percent as insurance reasons are entailed. Is the shock to the police force, however totally exogenous to crime? It is arguable that the attack happened within the country's boarder and thus it is possible that for some short time the criminals were directly affected. An additional limitation derives from the fact that it would not be favourable to extrapolate car theft and talk about crime in general. Finally, for more robust results, one would want more treatments in an experiment and use more than one exogenous event.

Following Di Tella and Schargrodsky, Klick and Tabbarock[7] use the terror alert level as an instrument, which actually fell and rose four times. On March 11, 2002, the office of

[7] Klick, Jonathan and Tabbarock, Alexander (2005), "Using Terror Alert Levels to Estimate the Effect of Police Presence on Crime", *Journal of Law and Economics*, 68:267-79

Homeland Security introduced the Homeland Security Advisory System to inform the public and other government agencies about the risk of terrorist attacks. During high-alert times, the police forces increased their presence on the streets of Washington D.C. enabling the authors to use high-alert periods to break the circle of endogeneity, and estimate the effect of police on reported crime.

They initially study what happens to crime in Washington D.C. during high-alert periods and find that crime decreased by an average of seven crimes per day. They then divide the town into districts and assume that the National Mall Area (where the White House, the Congress, and the Smithsonian are located) received most of the increased police attention. This implies that they use a difference in difference analysis, having this district as a treatment group and all other districts as control groups. They conclude that crime overall decreased in the districts of the control group by approximately 2 crimes per day.

The major concern of this study is that there might be a direct link between the terror alert level and the crime level, in the sense that higher crime levels may increase the alert level. At this case the possibility of spurious correlation among the variables is higher within the setup and biased results may arise. They assume that the increase in policing was larger in the White House area, which may be true, but in a perfect experiment the control group must not at all be affected by the exogenous event.

In a recent paper, Poutvaara and Priks[8] use changes in the allocation of Stockholm Supporter Police following the 9/11 terrorist attack and the tsunami incident on December 2004, to clean for the causality problem. After the attack, the unit was monitoring a Stockholm mosque

[8] Poutvaara and Priks (2007), "Hooliganism in the Shadow of a Terrorist Attack and the Tsunami. Do Police Reduce Group Violence?" ,Helsinki Centre of Economic Research, Discussion Papers No.134

instead of Stockholm hooligans, while after the tsunami it was responsible for incoming goods of Swedish victims.

The key aspect of their analysis is that the changes in the allocation of the supporter police are exogenous to domestic hooligan violence, as both events took place outside Sweden's boarders. They start by using the tsunami event to determine the ice hockey violence and then the 9/11 terrorist attack for football related violence. Both of the police reallocations generated very large changes in violence. Stockholm violent acts went up by 273 percent during tsunami period and by 322 percent during the terrorist attack period. It is argued that results must be interpreted with attention as they rely on a small number of observations. My major concern regarding this paper lies on the 'originality' of the data used, since these come from hooligans themselves and may capture more violence than data from police. Furthermore, I argue that it is debatable how hooligans had such specific information on the police reallocation giving them a chance to be more violent.

III. Data Description

On September 11th, 2001 a series of coordinated terrorist attacks happened upon the United States of America. On that day, nineteen terrorists associated with the al-Qaeda organisation took control over four airliners with main target to damage critical US institutions such as the World Trade Centre (WTC) in New York City and the Pentagon in Virginia. American Airlines Flight 11 and United Airlines Flight 175 crashed into the World Trade Centre in lower Manhattan resulting in the collapse of both buildings and causing numerous deaths of innocent people. In addition, American Airlines Flight 77 crashed into the Pentagon causing additional severe damage and putting a huge burden on the homeland security of the country.

Due to the importance of the event, US government response was immediate and within hours of the attack, an extensive Search and Rescue (SAR) operation was established. The New York's City Fire Department (FDNY) deployed straight away half of their units to the scene putting lots of effort to the rescuing of people. In addition, New York's City Police Department Emergency Service Units (ESU) and other police personnel rushed to the scene. Nevertheless, the process of recovery lasted considerably longer than was expected: for several weeks the buildings' remnants were still smoking. Indeed, it is crucial to note that the clean-out was not completed until May 2002. Therefore, it is evident that increased police presence did not cease until then.

Thus, this shocking event brought about a geographical allocation and distribution of police staff which can be presumed to be exogenous when examining the effect of police presence on crime. Consequently, the terrorist attack of 9/11 can be used as a natural experiment to break the simultaneous determination of observed police presence and reported crime within a crime regression. I should stress here, that this kind of exogeneity will clean for the reverse

causality problem many authors have experienced before and will yield negative effects of observable police on crime.

It is natural for one to inquire into whether, and if yes to what extent, police officers responsible for the protection of the WTC and the damaged buildings around it, constitute effective crime-combating units. Firstly, it should be conceded that such officials possess a rather limited scope for pursuing potential criminals and other suspects that do not fall within their assigned responsibilities and tasks. Nevertheless, it is also true to argue that the policemen in question are able to pursue suspects near their posts or, alternatively, transfer valuable information they collect to near-by patrol cars. What is more, potential criminals will be deterred by the presence of such officers in that they will frequently expect them to intervene. Whatever the theoretical considerations may be, it is evident that anti-crime action is frequently undertaken, in practice, by the officers guarding specified institutions.

My approach diverges from the commonly used methods, since I will estimate the specified effect without having direct data on police enforcement, allocation and distribution among New York City, as those are confidential and unavailable to the public. Data on crime were collected from the New York State's Division of Criminal Justice Services (DCJS), being the only institution providing annual data sorted by county and I expect them to be characterized by trustworthiness and consistency. The data used are a panel of the five counties of New York City; Bronx, Kings, Manhattan, Queens, and Richmond, with observations ranging from 1997 to 2006.They consist of all components of violent and property crime; murder, rape, robbery and assault as well as burglary, larceny and motor-vehicle theft. Finally, additional variables such as population, per-capita income and unemployment rate were added to be controlled for[9].

[9] Refer to Bibliography-Internet Material.

Table 1-Average Values of Violent and Property Crime

Variable	Bronx	Kings	Manhattan	Queens	Richmond
Population	1,028,308	2,437,079	1,404,085	2,121,999	424,137
Violent Crime	15,061	23,643	14,288	13,176	1,621
Murder	160	239	106	107	15
Rape	394	577	303	314	40
Robbery	6,036	11,084	6,747	6,325	491
Assault	8,471	12,743	7,132	6,430	1,075
Property Crime	30,903	54,493	54,883	46,909	6,514
Burglary	6,098	11,198	6,799	8,824	1,000
Larceny	19,101	33,879	44,341	27,326	4,372
Motor Vehicle Theft	5,704	9,416	3,743	10,759	1,142
Unemployment Rate	8.79	7.78	6.17	6.26	6.18
Per-capita Income	20,651	25,251	84,239	26,063	34,299

Given the average values presented above, it is evident that for all five counties there is less than one reported crime per ten individuals.In particular the lowest values for violent and property crimes respectively, are observed for the county of Richmond. The specified ratio accounts for 0.04 violent and 0.02 property crimes per ten individuals constituting Richmond the safest county of all five within the city of New York. On the other hand, it is evident that Manhattan residents are on average more exposed to both types of crime, with approximately half a reported crime per ten people. Property crimes for almost all counties in the sample are more than twice as high as violent crimes, with the maximum value observed in Manhattan. The broad variation of the crime data across the regions, enables me to rank overall the respective

counties starting from the safest as; Richmond, Bronx, Queens, Manhattan and Kings. It is interesting to notice that following Manhattan, Richmond has on average the second highest per-capita income value among the counties as well as a very low unemployment rate. Finally, the lowest value of per-capita income and the highest unemployment rate are observed within the county of Bronx.

Examining the overall trend of both violent and property crime within the New York City it is evident that for the respective period both series follow a decreasing trend. Throughout the indicated period, violent crime has been reduced by 44% where more than the half decrease taking place between the 2001-2006 sub-period. In addition, property crime has overall decreased by approximately 42% experiencing however a 21% fall in the post attack period.

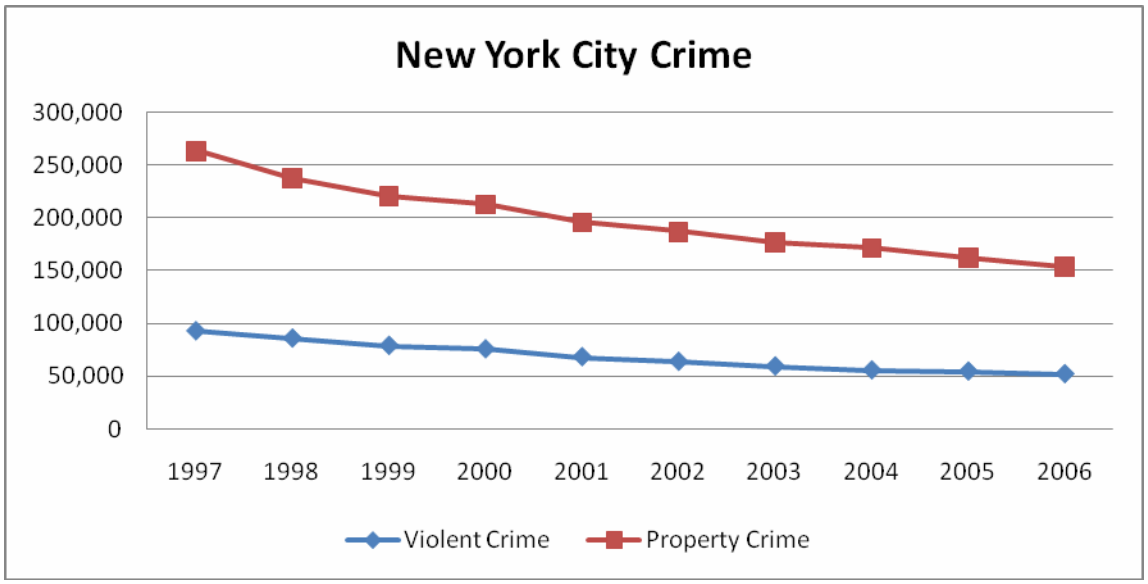

Figure 1: Trends in Crime

It is evident therefore, that both violent and property crime have experienced their largest decrease in the period after the terrorist attack of September 11th, 2001. These rapid downward trends in crime in line with the exogenous allocation of police forces induced by the 9/11 terrorist attack, constitute a healthy and promising environment for the examination of reported crime.

IV. The Effect of Police on Crime

IV.A .Empirical Strategy

The purpose of my study is to identify the causal effect of observed police presence on crime and to determine any intraregional changes in the volume of crime that may be present after the 9/11 terrorist attack. It is evident from section III that the population and crime rate differences between Richmond and all other regions are very large. Therefore, it is warranted not to focus my analysis on the said region in that it is 'incommensurable' with the other areas. More specifically, the effects that one may observe in regions with high populations may not even exist in areas with lower population, and vice versa. Also, the great proportion of the citizens of New York City reside in Bronx, Manhattan, Kings and Queens and thus granting Richmond merely a secondary focus in the analysis and will not but marginally, if at all, affect the credibility of the results and conclusions reached. Therefore, after identifying the right causal effect, my main objective is to examine the existence of significant post-attack crime changes across the four counties of New York; Bronx, Manhattan, Kings and Queens.

The empirical strategy formed and to be followed utilizes important aspects of my project's aim and the availability of my dataset. Firstly, the emplacement of police forces around the WTC is believed to be entirely exogenous and it is not derived from increasing crime trends. In other words, the allocation and presence of policemen around the WTC is not driven by increased crime levels in the region, but it is part of the government's immediate response to the event. Policemen were initially placed around the area of the WTC, following 9/11, for a multitude of reasons; importantly, none of which was concerned with increased regional crime level. Such reasons included, of course, cooperating with the firemen and helping with the rescue

of those who were wounded and those trapped inside the falling buildings in the first days of the tragic event. In addition, their deployment around the WTC was imbued with a symbolic character: to show the New York citizens that their city was not uncontrolled or in the lap of terrorists. Policemen had to be approachable and friendly towards citizens in order to calm them down in a period where New York and the U.S. as a whole were, arguably, on the verge of anarchy.

Secondly, my empirical strategy exploits the fact that data on different crime components are available both for the years before and after the terrorist attack, and most importantly are provided for each individual county exclusively. This allows me to 'investigate' the different regions separately and try to examine the extent to which crime was affected by the shocking event of September 11, 2001.With the use of the appropriate dummy variables (see below) I will capture any possible structural changes that occurred by making interesting and noteworthy comparisons to post-attack years .

Thirdly, the lack of data on police presence and distribution among the five counties of New York City deprives me from applying the general method used when examining crime;

$$Crime_{it} = \gamma_t + \lambda_i + \theta_j Police + \delta X + u_{it}$$

In the above equation, the left hand side variable captures all various components of crime one is interested to examine, while controlling for police presence as well as other possible determinants of crime, such as unemployment rate, per-capita income, educational levels etc, as captured by X. With the inclusion of state and time fixed effects one is able to identify and examine immediate causal effects of observed police presence on crime drawing various conclusions.

In my empirical strategy, consequently, to adjust for the absence of the 'police presence' variable from my regression, I need to proxy for it, by constructing applicable dummy variables which will capture the differences, if any, among the various regions. More precisely, I will examine the effect of police presence on crime using a modified version of the common regression, presented below;

$$Crime_{it} = c + \theta_j County_i * Post_t + \phi_j County_i + \gamma Post_t + \delta_k X_{it} + \varepsilon_{it}$$

where:

$Crime_{it}$ includes both violent and property crime, as well as their components,

$County_i * Post_t$ is the proxy for the police presence variable, where;

$County_i$ is a set of dummy variables that identifies each county specifically[10],

$Post_t$ is a dummy variable that is equal to 1 after the terrorist attack, and

X_{it} includes the variables per-capita income and unemployment rate.

Intuitively, the coefficient(s) on the dummy variable(s) 'county$_i$' will capture the reported crime within the specific region throughout the whole time-period from 1997 to 2006. Following some easy algebra steps, it is straightforward to notice that the average crime for the specified region prior to 2001 will be given by simply adding the constant and the coefficient of the specific dummy variable. In other words, the average crime for Bronx, for example, prior to 2001 will be given by the sum of the constant and the estimated coefficient on the Bronx variable.

[10] For example, dummy Bronx = 1 iff county="Bronx" and the same method is followed for all other dummies.

Furthermore, when interacting the variable ‘county$_i$’ with the ‘post$_t$’ dummy, then the additional effect of living in the specified region after the terrorist attack is identified. Following the same logic as before, the sum of the coefficients on the variable ‘post$_t$’ and any ‘county$_i$*post$_t$’ variable will bring about the changes in crime for the post-attack period, within the specified county.

Finally, intra-regional structural changes in crime before and after the attack will be calculated, yielding interesting results for every individual county. This will be achieved by simply calculating the ratio[11];

$$\rho_i = \frac{Post_t + (County_i * Post_t)}{c + County_i} \qquad \text{(Equation 1)}$$

IV.B. Results

The main concern when estimating an equation using panel data is the presence of correlation among the residuals over time. In such cases a downward bias of the standard errors is generated, inflating the magnitude of the t-statistics thus falsely increasing the significance of the estimated coefficients. Consequently, results are very likely to be biased and in some cases inconsistent. To clean for this problem I will add a time trend to my regression which will capture the specified correlation and reduce any possible biasedness of my results.

From an econometric point of view, it is interesting to notice that the calculated percentage changes[12] based on estimations derived from the ‘time trend’ specification are significantly smaller, and thus more realistic, to those based on the ‘no time trend’ specification (see Appendix B).

[11] For the case of Richmond: $\rho_i = \frac{Post_t}{c}$, will be used.

[12] Using equation (1)

Finally, it is important to state that in all regressions the county of Richmond is used as the default category. This is in line with the big difference of crime between Richmond and all other counties, as well as the population issues raised before in the paper. In addition, there was no log linear transformation on the variables, which enter the regression in absolute sizes. Hence the results cannot be interpreted in terms of elasticities.

(i) Violent Crime;

The estimating equation is given by;

$$ViolentCrime_{it} = c + \theta_j County_i * Post_t + \phi_j County_i + \beta Post_t + \gamma_k X_{it} + \delta Year + + \varepsilon_{it}$$

The first column of Table 2 reports the results when violent crime is the dependent variable, while its various components are presented in the other columns. Interpretation of the results will be distinct for each different variable.

Table 2: The Effect of Police Presence on Violent Crime

Variables	Violent-Crime	Murder	Rape	Robbery	Assault
Constant	1328208.* (4.885)	8055.726 (1.654)	25164.91 (1.650)	349828.1** (2.168)	945159.5* (6.513)
Bronxta	-4111.531* (-4.876)	-17.51603 (-1.160)	-114.6041** (-2.423)	-2078.227* (-4.155)	-1901.184* (-4.225)
Manhattanta	-4558.381* (-4.815)	-23.18322 (-1.367)	-17.86339 (-0.336)	-2559.976* (-4.558)	-1957.359* (-3.874)
Kingsta	-8466.331* (-9.956)	-19.23196 (-1.263)	-198.7893* (-4.168)	-4104.690* (-8.139)	-4143.620* (-9.133)
Queensta	-4369.544* (-5.185)	-14.09620 (-0.934)	-45.23047 (-0.957)	-2484.104* (-4.968)	-1826.113* (-4.056)
Bronx	15049.11* (13.568)	162.1654* (8.161)	380.2924* (6.111)	5937.860* (9.023)	8568.791* (14.474)
Manhattan	17932.90* (5.490)	91.74161 (1.568)	225.2728 (1.229)	9025.823* (4.657)	8590.063* (4.927)
Kings	27540.84* (31.178)	239.8018 * (15.154)	631.2467* (12.737)	12515.08* (23.881)	14154.71* (30.022)
Queens	13880.02* (18.385)	102.9303* (7.611)	304.7199* (7.194)	7167.007* (16.001)	6305.361* (15.648)
Post	3030.933* (3.860)	13.649 (0.955)	63.29619 (1.414)	900.7989*** (1.902)	2103.188* (4.937)
Unemployment Rate	63.71690 (0.458)	-0.907350 (-0.364)	20.96941* (2.685)	198.5089** (2.403)	-154.8540** (-2.084)
Per-capita Income	-0.050667 (-0.731)	0.000278 (0.224)	0.000964 (-0.248)	-0.024660 (-0.600)	-0.027248 (-0.737)
Year	-663.0484* (-4.858)	-4.023546 (-1.646)	12.65299 (-1.653)	-174.9981** (2.161)	-471.3737* (-6.472)
Panel Least Squares	Yes	Yes	Yes	Yes	Yes
N of observations	50	50	50	50	50
R-Squared	0.990006	0.964773	0.946294	0.983943	0.988990

Note: t-ratios below coefficients
* indicates significance at 1 percent level, ** at 5 percent and *** at 10 percent.

Violent Crime;

Coefficients on all county variables, capturing violent crime within a specific county throughout the whole time period, are positive and significant even at the 1% level. Interestingly enough, when examining the same counties for the post-attack period, coefficients remain significant but they are now experiencing a negative sign, indicating the drop in violent crime. Unemployment rate and per-capita income fall insignificant in the crime regression, indicating no special relationship between the variables.

Having said the above, intraregional changes in violent crime, calculated using equation 1, can be seen below;

Table 2a: Violent Crime

County	Percentage Changes
Bronx	-0.080
Kings	-0.401
Manhattan	-0.113
Queens	-0.099

It is evident that for all three counties violent crime decreased after the terrorist attack. In Manhattan violent crime decreased by 0.113% accounting for approximately 16 less violent crimes. The largest decrease is experienced within the Kings County, whose residents are now exposed to 0.401% less violent crime, i.e. on average, 95 less violent crime acts.

Murder;

When regressing for murder as a dependent variable, coefficients on most specific county variables yield positive and significant results, although the same is not true when examining the post-attack period. Despite the negative signs observed, it is evident that coefficients on all variables proxying for the police presence are not found to be significant at any level. In

addition, the variable ‘post’ is non-significant indicating that murder was not at all affected by the exogenous police deployment around the WTC after the attack .This is in line with the intentional character of murder as an act, where increased police presence around a specific region is less likely to affect it. This statement is consistent with the results found when examining murder. Finally, as it can also be seen from the figure, there is no particular pattern in the evolution of murder across time among the counties.

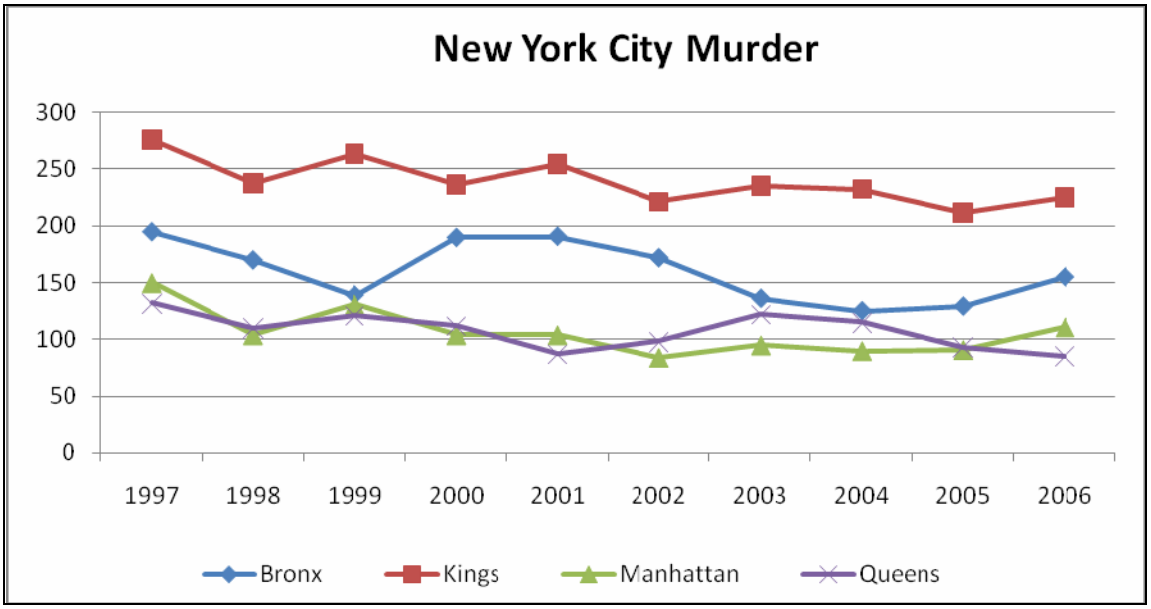

Figure 2: Trends in Murder

Rape;

Interestingly enough, the coefficient on the variable ‘post’ is non-significant when examining rape. This implies that calculating intra-regional percentage changes will be meaningless due to the insignificance of the results. Furthermore, although coefficients on all county variables, except Manhattan, are positive and significant, the county of Queens drops insignificant when examining the post-attack period. Finally, unemployment rate enters the regression significantly indicating that a 1% increase will increase the number of rapes significantly by an approximate factor of 20.

Robbery;

When regressing for robbery, all variables of the regression turn out to be in line with my expectations of significant and positive results throughout the whole time period within the different counties, and negative coefficients when examining the counties individually at the period after the attack.

Significant decreases in robberies are observed for all counties, with the largest decrease taking place within Kings.

Table 2b: Robbery

County	Percentage Changes
Bronx	-0.331
Kings	-0.884
Manhattan	-0.462
Queens	-0.443

In absolute sizes, Manhattan's robberies decreased by 31 acts while the relevant figures for Kings, Queens and Bronx are 98, 28 and 27 respectively.

Assault;

Finally estimating the crime regression for the last determinant of violent crime, assault, significance is still maintained for all counties. As it can be seen below, only Kings seem to be negatively affected, since for all other counties positive, but very small, percentage changes are found.

Table 2c: Assault

County	Percentage Changes
Bronx	0.021
Kings	-0.212
Manhattan	0.015
Queens	0.029

Based on the results presented above, I argue that the incident as such as well as the increased police presence around WTC seem that affected the criminals' decision to commit or not to commit a crime, contributing to the overall downward trend of violent crime over time.

(ii)Property Crime

In this section I will analyze the results derived from examining the variable of property crime as well as its determinants. The estimating equation is given by;

$$PropertyCrime_{it} = c + \theta_j County_i * Post_t + \phi_j County_i + \beta Post_t + \gamma_k X_{it} + \delta Year + \varepsilon_{it}$$

In the first column of Table 3, property crime is used as the dependent variable, while in the other three its determinants are examined separately. Due to the increased relative frequency of property crime to violent crime, it is evident that the magnitude of the coefficients when regressing for the former is much larger. In addition, the coefficients on all variables are found to be significant, indicating significant intra-regional changes in property crime among the different counties. In particular;

Table 3: The Effect of Police Presence on Property-Crime

Variables	Property-Crime	Burglary	Larceny	MV Theft
Constant	2665966.* (3.631)	762104.3* (3.394)	631851.5*** (1.735)	1272010.* (4.591)
Bronxta	-4624.897** (-2.031)	-2968.783* (-4.264)	-29.48327 (-0.026107)	-1626.631*** (-1.893)
Manhattanta	-14433.86* (-5.646)	-3028.556* (-3.874)	-9589.946* (-7.563)	-1815.354*** (-1.882)
Kingsta	-12840.18* (-5.593)	-4712.474* (-6.713)	-3766.101* (-3.308)	-4361.608* (-5.035)
Queensta	-17160.28* (-7.540)	-4391.875* (-6.311)	-5451.051* (-4.829)	-7317.354* (-8.521)
Bronx	20972.07* (7.001)	5869.117* (6.408)	9482.613* (6.383)	5620.334* (4.972)
Manhattan	81048.29* (9.187)	8662.545* (3.211)	70400.17* (16.090)	1985.584 (0.596)
Kings	51616.46* (21.637)	12389.00* (16.984)	28262.76* (23.887)	10964.70* (12.181)
Queens	48387.93* (23.733)	10308.80* (16.535)	23887.36* (23.622)	14191.77* (18.447)
Post	6973.089* (3.235)	1738.875** (2.638)	3145.591* (2.942)	2088.623** (2.568)
Unemployment Rate	309.7028 (0.824)	274.347** (2.386)	-111.3730 (-0.597)	146.7289 (1.035)
Per-capita Income	-0.039919** (-2.106)	-0.021036 (-0.368)	-0.407035* (-4.387)	0.034153 (0.484)
Year	-1325.022* (-3.595)	-381.2713* (-3.383)	-307.1285 (-1.680)	-636.6221* (-4.578)
Panel Least Squares	Yes	Yes	Yes	Yes
N of observations	50	50	50	50
R-Squared	0.989214	0.973796	0.995105	0.967039

Note: t-ratios below coefficients
* indicates significance at 1 percent level, ** at 5 percent and *** at 10 percent.

The largest percentage decrease in property crime is experienced in the county of Queens, where property crime decreased by approximately 176 incidents, while in Manhattan a reduction of 149 is the relative value. The county of Kings seemed also to be negatively affected, with the -0.216% decrease accounting for 118 less property crime acts.

Table 3a: Property Crime

County	Percentage Changes
Bronx	0.087
Kings	-0.216
Manhattan	-0.271
Queens	-0.375

Results follow exactly the same pattern when examining burglaries and calculating intra-regional structural changes before and after the terrorist attack. It is true, that coefficients for all counties are positive throughout the whole time period, but turn negative when decreasing the sample to post-attack years. The percentage changes derived from the results are particularly significant for all counties, with the highest decrease observed within Kings;

Table 3b: Burglary

County	Percentage Changes
Bronx	-0.160
Kings	-0.383
Manhattan	-0.167
Queens	-0.343

Furthermore, from the third column of Table 3, larcenies taking placing within the Bronx County seem not to be significantly affected. Although significance is found when investigating the different counties throughout the whole time period, limiting the time horizon to the post-

attack period the variable 'Bronxta', despite negative signed, drops insignificant. Finally, significant decreases within the other counties are indeed found, as specified;

Table 3c: Larceny

County	Percentage Changes
Kings	-0.094
Manhattan	-0.917
Queens	-0.351

The last variable to be examined is the motor vehicle theft. As I have mentioned above, Di Tella and Schargrodsky have done a similar survey on car thefts in Buenos Aires, Argentina using the exogenous event of the terrorist attack on July, 1994. In my analysis, I find significant decreases in the amount of vehicle thefts only within Kings and Queens, while Manhattan and Bronx yield very small, positive, but significant, percentage changes;

Table 3d: Motor Vehicle Theft

County	Percentage Changes
Bronx	0.036
Kings	-0.177
Manhattan	0.021
Queens	-0.406

In absolute sizes, the fall in car theft in Kings and Queens accounts for approximately 16 and 44 fewer incidents respectively. Based on the results above, I would not be mistaken to argue that in addition to violent crime, property crime also seems to be affected adversely by the terrorist event of September 11th, 2001.

IV.C .Further Results

At this section I will demonstrate the relevant percentage changes calculated for the county of Richmond which, as I have mentioned above, constitutes a secondary focus of my project. It is important to note that Richmond is a county of New York situated entirely on an island called the Staten Island and is land-accessible to New York (more precisely, Brooklyn) via the Verrazanno-Narrows Bridge. Due to its geographical location therefore, it is predicted that the increased police presence around WTC would not affect substantially, if at all, its yet very low crime rates. In particular;

Table 4a: Violent Crime in Richmond

Variables	Percentage Changes
Violent Crime	0.228
Murder	0.169
Rape	0.251
Robbery	0.257
Assault	0.222

Table 4b: Property Crime in Richmond

Variables	Percentage Changes
Property Crime	0.261
Burglary	0.234
Larceny	0.498
Motor Vehicle Theft	0.164

Indeed, results indicate that Richmond's violent and property crimes were not affected adversely by the increased police presence in lower Manhattan. Percentage changes were found to be positive but small in magnitude indicating slight increases in Richmond’s already low crime rates.

V. Conclusions

Given the main challenge of identifying a correct casual effect when examining police presence on crime, which exists in the crime literature, I hereby tried to tackle this problem by using the terrorist attack of September 11th, 2001 in the city of New York. Part of the government's immediate response to the event was the instant deployment of hundreds of police officers around the WTC with jurisdictions ranging from the rescuing of victims to organizational issues and providing public calmness. I argue that this event is entirely exogenous to crime, since the increased police presence was not driven by upward trends in regional crime.

I collected data on all components of violent and property crime for all counties of New York before and after the terrorist attack. The unavailability of police data, however, deprived me from using a common difference-in-difference estimation with the county of Manhattan as a treatment group, as it is specified in the relevant studies so far. By creating suitable dummy variables, I managed to capture county specific effects and examine structural changes in crime before and after the terrorist attack.

It is evident that components of violent and property crime, as well as those as such, were affected significantly by the sudden allocation of police forces rising from the shocking event of September 11th, 2001. In most cases negative intra-county percentages changes were calculated, suggesting significant drops in crime after 2001. Based on those I would not be mistaken to argue that the terrorist attack made New York City a safer and more secure city! Consequently, it is evident that the marginal benefit of reducing crime is higher than the marginal cost of hiring an additional policeman.

Data unavailability constituted an important constraint in my study. Despite the lack of data on police recruitment and distribution, which can be overcome, the absence of data on crime

variables sorted in a monthly basis, rather in an annual one, weakens my dataset. My results, however become stronger with the inclusion of a time trend and when controlling for county specific effects. I argue that repeating the same exercise using monthly data sorted by county on the specified crime variables, would yield more reliable results and promising conclusions regarding public policy implementations.

APPENDIX A

Econometric Results of the 'No Time-Trend' Specification

(1) Violent Crime:

Table A1: The Effect of Police Presence on Violent Crime

Variables	Violent-Crime	Murder	Rape	Robbery	Assault
Constant	7145.775**	39.18341	-44.99435	1160.539	5991.047*
	(2.259)	(0.854)	(-0.313)	(0.746)	(3.109)
Bronxta	-4111.369*	-17.75777	-115.3643*	-2088.741*	-1929.505*
	(-3.899)	(-1.150)	(-2.385)	(-3.988)	(-2.976)
Manhattanta	-3532.362*	-16.95707	1.71620	-2289.179*	-1227.942**
	(-3.031)	(-1.003)	(0.032)	(-3.993)	(-1.730)
Kingsta	-8349.416*	-18.52249	-196.5582*	-4073.832*	-4060.502*
	(-7.780)	(-1.190)	(-4.032)	(-7.717)	(-6.214)
Queensta	-4400.269*	-14.28265	-45.81680	-2492.1213*	-1847.957*
	(-4.135)	(-0.925)	(-0.948)	(-4.760)	(-2.852)
Bronx	11937.06*	143.2807*	320.9050*	5116.497*	6356.375*
	(10.438)	(8.640)	(6.177)	(9.009)	(9.128)
Manhattan	26350.05*	142.8190*	385.8977**	11247.36*	14573.97*
	(7.534)	(2.816)	(2.429)	(6.537)	(6.844)
Kings	25425.13*	226.9632 *	590.8726*	11956.69*	12650.61*
	(26.195)	(16.126)	(13.402)	(25.040)	(21.404)
Queens	12835.50*	96.591*	284.7872*	6891.326*	5562.790*
	(14.043)	(7.288)	(6.857)	(15.327)	(9.995)
Post	732.9994	-0.59865	18.49046	281.1098	433.9979
	(0.914)	(-0.051)	(0.507)	(0.712)	(0.888)
Unemployment Rate	319.6977***	-0.64601	25.85430*	266.0698*	27.12756
	(1.964)	(0.274)	(3.497)	(3.323)	(0.274)
Per-capita Income	-0.23149*	-0.00082	-0.00249	-0.07238***	-0.15599*
	(-3.137)	(-0.766)	(-0.742)	(-1.994)	(-3.467)
Panel Least Squares	Yes	Yes	Yes	Yes	Yes
N of observations	50	50	50	50	50
R-Squared	0.98363	0.96219	0.94233	0.98192	0.97653

Note; t-ratios below coefficients

* indicates significance at 1 percent level, ** at 5 percent and *** at 10 percent.

It is true that the variable 'post' is non-significant for all levels, bringing about unimportant intra-regional changes. The same is also true when examining property crime;

(2) Property Crime;

Table A2: The Effect of Police Presence on Property-Crime

Variables	Property-Crime	Burglary	Larceny	MV Theft
Constant	25982.46* (3.350)	2456.453 (1.052)	19926.38* (5.801)	3599.618 (1.142)
Bronxta	-4704.507*** (-1.802)	-2991.691* (-3.806)	-47.93626 (-0.041)	-1664.880 (-1.569)
Manhattanta	-12383.48* (-4.335)	-2438.566* (-2.834)	-9114.687* (-7.203)	-830.2274 (-0.715)
Kingsta	-12606.54* (-4.793)	-4645.244* (-5.863)	-3711.945* (-3.186)	-4249.352* (-3.974)
Queensta	-17221.68* (-6.602)	-4409.543* (-5.612)	-5465.283* (-4.729)	-7346.855* (-6.927)
Bronx	14753.01* (5.263)	4079.601* (4.832)	8041.090* (6.476)	2632.316** (2.309)
Manhattan	97868.95* (11.417)	13502.64* (5.229)	74299.05* (19.567)	10067.26* (2.888)
Kings	47388.49* (19.919)	11172.41* (15.590)	27282.76* (25.889)	8933.319* (9.236)
Queens	46300.58* (20.667)	9708.166* (14.387)	23403.53* (23.584)	13188.88* (14.480)
Post	2281.028 (1.160)	388.7481 (0.656)	2058.012** (2.363)	-165.7317 (-0.207)
Unemployment Rate	821.2494** (2.059)	421.5429* (3.508)	7.199 (0.041)	392.5074** (2.420)
Per-capita Income	-0.75526* (-4.176)	-0.12501** (-2.295)	-0.49079* (-6.126)	-0.13946*** (-1.897)
Panel Least Squares	Yes	Yes	Yes	Yes
N of observations	50	50	50	50
R-Squared	0.98545	0.96569	0.99473	0.94837

Note; t-ratios below coefficients
* indicates significance at 1 percent level, ** at 5 percent and *** at 10 percent.

APPENDIX B

Intra-Regional Percentage Changes of the Two Specifications.

At this section I will present the calculated percentage changes for the two specifications i.e. the 'no time trend' and 'time trend' estimations.

(A) Violent Crime

Note the large difference of their magnitudes, caused by the residual correlation and the downward bias of the standard errors generated when excluding the time trend from the regression.

I should stress that significance of the coefficients does not change among the two specifications for almost all variables, except that of assault within the Manhattan County.

(i) Violent Crime

Table B1: Violent Crime-No Time Trend Specification

County	Percentage Changes
Bronx	-17.704
Kings	-23.384
Manhattan	-8.357
Queens	-18.353

Table B2: Violent Crime-Time Trend Specification

County	Percentage Changes
Bronx	-0.080
Kings	-0.401
Manhattan	-0.113
Queens	-0.099

(ii) Murder

No significant differences were found in either of the two cases.

(iii) Rape

No significant differences were found in either of the two cases.

(iv) Robbery

Table B3: Robbery-No Time Trend Specification

County	Percentage Changes
Bronx	-28.797
Kings	-28.914
Manhattan	-16.184
Queens	-27.460

Table B4: Robbery-Time Trend Specification

County	Percentage Changes
Bronx	-0.331
Kings	-0.884
Manhattan	-0.462
Queens	-0.443

(v)Assault

Table B5: Assault-No Time Trend Specification

County	Percentage Changes
Bronx	-12.112
Kings	-19.454
Queens	-12.238

Table B6: Assault-Time Trend Specification

County	Percentage Changes
Bronx	0.021
Kings	-0.212
Manhattan	0.015
Queens	0.029

(B)Property Crime

When estimating property crime without a time trend in the regression, it is true that the variable 'post' drops insignificant for all variables except that of larceny. As a result the calculated percentage intra-changes will be non-significant. These will be presented only for illustrating the difference of their magnitudes between the two specifications.

(i) Property Crime;

Table B9: Property Crime-No Time Trend Specification

County	Percentage Changes
Bronx	-5.949
Kings	-14.073
Manhattan	-8.157
Queens	-20.670

(ii)Burglary

Table B10: Burglary-No Time Trend Specification

County	Percentage Changes
Bronx	-39.824
Kings	-31.231
Manhattan	-12.844
Queens	-33.053

(iii)Larceny

Table B10: Larceny-No Time Trend Specification

County	Percentage Changes
Kings	-3.503
Manhattan	-7.489
Queens	-7.863

(iv) Motor-Vehicle Theft

Table B10: Motor Vehicle Theft-No Time Trend Specification

County	Percentage Changes
Bronx	-29.375
Kings	-35.229
Manhattan	-7.287
Queens	-44.748

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