Crime in Urban Areas: An Empirical Investigation

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ABSTRACT

Crime is an illness that attacks rights of individuals. It therefore interests everybody in a society. It is argued that as urbanization increases so does crime. The purpose of this paper is to empirically investigate the determinants of crime in urban areas by using cross-sectional data. The results we get indicate that per capita income, income inequality, population, and present of black population are all important determinants of urban crime. Our results also confirm previous empirical studies on the subject.

Key Words: *Urban crime, Economics of crime, Property crime.*

INTRODUCTION

From old times to today's modern societies, crime has always been a hot subject and kept its place in every day's agenda. In particular, as economic growth and development of countries increase, in general, from one year to another, it is expected that crime rate should decline over time. However, it does not decline, and it has become more important in the second half of this century. As Becker (1968:172) pointed out years ago that "Crime has probably become more important during the last forty years". Every society has its own values system. Crime is defined by mainly these values system. For one reason or the other, there has been crime in every society throughout history though the rate, type, cause, and effect on each society might be highly different.

Percentage of population that lives in the urban areas has been constantly increasing in the world as table 1 indicates. This means that crime and crime prevention measures will become more important in urban areas in years to come. While 30 percent of world population was living in urban areas in 1950, it was about 47 percent in 2000, and estimated to reach 60 percent in 2030.[1] Therefore, it is crucial to understand the relationship between crime and urban areas.

It is natural to ask why does one commit crime? What should be done to prevent the crime? We could list many related questions but the answers to all these crime-related questions are not simple. Because of this difficulty, there have been

[1] See table 1 for details.

many academic disciplines that study the subject. As it "…requires multidisciplinary approach…" (Stevans, 1983). Each discipline, of course, studies it from its own perspective. Sociology, psychology, political science, anthropology, law, and economics are some of the disciplines that study the crime in various ways.

Table 1: Urban Population, Growth Rate and Urbanization Percentage.

Region	Urban Population (Millions)			Growth Rate (Percent)		Percentage Urban		
	1950	2000	2030	1950-2000	2000-2030	1950	2000	2030
World	750	2860	4980	2.68	1.85	29.8	47.2	60.2
More Developed Regions	450	900	1000	1.4	0.38	54.9	75.4	82.6
Less Developed Regions	200	1960	3980	3.73	2.35	17.8	40.4	56.4
Northern America	110	243	335	1.59	1.07	63.9	77.4	84.5
Latin America	70	391	608	3.44	1.47	41.9	75.4	84
Oceania	8	23	32	2.14	1.19	61.6	74.1	77.3
Europe	287	534	540	1.24	0.04	52.4	73.4	80.5
Asia	244	1376	2679	3.46	2.22	17.4	37.5	54.1
Africa	32	295	787	4.42	3.27	14.7	37.2	52.9

Source: United Nations Population Division*, World Urbanization Prospects:* The 2001 Version.

In a recent study, Gendrot (2001) tries to distinguish between crime and fear of crime in urbanized great cities of the United States, United Kingdom and France. She analyzed the issue in political perspective and noted that in each of the cities in

her study the local authorities, police department, educators, human services, non-profit organizations and the local housing and sport authorities work together to prevent crime. This shows that in preventing crime, local authorities from various departments should eventually cooperate to be successful. That is, different disciplines should involve.

It is argued that, as urbanization increases, so does crime (Galvin, 2002:130; Gaviria and Pagés, 2002:190). In another words, as urban areas become larger, the rate of crime in these areas increases. The purpose of this paper is to empirically investigate the determinants of crime in urban areas by using cross-sectional data. There are many theories that have been developed in the social science literature to explain criminal behavior. Economists examine the issue of the crime differently from other social scientists. As an economist, we believe that people behave rationally; they maximize their utility (Mathur, 1977). Specifically, if one commits crime, it is his rational choice that he wants to maximize his utility by committing crime. Since most of the crimes take place in urban areas, residents of urban areas fear from being a crime victim.

In this paper, I focus on two types of crime in large U.S. cities. First, I use total number of serious crime known to police (NCRM) as my dependent variable. Second, I use serious violent crimes known to police (VCRM), which includes murder and nonegligent manslaughter, forcible rape, robbery and aggravated assault, as my second dependent variable. The first dependent variable is known as property

crime while the second is called personal crime, and both of them together are called as index crimes.[2] In the literature, there are commonly agreed three sets of variables used in determining crime. They are economic, socioeconomic-demographic, and the deterrent variables (Gaviria and Pagés, 2002, Mathur, 1977, Stevans, 1983, Meera and Jayakumar, 1995, and Masih and Masih, 1996).

Economic variables can be income inequality index (IIEQ), the median income of families, the unemployment rate, per capita city income etc. Each of them can have some impact on the crime rate. I expect that as unemployment rate (UMP) in the cities (urban areas) increases the crime rate would increase. A positive relationship is expected. The reason behind would be that, as people become unemployed they would in the short run search for new jobs. In the long run, if they do not find jobs they would tend to be criminal. Whether this is the case is also subject of another empirical study. Actually, there are many scholars who have studied this relationship. There is no satisfied and commonly agreed result yet. Masih and Masih (1996) summarize the existing literature on this issue and state that there were 33 studies that found positive and 19 studies that found a negative or no relationships between crime and unemployment rate (1094). I also expect a positive relationship between crime and income inequality. As income inequality increases, the difference between low-income people and high-income people increases. This gives the low-income people or the poor people an incentive to catch the high-income

[2] See for example Jayakumar and Meera (1995).

people standard of living by ways other than legal ways, such as stealing, robbing, and other unlawful means. This is because they think that they would never reach those high living standard people just by working. It would also be case that the poor people have difficulty of living. Their regular earnings may not even sufficient to meet their basic, necessity, needs, and therefore, they have another incentive to involve criminal activities.

On the other hand, a negative relationship can be expected between per capita city income (PCI) and crime. As PCI increases, in general, we expect wealth of everyone in the city to increase, thus the incentive committing crime based on PCI is reduced. Moreover, property crime is assumed to be more relevant with economic variables, and it would be reduced by increase in PCI. One can also use poverty line (POV) as income inequality index. In this case, the relationship between crime and POV can also be positive. As number of persons that are under poverty line increases, crime rate can be expected to increase as well.

Socioeconomic-demographic variables that determine crime would be educational level, age structure of the city, level of urbanization, percentage of certain race in the society, percentage of population who are male, or female in the labor force etc. One can expect a negative relationship between educational level in a society and crime. The higher the educational level of the members of a society, the less likely the crime to be committed among the members of the society. The relationship between crime and urbanization may be uncertain. Masih and Masih state

"At low levels of urbanization, crime may be high because of sparsely located residents; a further increase in urbanization may lead to decrease in crime because of closer proximity of residents; and finally, with even further increase in urbanization, crime may rise because individuals may not identify whether they are engaged in a legal or illegal activity" (1093). Indeed, Gaviria and Pagés, (2002:193) found positive relationship between city size and victimization. Thus, we can say that urbanization may have both negative and positive effects on crime in different urban setting. It needs an empirical investigation to see which effect outweighs.

Deterrent variables such as police force, severity of punishment, justice and court systems, prison and jail conditions can affect the crime rate as well. We expect a negative relationship between crime and deterrent variables; as number of police increases in urban areas, the crime rate would decline because those who may want to commit crime would have a high probability of being caught. We could extend similar argument between other deterrent variables and crime as well. Severity of punishment, high probability of catch, bad jail and prison conditions, speedy-working justice and court systems all give disincentive to those who intend to commit crime.

DETERMINANTS OF CRIME IN URBAN AREAS

The causes and influences of crime in different countries are different. In general, there is no direct relationship between causes of a certain crime in one country to another. But when we study the causes of crime in a society they should be

same. The objective of this section is to explore the determinants of crime in large cities, which have population of 200,000 or more, in the U.S.

As mentioned in the earlier section, we identify variables under three categories: deterrence, economic, and socioeconomic-demographic factors. We have mainly two types of crime variables. Total number of crime and total number of violent crime in large cities. The first one is property crime (NCRM), and the second one is personal crime (VCRM). Since these two crimes are in number, we divide them by the city population to get crime rates. Thus, we have two additional dependent variables; personal crime rate (VCR) and property crime rate (CR). We use these rates as well as total number of crimes to see if we get better statistical results. Moreover, we take natural logarithm of all the four dependent variables as well as independent variables and estimate them to see if there are some improvements in the results. Therefore, we have eight equations to estimate.

Initially nine explanatory variables used. There is only one deterrent variable available for use. We should have used more than one deterrent variable but either the data are not available or data are available but not appropriate for our models given framework of the study.

As economic variables, we use four variables; per capita city income (PCI), unemployment rate (UMP), income inequality (IIEQ) defined as percent of households with income of $ 75,000 or more annually. We also use poverty line as another income inequality variable, which is defined as percent of all persons that

have income below poverty level. To determine which one of income inequality variable to use, we look at correlation between crime and these two variables and choose the one that has the highest correlation.

We use four socioeconomic-demographic explanatory variables. For city size we use land area and city population. Again, for this urbanization measurement, we look at correlation between crime and these two variables and choose the one that has higher correlation. We also use black population to see if it does add power in explaining the relationship between crime and a certain race population. This is a special case for the cities in the United States. It is an observation that when presence of black population in a city increases the crime committed in that city is likely to increase. Glaeser and Sacerdote (1999: 8, 15, 24), Grogger and Willis (2000), Krivo and Peterson (1996), Cullen and Levitt (1999) and many other empirical studies include this variable to see if it contributes, if any, to explain urban crime. In fact, Blumstein et al. (1986) regard fraction of blacks as important predictor of crime. To include educational variable, (EDU), we use high school dropouts. In this case, we expect crime rate to increase as number of high school dropouts increases.

CORRELATION

To choose between land area (LA) and population (POP) variables for representing urbanization variable, and between Poverty (POV) and income inequality (IIEQ) variables for representing income inequality index, we have calculated these variables correlation with respect to all four types of crime variables.

Table 2: Correlations

Dependent Variables	Independent Variables								
	LA	POP	BPOP	EDU	POV	PCI	UMP	POL	IIEQ
NCRM	0.18	0.98	0.89	0.95	0.13	0.18	0.19	-0.05	0.19
VCRM	0.14	0.97	0.9	0.95	0.14	0.18	0.24	-0.07	0.19
CR	-0.14	-0.06	0.02	-0.04	0.38	-0.14	0.24	0.2	-0.17
VCR	-0.14	0.13	0.29	0.19	0.51	-0.15	0.44	0.15	-0.14

As seen in the table 2, the correlation between NCRM and POP is very high (0.98) while it is only 0.18 between NCRM and LA. The same is true between VCRM and LA and between VCRM and POP. Although the correlation between CR and LA is higher in absolute value the sign is negative and thus the correlation between CR and POP is higher. The correlation between VCR and LA is negative while it is positive between VCR and POP. As a result, we use POP as our urbanization variable instead of LA.[3]

When we look at the correlation between NCRM and POV, and between NCRM and IIEQ, we see that the latter is higher. This is same for VCRM and IIEQ. However, the correlation between CR and IIEQ is negative. It is also negative between VCR and IIEQ contrary to our expectation. On the other hand, they are positive with respect to POV as we expected. Therefore, we use POV as our income inequality variable instead of IIEQ.

THE MODEL AND DATA

Using the stated explanatory variables, we specify the model as follows;

$$C=\beta_0+\beta_1 POP+\beta_2 BPOP+\beta_3 EDU+\beta_4 POV+\beta_5 PCI+\beta_6 UMP+\beta_7 POL+\varepsilon \quad \textbf{(1)}$$

Where C stands for crime, ε stands for residuals, and all other variables are same as they were introduced in the previous section.

We get our second model by taking natural logarithm of the above model. It is

$$LnC=\beta_0+\beta_1 \ln POP+\beta_2 \ln BPOP+\beta_3 \ln EDU+\beta_4 \ln POV+\beta_5 \ln PCI$$
$$+\beta_6 \ln UMP+\beta_7 \ln POL+\varepsilon \quad \textbf{(2)}$$

where lnC is natural logarithm of C. It should be noted that we have eight equations. Four of them will be estimated based on model (1), and the rest will be estimated based on the model (2). Our independent variables will remain same but dependent variable. We have personal crime (VCRM) and personal crime rate (VCR), and property crime (NCRM) and property crime rate (CR), and natural logarithm of them as follows; lnVCRM, lnVCR, lnNCRM, and lnCR.

Data used in this study are from County and City Data Book.[4] In this book, we use 75 large U.S. city data. The cities have 200,000 or more population. Although we found almost all of the data that we originally thought would be helpful, we did not find data on crime prevention expenditure other than local or city government police expenditures. We would get these data from other sources but they would have not matched with our definitions, and therefore, would have given biased results.

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[3] We used LA in our model in place of POP and run the regression, however, we get very weak result, and therefore we prefer using POP.

[4] The full reference can be seen at the reference section.

One other important detail about our data is that the times of data are not the same. Socioeconomic-demographic data are for 1990, deterrence variable data are for 1990-1991, and economic data are for 1989 except unemployment rate data that are for 1991. For dependent variables, all data are for 1991. Because of the difficulty of the data to get, we think that they are one year later or early would produce no serious statistical problem. This is because all other characteristics of the variables remain same.[5]

REGRESSION RESULTS

Results of ordinary least squares (OLS)[6] are presented in table 3 and in table 4. We have eight equations and in each equation we use seven independent variables, totaling 56 variables. Of the 56 coefficients, we get 37 statistically significant coefficients based on t-statistics.

Table 3: Regression Results

Equations		1		2		3		4	
Dependent Variables		NCRM	t values	CR	t values	VCRM	t values	VCR	t values
Explanatory Variables	Constant	-78163	-3.66	-0.06	-1.31	-26278	-4.17	-0.035	-3.3
	POP	0.082	9.8	1.12	0.06	0.018	7.2	-6.8	-1.6
	BPOP	0.01	0.69	1.75	0.53	0.0088	1.9	1.97	2.5
	EDU	0.88	1.09	-0.0000015	-0.89	0.31	1.3	0.000000178	0.44
	POV	1650	3.75	0.0034	3.84	329	2.53	0.00092	4.14
	PCI	3.32	3.34	0.000006	2.9	0.94	3.2	0.0000019	3.82
	UMP	-437	-0.44	-0.00022	-0.11	516	1.77	0.000576	1.15
	POL	926	2.43	0.0018	2.4	92	0.82	0.000385	2.003
R SQR.		0.97		0.27		0.97		0.46	
D-W		1.72		1.94		1.56		1.51	

[5] In social sciences, getting data is not an easy task to do. Also, if we are to find exact year data for all variables, we could not complete the study because of the lack of data.
[6] Many empirical studies in this literature employ OLS or TSLS.

In table 4, it should be observed that results of equations lnNCRM and lnCR are almost identical. Similar results also exist between the equations of lnVCRM and lnVCR. Therefore, we base our interpretation on equations 1-5 and 7, leaving equations 6 and 8 out. In this case, we have 28 statistically significant coefficients out of 42. As seen from tables, POV and PCI coefficients are statistically significant in all equations. However, we expected the coefficient of PCI to be negative.

Table 4: Regression Results in Natural Logaritm

Equation		5		6		7		8	
Dependent Variables		lnNCRM	t values	lnCR	t values	lnVCRM	t values	lnVCR	t values
Independent Variables	Constant	-8.86	-3.4	-8.86	-3.4	-19.4	-5.12	-19.4	-5.12
	lnPOP	0.89	6.14	-0.114	-0.79	0.53	2.52	-0.47	-2.26
	lnBPOP	0.041	1.06	0.04	1.06	0.24	4.3	0.24	4.3
	lnEDU	-0.0065	-0.055	-0.0066	-0.055	0.18	1.032	0.18	1.032
	lnPOV	0.45	3.343	0.45	3.34	0.69	3.52	0.69	3.52
	lnPCI	0.617	2.378	0.62	2.38	1.45	3.84	1.45	3.84
	lnUMP	-0.009	-0.08	-0.0096	-0.08	0.28	1.6	0.28	1.6
	lnPOL	0.2	2.37	0.2	2.37	0.35	2.8	0.35	2.8
R SQR.		0.88		0.98		0.86		0.59	
D-W		2.05		1.72		1.71		1.71	

POV is an important determinant of crime. As number of people under poverty line increases, the wealth of poor people declines therefore criminal behavior would increase, as income inequality gap becomes large. This result confirms the previous empirical studies where income inequality variables were used. For instance, see Ehrlich (1973).

When we look at unemployment rate coefficients in the both tables, we see that only in two equations they are statistically significant. Those insignificant coefficients of UMP are negative. Our results on UMP are inline with those of Masih and Masih (1996).

Urbanization variable, POP, has 5 statistically significant coefficients in these 6 equations although one of the coefficients has a negative sign. Thus, POP is also an important determinant of urban crime. Increases in urban areas do cause more crimes.

This strong result on POP is expected. It supports Glaeser and Sacerdote results (1996). As they mention in their article, when cities are getting larger, this make the return on stolen goods higher, the probability of getting caught is adversely related with city size and finally, availability of resale market of stolen goods are also increases with city size. Viewing in this angle, our results strongly support this.

Half of the coefficients of BPOP are also statistically significant; indicating that percent of black population has significant impact on crime. Specifically, our results demonstrate that presence of black population in large U.S. cities affects urban crime.

The weak result we obtained is the coefficient of educational level. It has only one statistically significant coefficient. Even though we expected that as number of high school dropout's increase, many of them become criminal later on, our results indicate that that is not the case.

City government police expenditure has statistically significant coefficient of 5 in 6 equations though the signs are contrary to our expectations. We expected negative coefficient, which indicates that, as city government police expenditures increase, the crime may be reduced. Our results don't support what we have predicted. The reason would be, among others, that the rates of increase in city police expenditures fall behind the rate of population growth. Therefore, it has not resulted what we initially anticipated.

CONCLUSIONS

This study uses large U.S. City data to empirically investigate the determinants of crime in urban areas. The results we get indicate that per capita income, income inequality, population, and present of black population are all important determinants of crime in urban areas. Unemployment rate and police expenditures have also important effects in determination of crime, but they are not so very strong. Our results also confirm previous empirical studies on the subject.

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