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An ~~Inter~~country Analysis of Homicide

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ABSTRACT

Since the pioneering work of Gary Becker (1968), economists have analyzed determinants of crime from the perspective of the offender's rational decision to participate in illegal activities. Pooled time series and cross section data for 1997 and 2000 were used in this paper to examine intercountry differences in effects of economic incentives and deterrence on homicide rates. Inequality of income or consumption was significant in all of the estimated equations. This is consistent with the findings of Fajnzylber et al., who claimed that income inequality has a significant and independent impact on intentional homicide rate and that "this conclusion is not only derived from studies based on official crime statistics but is also present in those based on victimization rates from household surveys." Per capita GNP and total police personnel per 100,000 inhabitants were found to have significant relationships with completed intentional homicide.

AN INTERCOUNTRY ANALYSIS OF HOMICIDE

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INTRODUCTION

Since crime was considered a deviant behaviour, its causes were sought in deviant factors and circumstances determining behaviour. Erlich (1973) wrote:¹

"Much of the search in the criminological literature for a theory explaining participation in illegitimate activities seems to have been guided by the predisposition that since crime is a deviant behaviour, its causes must be sought in deviant factors and circumstances determining behaviour. Criminal behaviour has traditionally been linked to the offender's presumed unique motivation, which, in turn, has been traced to his presumed unique structure, to the impact of exceptional social or family circumstances, or to both. (for an overview of the literature see, e.g., Taft and England [1964])"

Various analysts claimed that "the crux of the question was not economic want but the existence of a distinct criminal class lurking in the big cities."²

Becker (1968) introduced an economic approach wherein determinants of crime were analyzed from the perspective of a rational decision to maximize utility subject to resource constraints.³ In his Nobel lecture,⁴ he stated that "rationality implied that some

¹ Ehrlich, I. (1973), "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation," Journal of Political Economy, 81(3): p.521. (See also Taft, D.R., and England, R.W., Jr., Criminology, 4th ed., New York: Macmillan, 1964.)

² See Yue-Chim Richard Wong, "An Econometric Analysis of the Crime Rate in England and Wales, 1857-92," Economica, 62 (May 1995), pp. 235-246.

³ Becker, Gary S. (1968). "Crime and Punishment: An Economic Approach." Journal of Political Economy 76: 169-217.

⁴ Becker, Gary S., "The Economic Way of Looking at Life," Nobel Lecture, December 9, 1992, <http://home.uchicago.edu/~gbecker/Nobel/nobellecture.pdf>. See also Becker, Gary S. (1993), "Nobel Lecture: The Economic Way of Looking at Behavior." Journal of Political Economy 101: 385-409.

individuals become criminals because of the financial rewards from crime compared to legal work, taking account of the likelihood of apprehension and conviction, and the severity of punishment.”

In this paper, we use an economic approach to analyze causes of homicide from an intercountry perspective. From data obtained for 1997 and 2000, we found significant crime-inducing impact of inequality of income or consumption, as well as significant negative and positive relationships of completed intentional homicide with per capita GNP and with total police personnel per 100,000 inhabitants, respectively. Section 1 is on an econometric specification of a supply of offenses function. The regression results are in section 2.

I. SUPPLY OF OFFENSES FUNCTION

Erllich (1973) developed an uncertainty model of participation in illegitimate activities. An econometric specification of his supply of offenses function is

$$C = f(W^l, W^i, P, F) \quad (1)$$

where C is the crime rate, W^l and W^i are the gains from legal and illegal activities, respectively, P is the probability of being apprehended and punished for committing the offense, and F is the severity of punishment.

He postulated that illegal payoffs “depend primarily on the level of transferable assets in the community, that is, on opportunities provided by potential victims of crime.” He used the median income of families as proxy for illegal payoff in a cross section study of index crimes across states in the United States. In his time series analysis of British crime in the second half of the nineteenth century, Yue-Chim Richard Wong’s (1995) proxies were the real per capita net national income, as a measure of the state of the economy, and the index of real wages for all workers, an indicator of the standard of living of the population. Carr-Hill and Stern (1979)⁵ used the rateable value of property per unit area. Fajnzylber, Lederman, and Loayza’s (2000) proxy for overall development in their cross-country analysis of determinants of homicide and robbery rates is GNP per capita.⁶

⁵ Carr-Hill, R.A. and Stern, N.H. (1979), Crime, the Police and Criminal Statistics, New York: Academic Press.

⁶ Pablo Fajnzylber, Daniel Lederman and Norman Loayza, “Crime and Victimization: an Economic Perspective,” Economia 1.1 (2000) 219-278. See also, Pablo Fajnzylber, Daniel Lederman, and Norman Loayza, “Crime and Victimization: an Economic Perspective”, May 8, 2000, <http://www.lacea.org/meeting2000/PabloFajnzylber.pdf>

Considering that “potential offenders are more likely to be those whose legitimate skills have not grown over time with the rest of the population, Yue-Chim Richard Wong used the index of real wages for workmen of unchanged grade as proxy for legal gains of potential offenders. Erlich computed these gains indirectly by using income inequality as a measure of the relative distance between legitimate and illegitimate opportunities. For this purpose, he used the percentage of families below one-half of the median income in the state. The income inequality variable used by Fleisher (1966) is the difference between the average income of the second lowest quartile and the highest quartile of households.⁷ Fajnzylber et al. used the gini coefficient. Neumayer (2004) used the ratio of the top to the bottom income quintile in the case of robbery and violent theft.⁸

Proxies for the probability of apprehension and conviction are the number of offenders imprisoned for the offense (Erlich), the ratio of the number of convictions to the number of indictable offenses known to the police (Yue-Chim Richard Wong) and the number of police personnel per 100,000 inhabitants (Fajnzylber et al.). Levitt used size of prison population, the number of police per capita and conviction rates.⁹

The time served by offenders in prison was used as proxy for the severity of punishment by Erlich and Yue-Chim Richard Wong. Fajnzylber et al. used the presence of the death penalty as an indication of the overall severity of legislation regarding the punishment of offenders.

See also Pablo Fajnzylber, Daniel Lederman and Norman Loayza, “What Causes Violent Crime?” European Economic Review, Volume 46, Issue 7, July 2002, Pages 1323-1357;

⁷ Fleisher, Belton M. (1966), “The Effect of Income on Delinquency,” American Economic Review 56: 118-137.

⁸ Eric Neumayer, “Is Inequality Really a Major Cause of Violent Crime? Evidence from a Cross-National Panel of Robbery and Violent Theft Rates”, May 2004, <http://econwpa.wustl.edu:8089/eps/le/papers/0312/0312002.pdf>

⁹ Levitt, Steven. (1996). “The effect of Prison Population Size on Crime Rates: Evidence from Prison Overcrowding Litigation.” Quarterly Journal of Economics 111: 319-352.

Levitt, Steven. (1997). “Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime.” American Economic Review 87: 270-290.

Levitt, Steven. (1998). “Why Do Increased Arrest Rates Appear to Reduce Crime: Deterrence, Incapacitation, or Measurement Error?” Economic Inquiry 36: 353-372.

II. INTERCOUNTRY EVIDENCE

A. METHODOLOGY

We used pooled time series and cross section observations for 1997 and 2000 to obtain OLS estimates of the following equation:

$$\text{LN CR}_t = \beta_1 + \beta_2 D_t + \beta_3 \text{Ln } X_t + \beta_4 D_t * \text{Ln } X_t + \beta_5 \text{Ln PGNP}_t + \beta_6 D_t * \text{Ln PGNP}_t + \beta_7 D_t * \text{LN } P_t \quad (2)$$

where

- CR = CIH, HFA or NIH
- CIH = total recorded intentional homicide, completed per 100,000 inhabitants
- HFA = total recorded intentional homicide committed with firearms per 100,000 inhabitants
- NIH = total recorded non-intentional homicide per 100,000 inhabitants
- PGNP = per capita GNP
- t = 1997, 2000
- D_t = 0 if $t = 1997$; 1 if $t = 2000$
- P = total police personnel per 100,000 inhabitants
- X = gini coefficient or the percentage share of income or consumption of the highest 10%, the lowest 20% or the lowest 10%.

B. CRIME DATA

Our sources of data on homicide and total police personnel per 100,000 inhabitants are the sixth and the seventh United Nations Survey of Crime Trends and Operations of Criminal Justice Systems. They cover the years 1995 to 1997 and 1998 to 2000, respectively. Crime data were obtained from police statistics. Intentional homicide is defined as death purposely inflicted by another person, including infanticide; Non-intentional homicide refers to death not purposely inflicted by another person, including manslaughter but excluding traffic accidents resulting in death.

Pointing out deficiencies in official crime data, Fajnzylber et al. noted the following regarding homicide:

"Homicide data is of special interest because this crime is usually thought to suffer the least from the problems of underreporting and underrecording that afflict official crime statistics. Especially in cross-national studies, the use of homicide data is also justified by the fact that it is less sensitive to changing definitions of crimes across legal systems. Even in the United States, experts have

frequently focused on homicides as a proxy for crime, not only because 'it is a fairly reliable barometer of all violent crime' but also because 'at a national level, no other crime is measured as accurately and precisely.' "

C. RESULTS

Estimates of equation (2) are shown in Tables 1- 3. In Table 2, the elasticities of the rate of intentional homicide committed with firearms with respect to the gini coefficient and the percentage share of income or consumption of the highest 10% in 2000 are less than those in 1997. The p values of the differences are 0.0221 and 0.0138, respectively. In all of the other estimated equations in Tables 1 - 3, the differences between the elasticities of the homicide rates with respect to measures of inequality of income and/or consumption, per capita GNP and total police personnel per 100,000 inhabitants in 2000 and those in 1997 are not significant.

1. MEASURES OF INEQUALITY OF INCOME AND/OR CONSUMPTION

In all of the estimated equations in Tables 1-3, the coefficients associated with measures of inequality of income and/or consumption are significant, with maximum p values equal to 0.0009, 0.0053 and 0.0106 on completed intentional homicide, intentional homicide committed with firearms and non-intentional homicide, respectively. The elasticities with respect to the gini coefficient and the percentage share of income or consumption held by the highest 10% are positive. They are negative with respect to the percentage share of income or consumption held by the poorest 10% and by the poorest 20%. Greater income inequality and lower share in income or consumption of the poorest sectors are associated with higher homicide rates.

Fleisher and Erlich, pioneers in studying the effects of income levels and income disparities on the incidence of crime, found significant crime-inducing impact of income inequality. Erlich's interpretation of this result is that greater income inequality is an indication of a larger absolute differential between payoffs from legal and illegal activities. Deprivation theory regards economic inequality as a cause of violent crime since relative deprivation can lead to frustration and anger.

TABLE 1
OLS REGRESSION ESTIMATES OF COEFFICIENTS ASSOCIATED WITH SELECTED VARIABLES*

Dependent Variable: LN CIH_t

		C	D _t	LN GINI _t	D _t LNGINI _t	LN SHH10 _t	D _t LNHH10 _t	LN SHLOW20 _t	D _t LNSHLOW20 _t	LN SHLOW10 _t	D _t LNSHLOW10 _t	LN POL _t	D _t LNPOL _t	R ²	F
equation 1	Coefficient	-6.8593	9.9054	2.3242	-1.3817										
	Std. Error	3.6228	4.9472	0.6601	0.8521									0.5830	11.4466
	t-Statistic	-1.8934	2.0022	3.5208	-1.6216									0.4585	
	p value	0.0636	0.0502	0.0009	0.1106									-1.6028	0.0000
equation 2	Coefficient	-7.5001	10.7273			2.5051	-1.5115								
	Std. Error	3.7800	5.0391			0.7096	0.9168							0.5926	11.4287
	t-Statistic	-1.9842	2.1288			3.5300	-1.6486							0.4601	
	p value	0.0522	0.0378			0.0006	0.1049							-1.7714	0.0000
equation 3	Coefficient	5.3152	2.3835					-1.7918	0.9101						
	Std. Error	1.4991	2.7807					0.4311	0.5826					0.8292	13.3322
	t-Statistic	3.5456	0.8541					-4.1561	1.5623					0.4356	
	p value	0.0008	0.3968					0.0001	0.1240					-1.5553	0.0000
equation 4	Coefficient	4.0484	2.7228							-1.5772	0.7552				
	Std. Error	1.5071	2.7976							0.3918	0.5326			0.8246	13.0738
	t-Statistic	2.6862	0.9732							-4.0251	1.4180			-1.4215	
	p value	0.0065	0.3347							0.0002	0.1618			0.1608	0.0000

* The sample consists of 17 high income, 18 middle income and 4 low income countries. 15 were industrialized and 2 were from Sub-Saharan Africa.

CIH = Total recorded intentional homicide, completed per 100,000 inhabitants
t = 1997, 2000
D_t = 0 if t=1997; 1 if t=2000
PGNP = Per capita GNP
POL = Total police personnel per 100,000 inhabitants
GINI = Gini coefficient
SHH10 = Percentage share of income or consumption of highest 10%
SHLOW20 = Percentage share of income or consumption of lowest 20%
SHLOW10 = Percentage share of income or consumption of lowest 10%

TABLE 2
OLS REGRESSION ESTIMATES OF COEFFICIENTS ASSOCIATED WITH SELECTED VARIABLES*

Dependent Variable: LN HFA_i

	C	D ₁	LN GINI _i	D ₁ LN GINI _i	LN SHH10 _i	D ₁ LN SHH10 _i	LN SHLOW20 _i	D ₁ LN SHLOW20 _i	LN SHLOW10 _i	D ₁ LN SHLOW10 _i	LN POL _i	D ₁ LN POL _i	R ²	F
equation 1	-27.8251	34.5457	5.5265	-4.9689					-0.0342	-0.7640	1.5853	-1.8740	0.4709	4.0883
Std. Error	10.4878	14.1280	1.6552	2.0650					0.3120	0.4307	0.8999	1.5531		
t-Statistic	-2.6531	2.4452	3.3390	-2.4062					-0.1098	-1.7740	1.5654	-1.2086		
p value	0.0123	0.0202	0.0021	0.0221					0.9134	0.0656	0.1273	0.2364		0.0027
equation 2	-29.2562	35.8555			6.3364	-5.6987			-0.0030	-0.7856	1.5263	-1.8613	0.4935	4.4541
Std. Error	10.2404	13.6882			1.7554	2.1839			0.3058	0.4245	0.9759	1.5065		
t-Statistic	-2.8569	2.6194			3.6109	-2.6049			-0.0097	-1.8509	1.5640	-1.2339		
p value	0.0075	0.0134			0.0010	0.0138			0.9923	0.0734	0.1277	0.2262		0.0015
equation 3	-1.2355	10.2072					-3.5469	2.7981	-0.1630	-0.8127	1.7293	-1.8710	0.4636	3.9515
Std. Error	6.9518	9.7708					1.1124	1.4742	0.2996	0.4206	1.0165	1.5915		
t-Statistic	-0.1777	1.0447					-3.1886	1.8981	-0.5440	-1.4565	1.7013	-1.1758		
p value	0.8601	0.3040					0.0032	0.0687	0.5902	0.1550	0.0988	0.2484		0.0033
equation 4	-4.8226	12.8733							-0.2452	-0.5486	1.8102	-1.8698	0.4479	3.7093
Std. Error	7.1410	10.1613							0.9928	0.4172	1.0392	1.6389		
t-Statistic	-0.6753	1.2669							-0.8272	-1.3150	1.7420	-1.1531		
p value	0.5043	0.2143							0.4143	0.1979	0.0911	0.2574		0.0048

* The sample consists of 11 high income, 13 middle income and 2 low income countries. ~~10~~ were industrialized and 2 were from Sub-Saharan Africa.

HFA = Total recorded intentional homicide committed with firearms per 100,000 inhabitants
t = 1997, 2000
D₁ = 0 if t=1997; 1 if t=2000
PGNP = Per capita GNP
POL = Total police personnel per 100,000 inhabitants
GINI = Gini coefficient
SHH10 = Percentage share of income or consumption of highest 10%
SHLOW20 = Percentage share of income or consumption of lowest 20%
SHLOW10 = Percentage share of income or consumption of lowest 10%

TABLE 3
OLS REGRESSION ESTIMATES OF COEFFICIENTS ASSOCIATED WITH SELECTED VARIABLES*

Dependent Variable: LN NIH _t		C	D _t	LN GINI _t	D _t LN GINI _t	LN SHH10 _t	D _t LN SHH10 _t	LN SHLOW20 _t	D _t LN SHLOW20 _t	D _t LN SHLOW10 _t	LN PGNP _t	D _t LN PGNP _t	LN POL _t	D _t LN POL _t	R ²	F
equation 1	Coefficient	-13.7341	15.8528	3.5569	-2.1515						0.0300	-0.2108	0.1547	-1.1187	0.2788	2.0866
	Std. Error	7.1987	10.0106	1.3236	1.8834						0.2544	0.3519	0.6230	1.0208		
	t-Statistic	-1.9079	1.5836	2.6973	-1.1423						0.1179	-0.5991	0.2483	-1.0959		
	p value	0.0640	0.1216	0.0106	0.2605						0.9068	0.5527	0.8052	0.2800		0.0676
equation 2	Coefficient	-14.8483	17.8771			3.8572	-2.5688				0.0473	-0.2573	0.2907	-1.2476	0.2812	2.1240
	Std. Error	7.3832	10.0371			1.3927	1.9906				0.2552	0.3481	0.6284	1.0235		
	t-Statistic	-2.0111	1.7811			2.7696	-1.2904				0.1853	-0.7392	0.4641	-1.2189		
	p value	0.0514	0.0829			0.0086	0.2047				0.8540	0.4644	0.6452	0.2304		0.0643
equation 3	Coefficient	5.4717	4.1640													
	Std. Error	3.7746	6.1163													
	t-Statistic	1.4496	0.6808													
	p value	0.1554	0.5001													
equation 4	Coefficient	3.0667	5.1137													
	Std. Error	3.8782	5.8875													
	t-Statistic	0.8337	0.8686													
	p value	0.4096	0.3905													
equation 5	Coefficient															
	Std. Error															
	t-Statistic															
	p value															

* The sample consists of 13 high income, 14 middle income and 3 low income countries. 11 were industrialized and 2 were from Sub-Saharan Africa

NIH = Total recorded non-intentional homicide per 100,000 inhabitants
t = 1997, 2000
D_t = 0 if t=1997; 1 if t=2000
PGNP = Per capita GNP
POL = Total police personnel per 100,000 inhabitants
GINI = Gini coefficient
SHH10 = Percentage share of income or consumption of highest 10%
SHLOW20 = Percentage share of income or consumption of lowest 20%
SHLOW10 = Percentage share of income or consumption of lowest 10%

In their analysis of the determinants of national crime rates covering the period 1970 to 1994 in a sample of 45 countries for intentional homicides and 34 countries for robberies, Fajnzylber et al. found income inequality as measured by the gini index a significant positive determinant of national robbery and homicide rates. Analyzing cross-national panel data, Neumayer (2003) argued that "the apparent link between income inequality and homicide might be spurious."¹⁰ Bourguignon (1999) argued that "the significance of inequality as a determinant of crime in a cross-section of countries may be due to unobserved factors simultaneously affecting inequality and crime rather than to some causal relationship between these two variables."¹¹

Fajnzylber et al. cited the limited amount and the unequal distribution of crime prevention efforts that could be present in more unequal countries as a factor that could lead to such spurious correlation between income inequality and crime rates. From their additional analysis of factors that could affect both income inequality and crime, namely: the existence of educational inequality, and the degree of income and ethnic polarization, they concluded that income inequality has a significant and independent impact on intentional homicide and robbery rates. They claimed that "this is consistent with the observation in Neapolitan (1997) and LaFree (1999) to the effect that the most robust finding in cross-national crime research has been the positive relationship between income inequality and homicides"¹² and that "this conclusion is not only derived from studies based on official crime statistics but is also present in those based on victimization rates from household surveys."

2. PER CAPITA GNP

The elasticities of rates of intentional homicide committed with firearms and of non-intentional homicide with respect to per capita GNP are not significant. In Table 1, the elasticities of the rate of completed intentional homicide with respect to the same variable are negative and significant, with maximum p value equal to 0.0077.

¹⁰ Neumayer, Eric, (2003), "Good Policy can Lower Violent Crime: Evidence from a Cross-Panel of Homicide Rates, 1980-97," Journal of Peace Research 40(6): 619-640.

¹¹ François Bourguignon, "Crime, Violence and Inequitable Development," Paper prepared for the Annual World Bank Conference on Development Economics, Washington, D.C., April 28-30, 1999, http://www.worldbank.org/research/abcde/washington_11/pdfs/bourg.pdf

¹² Neapolitan, Jerome L. (1997), Cross-National Crime: A Research Review and Sourcebook. Westport, Connecticut: Greenwood Press.

LaFree, Gary (1999), "A Summary and Review of Cross-National Comparative Studies of Homicide." In M. Dwayne Smith and Margaret A. Zahn, eds., Homicide: A Sourcebook of Social Research. Thousand Oaks, CA: Sage Publications.

In their cross-country analysis of determinants of intentional homicide, Fajnzylber et. al. used two alternative sources of crime data, namely, the United Nations World Crime Surveys (UN) and the World Health Organization Mortality Statistics (WHO). The coefficient on per capita GNP is positive and insignificant in their regression equations based on data from the UN; It is negative and significant in their regression equations based on data from WHO. There are differences in these two samples, namely: 1) The UN data cover the period 1970-1994; the WHO data cover 1965-95; 2) Homicide is defined as "death purposefully inflicted by another person, as determined by an accredited public health official" in the WHO data set; In the UN surveys, intentional homicide refers to death purposely inflicted by another person, including infanticide, as recorded in police statistics; 3) The authors reported that while the two sample sizes are equal to 45, their composition are different and that in the WHO data set, industrialized and Latin American countries are over represented. Their UN data set includes 16 industrialized countries, or 35.6% of the sample of 45 countries, and excludes countries from Sub-Saharan Africa.

The sign and significance of the coefficients associated with per capita GNP in Table 1 are consistent with those found by Fajnzylber et al. based on data from WHO. They are different from their finding based on data from the UN. We note that our data, which were obtained from the same source, differ from theirs in four ways: 1) Our samples include countries from Sub-Saharan Africa; 2) The percentage of industrialized countries in our sample is different. 38.5%, or 15 of the 39 countries in Table 1 are industrialized; 3) Our sample size is smaller; 4) Our data cover 1997 and 2000.

Field (1990)¹³ and Erlich (1973) found significant positive effects of income on violent crime. Yue-Chim Richard Wong found a weak positive effect of real per capita net national income on the overall crime rate in England and Wales in 1857-92. The Center for International Crime Prevention noted that "the prevalence of both property crime and violent crimes is related to problems of economic hardship among the young no matter what region and that where more people are economically deprived, crime rates are higher."¹⁴ A negative effect from city average family income on young males

¹³ See FIELD, S. (1990), "Trends in Crime and their Interpretation: a Study of Recorded Crime in England and Wales," Research Study No. 119, London, HM Stationary Office, 1990, R Home Office A T O 90 1 in the literature survey identifying key economic, social and criminal justice factors that had a causal effect on the recorded levels of post-World War II violent crime and domestic burglary of Marris and Volterra Consulting, "Survey of the Research on the Criminological and Economic Factors Influencing Crime Trends," December 2000, <http://www.volterra.co.uk/docs/crimerlm.pdf>.

¹⁴ See Graeme Newman (Editor), Global Report on Crime and Justice, United Nations Office for Drug Control and Crime Prevention, Center for International Crime Prevention. Oxford University Press, News York, NY (1999)

arrest rates was found by Fleisher, who argued that the ambiguity of the effect on crime of higher levels of income is due to the correlation of income with both the opportunity cost and the expected payoff from crime

3. THE PROBABILITY OF APPREHENSION AND CONVICTION

In the estimated equations in Table 1, the elasticities of completed intentional homicide rate with respect to the total police personnel per 100,000 inhabitants are positive, with maximum p value equal to 0.0285. Those of the rates intentional homicide committed with firearms and of non-intentional homicide with respect to the same variable are not significant.

In their aforementioned analysis based on UN surveys, Fajnzylber et al. found the coefficient on police personnel per 100,000 inhabitants significantly negative in the case of intentional homicide and significantly positive in the case of robbery. Noting that "countries with higher incidence of homicides tend to have larger police force and tougher criminal legislation," they claimed that reverse causality should lead to a positive bias in the estimation of the coefficient of this variable. They concluded that finding a significantly negative coefficient on a deterrence proxy means that its crime-reducing impact is large enough to overcome the positive bias due to reverse causality. Thus, a positive bias due to reverse causality that overcomes this crime-reducing impact can lead to a significantly positive coefficient on a deterrence proxy.

Other possible causes of a positive relationship between crime and the probability of apprehension and punishment can be found in the literature. The probability of apprehension may be perceived as low by individuals living in areas with high crime rates because the resources spent in apprehending each criminal tend to be low, as argued by Sah (1991)¹⁵. In such event, an increase in the probability of apprehension and punishment due to the high crime rate can lead to a higher crime rate because of the low perception of the probability of apprehension. Erlich noted that in a riot, for example, the probability of apprehension of individual rioters, as well as of offenders committing other crimes, decreases considerably below its normal level due to the excessive load on local police units. He identified this as a source of external economies in criminal activity. Weatherburn, Topp, Midford and Allsop (2000) noted the suggestion of some studies that the deterrent effect of formal sanctions arises principally from the social stigma caused by their imposition. Fear of stigma depends on punishment's being a rare event. A criminal record cannot be socially isolating if it is commonplace. Thus the deterrent

¹⁵ Sah, Raj. (1991). "Social Osmosis and Patterns of Crime." *Journal of Political Economy* 99: 1272-1295.

effect may be eroded by an increase in the proportion of the population affected by this stigmatisation.¹⁶

Negative relationships of crime rates to measures of deterrence are also reported in the literature. In some perceptual deterrence studies, self-reported criminality was found to be lower among people who perceived the sanction risks as higher (eg Grasmick & Bursik, 1990; Paternoster & Simpson, 1997).¹⁷ Using cross-sectional data by US state for 1959-61, Gibbs (1968) found that those states with a higher probability of punishment had lower murder rates.¹⁸ Erlich found that rates of specific crime categories varied inversely with estimates of the probability of apprehension and punishment by imprisonment, measured by the number of offenders imprisoned per offenses known to have occurred.

A possible interaction between certainty of punishment and severity was pointed out by Ross and La Free (1986).¹⁹ When charges attract harsher penalties, defendants fight them more aggressively, prosecutors are more willing to plea bargain, and judges and jurors are less willing to convict (Ross, 1976).²⁰ Where the likelihood of punishment is very low, the potential offender discounts the risk of even more severe penalties as negligible. Thus, severe penalties can decrease the probability of punishment.

CONCLUSION

The coefficients on inequality of income or consumption are significant in all of our estimated equations on completed intentional homicide and intentional homicide

¹⁶ Don Weatherburn, Libby Topp, Richard Midford and Steve Allsopp (2000) "Drug Crime Prevention and Mitigation: A Literature Review and Research Agenda," Published by the NSW Bureau of Crime Statistics and Research, Attorney General's Department, Sydney, Australia, [http://www.lawlink.nsw.gov.au/bocsar1.nsf/files/r49.pdf/\\$file/r49.pdf](http://www.lawlink.nsw.gov.au/bocsar1.nsf/files/r49.pdf/$file/r49.pdf)

¹⁷ Grasmick, H.G. & Bursik, R.J. Jr 1990, "Conscience, significant others and rational choice: Extending the deterrence model", *Law and Society Review*, vol. 24, pp. 837-861.

Paternoster, R. & Simpson, S. (1997), "Sanction threats and appeals to morality: Testing a rational choice theory of corporate crime", *Law and Society Review*, vol. 30, 549-584

¹⁸ Gibbs, J.P. (1968), "Crime, punishment and deterrence", *Southwestern Social Science Quarterly*, vol. 48, pp. 515-530

¹⁹ Ross, H.L. & La Free, G.D. (1986), "Deterrence in criminology and social policy", in *Behavioural and Social Science: Fifty Years of Discovery*, eds N.J. Smelser & D.R. Gerstein, National Academy Press, Washington, D.C, pp. 129-152.

²⁰ Ross, H.L. (1976), "The neutralisation of severe penalties: Some traffic law studies", *Law and Society Review*, vol. 10, pp. 403-413.

committed with firearms. These are consistent with the findings of Fajnzylber et al., who claimed that income inequality has a significant and independent impact on intentional homicide rate and that "this conclusion is not only derived from studies based on official crime statistics but is also present in those based on victimization rates from household surveys." The coefficients on the same explanatory variables are also significant in our estimated equations on non-intentional homicide.

We found a significant and negative relationship of per capita GNP with completed intentional homicide. This is consistent with the finding of Fajnzylber et al. in their cross-country analysis of determinants of homicide rates based on data obtained from WHO but not with their analysis based on the United Nations World Crime Surveys. We found a significantly positive relationship of police personnel per 100,000 inhabitants and completed intentional homicide. Fajnzylber et al. also found the relationship of police personnel per 100,000 inhabitants with intentional homicide significant but with a different sign. The size and composition of our samples, as well as time periods, are different from theirs.²¹

²¹ Cassen and Associates (1994) hypothesize that, in the case of the relationship of aid and growth in cross-country analyses, ambiguity might depend on country groupings and time period chosen. See Cassen, R. and Associates (1994), Does Aid Work? 2nd edition, Oxford: Clarendon Press in Abuzar Asra et al., "Poverty and Foreign Aid: Evidence from Recent Cross-Country Data," ERD Working Paper Series No. 65, March 2005.

REFERENCES

- Becker, Gary. S. (1968), "Crime and Punishment: An Economic Approach." Journal of Political Economy 76: 169-217.
- Becker, Gary. S. (December 9, 1992), "The Economic Way of Looking at Life," Nobel Lecture, <http://home.uchicago.edu/~gbecker/Nobel/nobellecture.pdf>. See also Becker, Gary S. (1993), "Nobel Lecture: The Economic Way of Looking at Behavior." Journal of Political Economy 101: 385-409.
- Bourguignon, François "Crime, Violence and Inequitable Development," Paper prepared for the Annual World Bank Conference on Development Economics, Washington, D.C., April 28-30, 1999, http://www.worldbank.org/research/abcde/washington_11/pdfs/bourg.pdf
- Carr-Hill, R.A. and Stern, N.H. (1979), Crime, the Police and Criminal Statistics, New York: Academic Press.
- Cassen and Associates (1994), Does Aid Work?, 2nd edition, Oxford: Clarendon Press
- in Abuzar Asra et al., "Poverty and Foreign Aid: Evidence from Recent Cross-Country Data," ERD Working Paper Series No. 65, March 2005.
- Ehrlich, I. (1973), "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation," Journal of Political Economy, 81(3): pp521-565.
- Pablo Fajnzylber, Daniel Lederman and Norman Loayza, "Crime and Victimization: an Economic Perspective," Economia 1.1 (2000) 219-278. See also, Pablo Fajnzylber, Daniel Lederman, and Norman Loayza, "Crime and Victimization: an Economic Perspective", May 8, 2000, <http://www.lacea.org/meeting2000/PabloFajnzylber.pdf>
- Pablo Fajnzylber, Daniel Lederman and Norman Loayza, "What Causes Violent Crime?" European Economic Review, Volume 46, Issue 7, July 2002, pp. 1323-1357
- FIELD, S. (1990), "Trends in Crime and their Interpretation: a Study of Recorded Crime in England and Wales," Research Study No. 119, London, HM Stationary Office, 1990, R Home Office A T O 90 1
- Fleisher, Belton M. (1966), "The Effect of Income on Delinquency," American Economic Review 56: 118-137.
- Gibbs, J.P. (1968), "Crime, punishment and deterrence", Southwestern Social Science Quarterly, vol. 48, pp. 515-530
- Grasmick, H.G. & Bursik, R.J. Jr (1990), "Conscience, significant others and rational choice: Extending the deterrence model", Law and Society Review, vol. 24, pp. 837-861.

LaFree, Gary (1999), "A Summary and Review of Cross-National Comparative Studies of Homicide." In M. Dwayne Smith and Margaret A. Zahn, eds., Homicide: A Sourcebook of Social Research. Thousand Oaks, CA: Sage Publications.

Levitt, Steven. (1996). "The effect of Prison Population Size on Crime Rates: Evidence from Prison Overcrowding Litigation." Quarterly Journal of Economics 111: 319-352.

Levitt, Steven. (1997). "Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime." American Economic Review 87: 270-290.

Levitt, Steven. (1998). "Why Do Increased Arrest Rates Appear to Reduce Crime: Deterrence, Incapacitation, or Measurement Error?" Economic Inquiry 36: 353-372.

Marris and Volterra Consulting, "Survey of the Research on the Criminological and Economic Factors Influencing Crime Trends," December 2000, <http://www.volterra.co.uk/docs/crimerlm.pdf>.

Neapolitan, Jerome L. (1997), Cross-National Crime: A Research Review and Sourcebook. Westport, Connecticut: Greenwood Press.

Neumayer, Eric, (2003), "Good Policy can Lower Violent Crime: Evidence from a Cross-Panel of Homicide Rates, 1980-97," Journal of Peace Research 40(6): 619-640.

Neumayer, Eric (May 2004), "Is Inequality Really a Major Cause of Violent Crime? Evidence from a Cross-National Panel of Robbery and Violent Theft Rates", <http://econwpa.wustl.edu:8089/eps/le/papers/0312/0312002.pdf>

Newman, Graeme (Editor), Global Report on Crime and Justice, United Nations Office for Drug Control and Crime Prevention, Center for International Crime Prevention. Oxford University Press, New York, NY, 1999

Paternoster, R. & Simpson, S. (1997), "Sanction threats and appeals to morality: Testing a rational choice theory of corporate crime", Law and Society Review, vol. 30, 549-584

Ross, H.L. (1976), "The neutralisation of severe penalties: Some traffic law studies", Law and Society Review, vol. 10, pp. 403-413.

Ross, H.L. & La Free, G.D. (1986), "Deterrence in criminology and social policy", in Behavioural and Social Science: Fifty Years of Discovery, eds N.J. Smelser & D.R. Gerstein, National Academy Press, Washington, D.C, pp. 129-152.

Sah, Raj. (1991). "Social Osmosis and Patterns of Crime." Journal of Political Economy 99: 1272-1295.

Taft, D.R., and England, R.W., Jr. (1964), Criminology, 4th ed., New York: Macmillan

Don Weatherburn, Libby Topp, Richard Midford and Steve Allsopp (2000) "Drug Crime Prevention and Mitigation: A Literature Review and Research Agenda," Published by the NSW Bureau of Crime Statistics and Research, Attorney General's Department, Sydney, Australia, [http://www.lawlink.nsw.gov.au/bocsar1.nsf/files/r49.pdf/\\$file/r49.pdf](http://www.lawlink.nsw.gov.au/bocsar1.nsf/files/r49.pdf/$file/r49.pdf)

Yue-Chim Richard Wong, "An Econometric Analysis of the Crime Rate in England and Wales, 1857-92," Economica, 62 (May 1995), pp. 235-246.