



THE DETERMINANTS OF CRIME IN BARBADOS

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Abstract

This paper attempts to determine some of the causes of crime in Barbados from 1980-1999 using a simultaneous equation model. Explanatory variables used in the analysis include the unemployment rate, the extent of prison overcrowding, the number of persons executed, per capita GDP, the number of policemen relative to the size of the population, expenditure on the police force, and the size of the population. The impact of these variables on house break-ins, robbery, larceny, rape, murder, indecent assault, and overall crime are examined. Results suggest that prison overcrowding and unemployment are positively related to crime while police development expenditure, police per capita and real GDP for the most part, exerted negative influences on crime.

JEL Classification: I39

Keywords: Crime, unemployment, education, prison-overcrowding, police force, GDP.

Every crime destroys more Edens than our own.

Hawthorne, *The Marble Faun* vol I, ch. 23.

1.1 Introduction

Crime is a problem which has plagued many countries throughout the world - from the developed economies of the US and Canada, to the transition economies of Eastern Europe and to developing countries like Barbados. In fact Fajnzylber, Lederman and Loayza (1998) note that crime and violence have been highlighted as major obstacles to the achievement of developmental objectives in Latin America and the Caribbean. It is a social ill which not only affects the community through the reduction of the quality of life as persons have to deal with increased fears of personal safety, but also through its impact on the level of economic activity. This threat is perhaps even more acute in small open economies like Barbados, which are heavily dependent on an image-based tourism sector. Additionally, the double challenges of globalisation and trade liberalisation and the employment fall-out in various sectors in the adjustment process may provide an environment more conducive to crime.

Recently, there has been much debate about the level of crime in Barbados. Not only was there an increase in the overall level of crime in 1999 but what has concerned many Barbadians, is the increasing level of violence associated with crime. Over the period 1997 to 1999 there was a steady increase in the homicide rate (murder plus manslaughter), which was recorded at 8.6 per 100,000 up from 4.6 just two years earlier.

Given the topical nature of the issue and deleterious effect of crime on the social and economic fabric of society, this paper attempts to empirically identify some of the determinants of crime in Barbados. While many causes for crime have been advanced, ranging from criminal pathways theory, which focuses on the critical turning points in one's life, to differential association where behaviour is learnt from "bad" companies,

this study focuses on the more quantifiable social and economic aspects of crime. In the following section, some crime statistics in Barbados are presented, while section 3 reviews some of the prevailing empirical literature. Section 4 presents the model to be estimated and section 5 explains the data used in estimation. Section 6 reports the results of estimation and finally, in section 7 some concluding remarks and policy implications are given.

2 Features of Crime in Barbados

In this section, the trends in various categories of crime in Barbados are presented. In certain instances data availability allows discussion from 1970 while in others, the analysis is from 1980. At this point it should be noted that the data reported here reflect incidents that were brought to the attention of the police. It is therefore assumed that the ratio of reported crime to the true level of crime does not vary significantly over time, so that movements in reported crime reflect to a large extent, fluctuations in the actual level of crime.

2.1 Total Crime Reported

A look at total reports of crime in Barbados reveals that crime levels between 1970 and 1978 were relatively stationary, fluctuating around an average of 6,300 or about 2565 per 100,000. However, as the economy experienced some difficulty in the early eighties, the level of reported criminal activity increased, before reaching a new mean of around 7,926 or 3,170 per 100,000. Thereafter there was a steady rise in crime, which saw a maximum of 13,047 (4951 per 100,000) cases being reported in 1993. This was followed by a sustained fall in the numbers up to 1998, but the year 1999 however, saw an upturn in the level of crimes recorded. At year-end this figure totalled 10,196 (3,805 per 100,000), implying that on average, 1 person out of 28 would have been a victim of crime some form of crime in Barbados.

Chart 2.1 – Total reports of crime

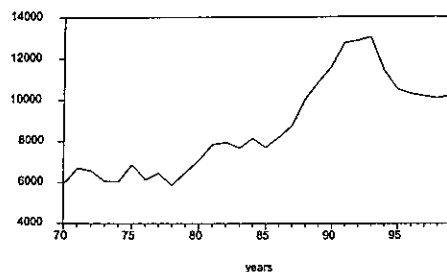
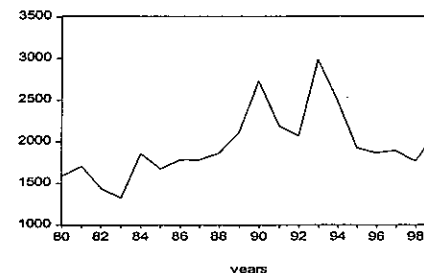


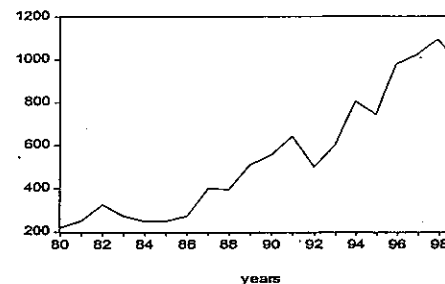
Chart 2.2 – House Burglaries



2.3 Drug Offences

As can be seen from Chart 2.3, the increase in the number of drug-related has been steady. Drug related offences have more than quadrupled from the 88 per 100,000 recorded in 1980 to 367 per 100,000 in 1999. However, the Office of the Attorney General (1999) cautions that because drug-related offences are victimless crimes, reports are only generated when arrests are made and consequently, some of the rise shown may be due in part to heightened police activity.

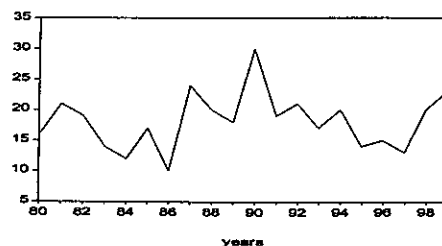
Chart 2.3 - Drug-Related Offences



2.4 Homicides

A plot of the number of homicides reported in Barbados, showed reveals no clear pattern, fluctuating between a minimum of 7 per 100,000 in 1986 to maximum of 12 per 100,000 in 1990. In 1999, there were 23 homicides. What is noticeable however, is the increase over the last two years of the sample period. In 1999 the homicide rate was approximately 8.6 per 100,000 up from 4.5 two years earlier. When compared to other countries, available information suggests that this rate may still be lower than in other Caribbean countries. In 1997, the homicide rate in Jamaica was approximately 41.6 per 100,000 while in Trinidad and Tobago it was estimated at 20.9 per 100,000, and 8 per 100,000 in St. Lucia.

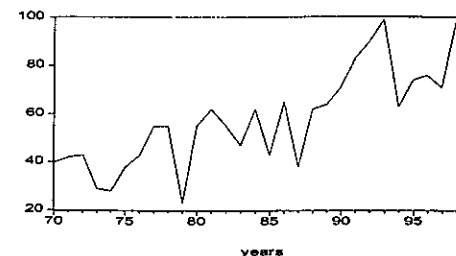
Chart 2.4 – Homicides



2.5 Rape

From 1970 to 1999, there was a general increase in the number of rape cases. In 1999, there were 68 reported cases of rape, up from a low of 23 in 1979. On a per capita basis this translates to an increase from 9 in 1979 to 25 per 100,000 in 1999. While a genuine upturn in the level of rape cannot be ruled out, it must be acknowledged that this increase in the number of rapes may be due to greater reporting by females.

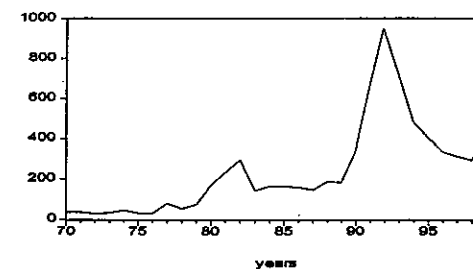
Chart 2.5 – Rape



2.6 Robbery

Over the twenty year period there has been a noticeable increase in the number of robberies reported, with distinct peaks during the recessionary periods in the early 1980s and 1990s. Crimes in this category grew from a mere 28 (12 per 100,000) in 1972, to 953 (363 per 100,000) in 1992. While there was some downward movement thereafter, 1999 saw an increase in the number of robberies recorded. On a per capita basis, in 1999, approximately 154 persons out of every 100,000 may have been a victim of robbery. In 1997, this figure was 118 and in Trinidad, for the same year, it was approximately 620 per 100,000 persons.

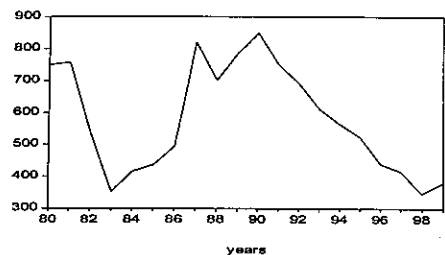
Chart 2.6 - Robbery



2.7 Crimes Against Visitors

Analysis of this category revealed that crimes against tourists fell and rose sharply in the 1980s and after peaking at 849 in 1990, there was a downward trend. However, 1999 saw an increase in the numbers to 379. Furthermore, statistics indicate that in 1999 approximately 40 out of every 100,000 visitors were victims of crime, a figure that threatens the tourist industry, as visitors will tell of bad experiences, but also because any incidents are made publicly available through newsprint and other media in source markets.

Chart 2.7 – Crimes Against Visitors



Literature Review

A review of the literature revealed that the level of crime is influenced by three main factors. These are: (a) pecuniary or incentive variables such as the unemployment rate, income inequality measures, median income of families, GDP per capita etc. (b) deterrence and punishment variables like the per capita police rate, police development expenditure, the imprisonment rate, average time served in prison by offenders and (c) socio-demographic factors such as the average education level of the society, urbanisation rate, the percentage of the population within a certain age range and the population size.

Ehrlich (1973) found that increasing the conviction or imprisonment rate significantly lowered the incidence of property crime in the US. With respect to other categories of crime, Ehrlich found that the probability of apprehension, punishment by imprisonment and the average length of time served in prison were negatively related to most categories of crime, while income inequality, measured by the percentage of families below one-half of the median income was significant for larceny, burglary, car theft and robbery.

Meera and Jayakumar (1995) examined the case of Malaysia and found that all categories of variables (pecuniary, deterrence and socio-demographic) significantly explained most categories of crime (homicide being the notable exception). Unemployment, urbanisation, prison overcrowding, police development expenditure and GNP per capita exerted a positive influence on crime. The size of the police force, the rural-urban income disparity and the proportion of young persons in the population did not significantly affect the level of crime in Malaysia. The study also found that violent crimes like rape and grievous assault were best explained by prison overcrowding, the unemployment rate, and urbanisation.

Fajnzylber, Lederman and Loayza (1998) in their study of crime rates around the world, concluded that economic downturns and income inequality as measured by the Gini coefficient exert a positive influence on homicide rates. Additionally, higher drug related activity, represented by both drug production and drug possession can lead to higher levels of intentional homicide. Results also suggested a strong degree of criminal inertia as past homicide rates were positively and significantly related with current levels – the rise in crime rates may be felt long after the initial shock, which can result in a crime wave. Having a more educated population, a stronger police force and higher conviction rate were found to have homicide reducing effects. With respect to robberies, the results obtained were largely the same as for homicides, however, urbanisation played a much more important role, exerting a positive influence on robbery.

While there has been no vigorous empirical work done in Barbados, there have been a couple of studies, which have hypothesised about the determinants of crime on the island. Bennett, Shields and Daniels (1997), using simple correlation analysis, divided possible criminal indicators into social factors (comprising, inequality, youth population, urban population and unemployment) and economic factors (consisting of GDP per capita, inflation and private consumption). At this point however, it should be noted that correlation is not an indicator of causality, as it merely shows how two variables move together. Indeed with this type of analysis it is possible to find a "relationship" between two variables where this is none, simply because they trend together. In their analysis, the authors found that all of the economic factors were positively correlated with incidents of burglary and larceny. Inequality and youth population on the other hand, were negatively correlated with burglary and larceny while urban population and unemployment were positively correlated burglary. Only urban population was found to be positively correlated with larceny. In looking at violent crimes, the authors found that only private consumption was correlated (positively) with murder, while GDP per capita and inflation were positively correlated with aggravated assault and rape. This positive correlation between private consumption and murder seems to be counter-intuitive and while this may be the true nature of the relationship, it may be due to the fact that these variables simply move together, and no causal relationship exists. As with burglary and larceny, inequality and youth population were negatively related to aggravated assault while urban population was positively correlated with positively correlated with aggravated assault and rape. This relationship between youth population and aggravated assault is somewhat unexpected, as this category of persons commits the majority of these crimes.

Other determinants, like some of those found by the National Task Force on Crime Prevention (1997) do not lend themselves easily to empirical analysis. These include variables such as religious participation, family influences, health, community and organisational factors. This paper, in an attempt to fill the void in the literature on crime in Barbados, undertakes a rigorous econometric approach to identify some of the factors which may explain criminal activity.

4. A Model of Crime

This section explores the determinants of crime by identifying variables, which influences criminal behaviour. These variables are examined under the three categories of deterrence, pecuniary and socio-demographic factors.

4.1 Deterrence Variables

Since the strength of the police and the judicial system should increase the probability of apprehension and punishment for criminal actions, thereby reducing the incentive for an individual to commit a crime, the number of police per capita, (PC) and per capita police development expenditure (PE) were included in the model. We also included the variable, prison overcrowding (PO), which especially in recent times, has been a point of concern in Barbados. A crowded prison increases the level of interaction among prisoners, leading to a rise in an individual's criminal knowledge and, if this individual is allowed to rejoin society, the probability that he commits a similar crime, or a different one based on his newly acquired knowledge, is relatively high. From a different perspective, excessive detention in a crowded prison can result in lower perceived chances of being punished, even if charged and convicted, thus leading to higher crime rates.

4.2 Pecuniary Variables

The level and growth of economic output create attractive opportunities for employment which should have a negative effect on crime rates but, since an increase in economic activity also improves the wealth of other members of the society, the size of the potential loot from crime, also rises. In addition, a rapid rise in economic activity is likely to make a society more materialistic and optimistic. Under such conditions, all types of crime may be expected to rise. Therefore, the effect of heightened economic activity on the individual's decision to commit a crime is, in principle, ambiguous. The rate of growth in real GDP was used as an explanatory variable in the model. Unemployment (UE) is also included since it is expected that as the level of unemployment rises so does the various crime rates. In a survey of the inmates at the island's sole prison, by

the National Task Force on Crime Prevention (1997), it was revealed that approximately one half of the inmates were unemployed at the time of conviction.

4.3 Socio-demographic Variables

As the population grows, *ceteris paribus*, it is expected to lead to an increase in crime rates. The population size (S) was therefore used in the model as an explanatory variable. Another important social variable is the level of education. Higher educational level maybe associated with higher expected earnings, therefore exerting a negative influence on crime. Also, there is the possibility that education would increase the individual's moral stance, hence reducing his propensity to commit a crime. However, education may raise the level of criminal activity, as it may provide opportunities for an individual to enter into higher-paying crimes. Therefore, the net effect of education on crimes is, in principle ambiguous. While the level of secondary school certification would have been useful, due to its unavailability school enrollments as a percentage of the eligible secondary school population (ED) was used as a representation of education levels. The education level is also of great importance since in the same study by the National Task Force on Crime Prevention it was revealed that 86% of the inmates left secondary school with out certification. It is therefore expected that this variable would have a negative effect on crime since, by its mere presence alone, it reduces the time available for participating in the crime industry.

Therefore the complete set of explanatory variables used in modelling crime in Barbados is $\{PC, PD, PO, GDP, UE, S, ED\}$. The dependent variables (Y) studied are the crime rates under the headings: total crimes (TC); house break-ins (HB); manslaughter (MS); murder (M); rape (R); drugs (D); and total crimes against visitors (TCV). A complete description of the variables and their sources are given in Table 1.

5 Specification and Results

5.1 Specification

Following Meera and Jayakumar, 1995, a simultaneous crime determination model for each category of crime mentioned above, is specified as:

$$Y = \beta_0 UE + \beta_1 GDP + \beta_2 S + \beta_3 PC + \beta_4 PD + \beta_5 PO + \beta_6 ED \quad (1)$$

$$PD_t = r_0 + r_1 TC_{t-1} + r_2 GDP_{t-1} + r_3 PO_{t-1} \quad (2)$$

$$PC_t = \alpha_0 + \alpha_1 TC_{t-1} + \alpha_2 S_{t-1} + \alpha_3 PO_{t-1} \quad (3)$$

$$PO_t = \lambda_0 + \lambda_1 TC_{t-1} + \lambda_2 PD_{t-1} + \lambda_3 PE_{t-1} \quad (4)$$

In equation 2, police development expenditure for any period is determined by lagged values of the total crime rate, real GDP growth and prison overcrowding. If crime rates are high in any period, then one would expect police development to rise in subsequent periods. Hence, a positive sign on r_1 is expected. Equation 3 explains police per capita at the end of any period as being determined by lagged values of the crime rate, population size and prison overcrowding. All three are expected to be positively related to police per capita. In equation 4, prison overcrowding is modelled as a function of the crime rate, police development expenditure and police per capita, all lagged one period. The sign on the crime rate is expected to be positive while that of police development expenditure is anticipated to be negative since such expenditures should include an expansion in the police force and an enhancement in the skills of the police force. The police per capita in principle can have any sign depending on the relative size of its affect on criminal activity and criminal arrest. A larger and more equip police may cause more criminals to be caught and ultimately punished or it may reduce criminal activities by having a deterring effect.

The above model was estimated using a two-step estimation process (A. Pagan, 1984). In the first stage the predicted values are generated for the dependent variables in

equations 2 – 4; at the second stage, these are used as the predictor variables in equation 1. The data run from 1972 to 1999, 28 observations, resulting in 21 degrees of freedom for the error, for individual models. This is acceptable econometrically and the final results are presented in Table 2.

5.2 Results

The values of the adjusted coefficient of determination ($\bar{R}^2$) range from 0.51, in the case of murder, to 0.95 for the case of drugs related crimes. This means that the combined model is able to explain most of the variations in crime rates. Furthermore, the results of the regression analysis support most of the hypotheses postulated earlier. For total crime, the signs of the coefficients are all consistent with the model hypotheses. Increases in the unemployment rate and population size have a positive effect on total crime rate, while the secondary school enrollment ratio has a negative impact on crime. The sign on the income variable indicates that as real income increases total crime decreases, so that the negative income affect is more dominant than its positive affect. The coefficients of police development establishment (PE) and police per capita are not statistically significant although correctly signed. The positive algebraic sign on the coefficient of prison overcrowding (PO) suggests that it makes a positive contribution to the crime rates. The reasoning behind this may be that an overcrowded prison reduces the suggestive probability of being punished (even after being caught, charged and convicted) as perceived by potential criminals. Furthermore, convicts incarcerated for 'soft' crimes, may have greater interaction with harden criminals and hence increase their potential for criminal activity. Prison overcrowding is also significant in the other equations and is the only variable that was significant across all equations suggesting that it exerts a major influence on crime rates.

In explaining house break-ins, the significant variables were real income growth, secondary school enrollment ratio, police development expenditure and prison overcrowding. Real income growth is a positive contributor to house breakings. The reason being that as wealth rises, so do the potential returns from this activity and so, more persons are willing to take the risk of being caught for the chance of getting away

with a sizeable loot. In the case of manslaughter, all the explanatory variables were significant with the exception of unemployment. Instances of murder are explained by increases in the population size, school enrollment, police per capita and prison overcrowding with the signs in accordance with our previous hypotheses. The number of hangings over the period was also included as an explanatory variable in this regression. However, its role as a deterrent could not be statistically established. Only the population size and prison overcrowding were significant determinants in the regression on rape. This was not surprising since rape may be depending more on psychological factors and not determined by economic conditions. The results for drug crimes suggest that unemployment, police development expenditure, police per capita and prison overcrowding are influencing factors. The sign on unemployment is consistent with the model hypothesis and it was only for this category that unemployment proved to be a significant explanatory variable. Its contribution to drug related crimes is not surprising since a lot of unemployed young persons end up on the 'block' and it is actually there that a culture of drugs is formed. The positive signs on the coefficients of PD and PC appear counterintuitive. But this may simply be suggestive of the fact that generally not all crimes are reported, and that the development of the police force causes more crimes to be reported. The negative sign on prison overcrowding is also counterintuitive and we have been unable to explain it thus far.

In the regression of crimes committed against visitors, all the explanatory variables are significant with the exception of unemployment. Again all the signs are as expected. The Dubin-Watson (DW) statistic computed for the different regressions are reported in the last column and do not indicate the existence of any residual correlation.

6 Conclusion

This paper formulated a simultaneous model of crime in Barbados. The crime rates were studied under seven different categories and the explanatory variables fell in to three classes: deterrence, pecuniary-motive, and socio-demographic. The main conclusions of the study are:-

1. Prison overcrowding is positively related to crime. The reasons for this could be that it reduces in the subjective probability of being punished as perceived by potential offenders and increases interaction among prisoners leading to a sharing of knowledge and a rise in criminal activity.
2. Police development expenditure and police per capita are, for most cases, negatively related to crimes. However, in two instances it proved to be positively related. This maybe so because an increase this expenditure could facilitate the reporting of crime, which consequently would show as an increase in reported crimes.
3. In the case where unemployment was significant it proved to be positively related to crime. Its contribution to crime maybe through the economic imbalances it causes among the different socio-economic groups.
4. In five of the seven cases studied, growth in real GDP exerts a negative influence on crime. In the other instances, it may reflect socio-economic differences and/or the presence of anomalies where normlessness or anomic begins to take root in society.
5. Secondary school enrollment was a significant explanatory variable in four of the seven crime categories, and in all crimes it serve to reduce crime rates. Its continuation may be coming from the fact that it raises the moral level of society and individuals, and also because it offers individuals opportunities to earn legal wages.

e implications of these findings are as follows:-

1. Crime in Barbados is motivated in part by economic factors such as unemployment and economic growth. Prison overcrowding has also contributed to crime rates.

2. To reduce crime to a naturally low level, long-term policies should be designed. Such policies should include more institutions to combat unemployment, and ensuring the more efficient operations of those already in existence. Measures should also be put in place to reduce overcrowding at the prison. This can be addressed by a program designed to expand the existing institution or to create a new one.
3. The development of the police force has been a deterrent to crime and any program to combat crime should feature police development as a component.
4. Since secondary school enrollment has proved to be a significant factor, policies should be implemented to increase the ratio and level of certification of students. Additionally, measures should also be taken to improve established facilities like the Samuel Jackman Prescod Polytechnic which provide a way for those who do not form part of the secondary school system to still improve their educational level. Also of some importance is the implementation of diagnostic testing at an early age to determine the nature and causes of any problems in schooling.

Combatting crime requires the proper identification of its determinants. With the limited data on hand factors that may influence criminal behaviours, such as imprisonment rate, average time served by prisoners, violence on television, family relations, health, secondary school enrollment rate, etc. could not be analysed. Nevertheless, the empirical identification of some of the social and economic determinants of crime in Barbados could be of some use to policy-makers, as they attempt to control criminal activity in Barbados.

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Table 1

Variable	Description	Source
Police Development Expenditure	The sum of current and capital expenditure on defense.	ASD
Police per capita	Number of persons in the police force divided by the mid-year population.	Annual Reports of the Police Force ASD
Total reports of crime	Total "true reports" of crime	Barbados Statistical Service
Drugs	The number of drug offences recorded.	Crime and Justice Bulletin 1: Recorded crime in Barbados 1980-1999, National Task Force on Crime Prevention, Office of the Attorney General
Crimes Against Visitors	Total crimes against persons visitors Barbados.	Same as above.
House break-ins	Number of house burglaries recorded.	Same as above.
Robbery	"True Reports" of robbery.	The Barbados Statistical Service.
Secondary Enrollment Ratio	Number of children enrolled in secondary school divided by the number of children of secondary	Caribbean Development Bank and the World Development Indicators published by the World Bank.

Variable	Description	Source
Murder	school age in the population. "True reports" of murder	The Barbados Statistical Service
Homicide	The sum of manslaughter and murder	Crime and Justice Bulletin 1: Recorded crime in Barbados 1980-1999, National Task Force on Crime Prevention, Office of the Attorney General
Rape	"True reports" of rape	The Barbados Statistical Service
Prison Overcrowding	Since the number of prisoners the facility was intended to hold was 250, and no significant modifications have been made to the structure, this number was held constant, and subtracted from the actual number of prisoners incarcerated.	Office of the Attorney General.
Unemployment rate	While the number of persons employed was available from 1956, the unemployment rate was only available from 1975. To obtain unemployment rates for the period 1970 to 1975, total population was multiplied by 0.662 to get an estimate for the total adult population, and the	ASD

Variable	Description	Source
	total adult population multiplied by 0.654 to get the labour force. The number of persons unemployed = labour force - employment, and the unemployment rate was therefore calculated as: $\text{unemployment rate} = \frac{\text{unemployed}}{\text{labour force}}$	
No. of hangings	The number of persons executed by hanging in Barbados.	Office of the Attorney General.
Real GDP	Estimates of Real Gross Domestic Product	Central Bank of Barbados.
Population	Total number persons inhabiting Barbados	World Development Indicators, World Bank

TABLE 2

Determinants of Crime in Barbados – 1992 - 1998¹
Explanatory Variables

CRIME	UE	GDP	S	ED	PD	PC	PO	H	$\bar{R}^2$	DW
Total Crime	0.003 (0.04)	-0.002 (0.19)	0.005 (0.01)	-0.001 (0.002)	-0.003 (0.56)	-1.138 (0.84)	0.08 (0.00)		0.86	1.37
House Breaking	14.06 (0.64)	0.006 (0.01)	0.002 (0.94)	-108.5 (0.00)	-25.11 (0.00)	6405.44 (0.99)	1287.4 (0.00)		0.64	2.19
Manslaughter	-0.002 (0.98)	-0.001 (0.12)	-0.002 (0.06)	0.04 (0.27)	-0.008 (0.8)	-7.094 (0.05)	3.33 (0.1)		0.67	2.05
Murder	-0.14 (0.64)	-0.26 (0.21)	0.0002 (0.03)	-0.67 (0.04)	0.029 (0.722)	-10.601 (0.095)	5.83 (0.11)	-1.17 (0.36)	0.51	2.18
Rape	-0.88 (0.40)	-7.72x10.5 (0.40)	0.0008 (0.06)	0.32 (0.88)	-0.042 (0.89)	42.47 (0.97)	13.75 (0.0132)		0.71	7.3

¹ Figures in parentheses are the p-value associated with the regression coefficients for the $H_0: \beta_i = 0$.

CRIME	UE	GDP	S	ED	PD	PC	PO	H	$\bar{R}^2$	DW
Drugs	30.08 (0.00)	-0.0005 (0.53)	0.0047 (0.67)	15.11 (0.11)	2.64 (0.10)	689.9 (0.00)	-202.5 (0.12)		0.95	1.7
Total crime against visitors	6.8 (0.59)	0.003 (0.029)	0.038 (0.0351)	-33.58 (0.04)	-15.96 (0.00)	-877.9 (0.016)	665.01 (0.005)		0.65	1.8

UE = Unemployment; GDP = Real GDP growth; S = Population size; PD = Police development expenditure; PC = Police per capita; PO = Prison overcrowding.