Serious Crime in Trinidad and Tobago:
An Empirical Analysis Using Time-Series Data
Between 1970-2007

Sandra Sookram*
George Saridakis**
Maukesh Basdeo***
Kerry Sumesar-Rai***

* Sir Arthur Lewis Institute of Social and Economic Studies
  The University of the West Indies

**The Business School
Loughborough University

***Department of Behavioural Sciences
The University of the West Indies

SALISES Publications • Working Papers

Paper 2009:20

(Second version)
Serious Crime in Trinidad and Tobago:
An Empirical Analysis Using Time-Series Data
Between 1970-2007

Abstract

This paper uses time-series data from Trinidad and Tobago and tests for the existence of a long-run cointegration relationship among serious crime, clearance rate and various socio-economic indicators. The cointegration analysis provides strong evidence of the existence of a long-run model, with the normalised coefficients showing a negative effect of the clearance rate, the percentage of females in the labour force and the percentage of the labour force with tertiary education on serious crime, with the sole exception being the unemployment rate which is found to exert a positive effect.

Keywords: Crime, Trinidad and Tobago, Time-Series, Cointegration

JEL classification: I2, K42
1. Introduction

Research on the causes of crime has received an enormous amount of attention by sociologists and criminologists (see Merton, 1938; Shaw and McKay, 1942; Sutherland, 1942; Cohen and Felson, 1979). However, Becker (1968) suggested that an individual’s decision to participate in crime and delinquency could be analysed through the use of utility theory. The basic assumption of this theory is that an individual is a rational utility maximiser who decides whether or not to engage in criminal activity by comparing the costs and benefits of crime. The seminal work from Becker has been subsequently extended by Ehrlich (1973), who considered a time allocation model (i.e. individuals have to decide how to allocate their time between legitimate and illegitimate activities) and who was the first to empirically test the economic model of crime. Since the Becker-Ehrlich model, significant theoretical and empirical developments have been made (see, for example, Williams and Sickles, 2002; Grogger, 1995; Witte, 1980) and the incentive-based economic model of crime has been increasingly applied to both property and violent crime analysis.

The primary aim of this paper is to examine the effect of two central variables on the incentive-based economic model of crime on serious crime (i.e. all crimes carrying a penalty of five or more years’ imprisonment for which proceedings have been instituted in the High Court) in Trinidad and Tobago. The two central variables being considered are the clearance rate, which is used as a measure of the ability of the police to solve crimes (or as a general indicator of police performance), and the unemployment rate, which reflects the opportunity for participation in the legitimate job market and the acquisition of legal earnings (see Freeman, 1999). As far as we are aware this is the first study examining aggregated crime data for this unitary state in the Caribbean region\(^1\), although there are a few studies examining the Caribbean region as a whole (e.g., Forst and Bennett, 1999; Lester, 1999; de Albuquerque and McElroy, 1999) or other single-countries in the Caribbean (e.g. for Jamaica Ellis, 1991 and Harriott 2004). Also, in this study we consider the percentage of females in employment and the percentage of the labour force with tertiary education, variables that to date have not received a great deal of attention in crime studies (some

---

\(^1\) A recent joint report by the United Nations Office on Drugs and Crime and the Latin America and the Caribbean Region of the World Bank (2007) revealed that murder rates in the Caribbean region is higher than in any other part of the world. Assault rates, at least based on assaults reported to police, are also significantly above the world average.
exceptions are, for example, the studies by Saridakis, 2004; Lochner, 2004; Witt and Witte, 2001; Becker and Mulligan, 1997).

The rest of the paper is organised as follows. Section 2 presents the model. Section 3 describes the data. Section 4 presents the statistical framework. Section 5 discusses the results. The final section summarises the findings and presents overall conclusions.

2. The model
The serious crime rate equation can be written as:

\[ scr = f(det, ur, flf, ed) \]  

(1)

The assumption of linearity in the functional form for \( f \) is adopted. We use a log linear specification to measure elasticities\(^2\). Thus, equation (1) demonstrates a log-linear specification of the model of serious crime:

\[ lscr_t = \alpha_1 + \alpha_2 ldet_t + \alpha_3 lur_t + \alpha_4 lflf_t + \alpha_5 led_t + \epsilon_t \]  

(2)

where \( t \) represents time period and \( l \) denotes natural logarithms.

The expected signs of the coefficients \( \alpha_i \) (\( i=2 \) and 3) in equation (2) are: (i) \( a_2 < 0 \): the economic model predicts that an increase in the probability of being caught (and punished) decreases the expected utility of crime; and (ii) \( a_3 > 0 \): the exclusion from legal income opportunities increases the returns to crime. There are some significant empirical studies on violent crime, however, that underline that the basic assumptions of the economic model regarding the deterrence effect and the relationship between unemployment and crime, may be more important factors for property crime than violent crime (e.g. Saridakis, 2008; 2004; Raphael and Winter-Ebmer, 2001; Cherry and List, 2001; Entorf and Spengler, 2000). Finally, for the coefficients \( \alpha_i \) (\( i=4 \) and 5) we expect: (iii) \( a_4 > 0 \): the increased entry of women into employment increase the overall supply of workers thus lowering wages, which may in turn increase crime (see Hansen, 2009)\(^3\); and (iv) \( a_5 < 0 \): education increases the

---

\(^2\) The slope coefficient in a log linear specification shows the percentage change in the dependent variable per unit of a percentage change in an independent variable.

\(^3\) Also, Saridakis (2004) suggested that an increase in the employed female population increase the time spent out of homes and contribute to low parental supervision of children and thus, could be an associated with an increase in violent crime rates. However, this was not supported empirically. Also, one can further argue that a higher female labour force participation reduces guardianship (see theory developed by Cohen and Felson, 1979) which in turns may increase property crime.
returns to legitimate work and raises the opportunity cost of engaging in criminal activity (see Lochner, 1999).

3. Data
The data used in this study was obtained from the Central Statistical Office (CSO) of Trinidad and Tobago (see Table 1 for summary statistics). Since time-series data for the clearance rate are only available for serious crime, we restrict our analysis to this type of crime. According to the Central Statistical Office report on Crime Statistics 2006 serious crimes are all indictable offences carrying a penalty of five or more years, for which prosecutions have been instituted in the High Court (see Appendix 1). Although this goes beyond the scope of this paper, we acknowledge that police crime statistics are based on cases that are reported to the police by the public and thus, there might be significant under-reporting of offences (especially violence against women). The logarithms of the variables used in the regression analysis are presented in Figure 1.

4. Statistical framework
In order to determine the size of the coefficients in equation (2) we could estimate it using Ordinary Least Square (OLS). However, since many of the variables are dominated by strong time trends as well as possible endogeneity between serious crime and clearance rate (i.e. the level of crime determines the workload of the police and thus, the success of solving offences) application of OLS might produce biased estimates of the coefficients. Following previous work (see Saridakis, 2008, 2004; Witt and Witte, 2001; Field, 1999; Hale, 1998; Pyle and Deadman, 1994; Hale and Sabbagh, 1991) we use a cointegrating Vector Autoregressive (VAR) model to surmount these problems.

Specifically, we have used a generalised version of Johansen’s (1991, 1995) maximum likelihood approach described by Pesaran and Pesaran (1997) and estimated an unrestricted VAR model for serious crime in Trinidad and Tobago as follows:

---

4 The crime rates for the last two years (2005-2006) were obtained from the Crime and Problem Analysis (CAPA) Unit of the Ministry of National Security.

5 Also, some commentators have cast doubts about the reliability of the clearance rate as a statistical measure of police crime investigation activity (see Smit et al., 2004).
\[ \Delta y_t = \alpha_0 + \alpha_1 y_t - \Pi z_{t-1} + \sum_{i=1}^{p-1} \Gamma \Delta z_{t-i} + u_t \]  \hspace{0.5cm} (3) \]

where \( z_t = (y_t', x_t')' \) with \( y_t \) being the vector of jointly determined (endogenous) \( I(1) \) variables (serious crime and clearance rates) and \( x_t \) being the vector of exogenous \( I(1) \) variables (unemployment rate, employed female population and labour force with tertiary education). \( \Delta \) is the difference operator. The intercept and the trend coefficients are \( \alpha_0 \) and \( \alpha_1 \), respectively. \( u_t \) is the vector of serially uncorrelated shocks.

5. Results

Before estimation of the cointegrated VAR model, we need to ensure a stationary representation of the model. The Augmented Dickey Fuller (ADF) test is one of the most frequently used tests for unit roots. The null hypothesis is that there exists a unit root or that the series is \( I(1) \). The results of the ADF test are presented in Table 2\(^6\). It shows that the null of a unit root of the variables at levels cannot be rejected for any of the variables at the 5% level of significance. However, the series become stationary after first differencing\(^7\). Finally, given that we have only 38 observations, we use a lag length of 2 in the VAR: we found that there is no evidence of serial correlation in any of the endogenous equations using the LM test for up to second-order serial correlation.

[Table 2 about here]

We now proceed with the cointegration analysis and present the results based on the trace of the stochastic matrix. This test supports the rejection of the null hypothesis \( r=0 \) and indicates that there is one cointegrating relationship \((r=1)\)\(^8\). Table 3 presents the results of the cointegration test.

\(^{6}\) We estimate the following regression equation: \( \Delta X_t = b_0 + b_1 t + \alpha X_{t-1} + \delta \sum_{i=1}^{k} \Delta X_{t-i} + v_t \) where \( k \) lagged dependent variables are included in the estimated equation to account for autocorrelation in the error process.

\(^{7}\) The sole exception is the unemployment variable. However, the Phillips-Perron unit root test, which proposes an alternative nonparametric method of controlling for serial correlation when testing for unit root suggests that the unemployment variable becomes stationary after first differencing.

\(^{8}\) This is also supported by the test based on the maximal eigenvalue.
The long run relationship among the variables can be summarised in the following estimated cointegrating relation in which the coefficient of $lscr$ is normalized to 1 (estimated standard errors appear in parentheses):

\[
lscr = -0.85\text{det} + 0.65\text{ur} - 0.53\text{flf} - 0.15\text{led} + 0.05\text{trend}
\]

Our findings indicate that during the period under study the detection rate, the unemployment rate, the percentage of females in employment and the percentage of persons with tertiary education had significant impacts on serious crime. Specifically, our results indicate that the detection rate and crime are negatively related, as detection decreases the crime rate increases, providing support for the deterrence hypothesis\(^9\). Furthermore, we found a positive relationship between unemployment and serious crime; high rates of unemployment indicate a lack of legal income opportunities, and thus serve to reduce the opportunity cost of engaging in criminal activity. This has been also supported by Ellis (1991), who examined annual crime rates in Jamaica for the period 1950-84, and found that high crime is associated with periods of high unemployment.

In contrast to the argument developed in the methodology section, we found a negative relationship between the employed female population and crime. Witt and Witte (2001), examining the relationship between female labour force participation and crime rates in the United States, suggest that an increase in female labour force participation has a positive effect on the crime rate. Similar results were also reported by Entorf and Spengler (2002). It is possible that this result was obtained because an increased employed female population in T&T, which can be viewed as a labour market improvement, may have raised family income - especially in the case of female-headed households - and in addition improved women's structural position in society, a factor which impacts on female crime rates and victimization. Finally, the percentage of persons with tertiary education had a negative effect on the serious crime rate. This was an expected result since as noted before an individual with this

---

\(^9\) However, the reported elasticities of crime with respect to deterrence are very diverse in the literature.
level of education would have access to legitimate earnings which increases the opportunity cost of committing a crime.

Furthermore, we estimated the error correction coefficient to be at -0.723 (std. err. = 0.218)\textsuperscript{10}, which is statistically highly significant and suggests a quick speed of convergence to equilibrium.

6. Conclusions
In this study we empirically examined the effect of the clearance rate, the unemployment rate, the percentage of females in employment and the percentage of the labour force with tertiary education on serious crime in Trinidad and Tobago over the last four decades. Our study concluded that all of these variables were very important in determining the serious crime rate. Particularly, and in line with the economic theory, we found that the clearance rate, unemployment rate and education variables have negative effect on serious crime, which is line with the economic theory. With regard to the clearance rate finding, the result suggests that policy makers should, when framing policy, put emphasis on the mechanisms that make for strengthening the capacity of the police force to detect crime. Similarly, policy makers can use the results of this study to put systems in place to keep the unemployment rate low and to ensure that individuals have access to educational opportunities that encompass tertiary level education.

Interestingly we found that rising female employment is associated with reduction in crime, a result that contradicts with existing studies that observe a positive association. We suggest that this may be associated with changes in family income and the woman’s structural position in the society, but this association needs to be explored further. Even though this result does not agree with that found in other studies, a result such as this, which is particular to the Trinidad and Tobago case, could be of significant benefit. It can serve to provide the basis for the government to adopt gender-specific strategies in relation to women and labour market outcomes.

The results of this research can serve as a starting point to other studies on criminality in the Caribbean region. Future research should distinguish between property and violent crime (in which case the above factors may behave differently)

\textsuperscript{10}To examine validity of the assumption of the endogeneity of the clearance rate, we estimated also an error correction coefficient for the clearance rate equation. The coefficient was found to be statistically significant suggesting that this variable has been correctly used as an endogenous variable.
and explore the role of social capital indicators (e.g. religion and religiosity), alcohol consumption, demographic factors and media on criminal behaviour.
References


Figure 1:
log of the serious crime rate (lscr); the clearance rate (ldet); unemployment rate (lur); the employed female population (lflf); and the labour force with tertiary education (led)

Table 1:
Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious Crime (per 100,000); scr</td>
<td>.195</td>
<td>.041</td>
<td>.050</td>
<td>.195</td>
</tr>
<tr>
<td>Rate of Detection (%) ; det</td>
<td>25.58</td>
<td>4.31</td>
<td>17.45</td>
<td>33.71</td>
</tr>
<tr>
<td>Unemployment Rate; ur</td>
<td>14.06</td>
<td>4.25</td>
<td>6.2</td>
<td>22.3</td>
</tr>
<tr>
<td>Employed Female Population (%) ; flf</td>
<td>43.28</td>
<td>9.19</td>
<td>28</td>
<td>54</td>
</tr>
<tr>
<td>Labour Force with Tertiary Education (%); ed</td>
<td>6.79</td>
<td>5.19</td>
<td>2</td>
<td>21</td>
</tr>
</tbody>
</table>

*Source:* Table generated by authors using data from the Trinidad and Tobago Central Statistical Office and the Crime and Problem Analysis (CAPA) Unit of the Ministry of National Security. 2008
Table 2:
Results of the Augmented Dickey-Fuller test for Unit Roots

<table>
<thead>
<tr>
<th>Variable(s)</th>
<th>Levels</th>
<th>First Diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>lscr</td>
<td>-2.87 (0)</td>
<td>-5.20 (1)</td>
</tr>
<tr>
<td>ldet</td>
<td>-2.56 (7)</td>
<td>-4.89 (0)</td>
</tr>
<tr>
<td>lunemp</td>
<td>-1.65 (2)</td>
<td>-2.23 (2)</td>
</tr>
<tr>
<td>lfemale</td>
<td>-1.57 (0)</td>
<td>-5.03 (8)</td>
</tr>
<tr>
<td>leducate</td>
<td>-0.76 (4)</td>
<td>-5.72 (3)</td>
</tr>
</tbody>
</table>

Notes: In parentheses are the lag lengths based on AIC. Critical values at the 5% level is –3.544
\( l \) denotes that the variables are measured in natural logarithms.
Exogenous: Constant, Linear Trend

Table 3:
A Cointegration Analysis of Serious Crime

<table>
<thead>
<tr>
<th>Null</th>
<th>Alternative</th>
<th>Trace Statistics</th>
<th>95% Quantile</th>
</tr>
</thead>
<tbody>
<tr>
<td>r=0</td>
<td>r&gt;=1</td>
<td>42.50*</td>
<td>40.37</td>
</tr>
<tr>
<td>r&lt;=1</td>
<td>r&gt;=2</td>
<td>13.06</td>
<td>20.47</td>
</tr>
</tbody>
</table>

*Significant at the 5% level.
Appendix

Table A1:
Classes of serious crime defined

**Class I** - These are serious offences against the person, including murder, conspiracy to murder, manslaughter, infanticide, attempted murder, suicide and attempted suicide, written threat to commit murder, felonious wounding, acts causing or tending to cause danger to life, rape and unlawful carnal knowledge, abduction, defilement and procurement of women; child-stealing; burglary, abortion and concealment of birth, and unnatural offenses.

**Class II** - Offences against property with violence, includes blackmail and extortion, breakings and breakings with intent and burglaries, possession of house breaking implements and robberies.

**Class III** - Offences against property (over $2,000) without violence. These include embezzlement, falsification of accounts, false pretences, fraud and fraudulent conversion, general larceny, larceny of motor vehicles, larceny of postal packets, post office felonies, larceny dwelling house/entering dwelling house by night with intent.

**Class IV** - Malicious injuries to property with intent. These include arson, other malicious damage over $1,000 (not private dispute) and cattle maiming.

**Class V** – These crimes take the form of forgery and crimes against currency and include forgery (other than currency notes), coinage offences, forgery of currency notes and offences under the Central Bank act and Exchange Control act.

**Class VI** - These are other serious offences and include treason, sedition, perjury, riot, criminal libel, personation, corruption and firearm offences.

**Class VII** - narcotic offences – these include trafficking and possession of dangerous drugs for the purpose of trafficking.