A Time-Series Analysis of Crime in Trinidad and Tobago

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Abstract

What should be done about crime is a matter of heated debate: popular, political, and academic. Alternatively, one might treat crime control as an ordinary policy issue, like transportation or the control of pollution, in which policies are to be judged by their outcomes, including their costs. In Trinidad and Tobago the policy agenda and the public are demanding stronger measures to deal with rising crime. This paper evaluates empirically the effect of the criminal justice system and socio-economic conditions on serious crime (which includes both property and violent crime) in Trinidad and Tobago over the period 1970-2007. Our study finds that the crime detection rate, unemployment rate, the percentage of females in the labour force and the percentage of the labour force with tertiary education are very important in determining criminal behaviour.

Keywords: Crime, Trinidad and Tobago, Time-Series

JEL classification: I2, K42

1. Introduction

The 2007 World Bank report revealed that murder rates in the Caribbean region is higher than in any other part of the world. In particular, Trinidad and Tobago (T&T), a unitary state in the Caribbean region, that has seen its overall crime rate escalating at a phenomenal rate especially within the last decade. At the same time, crime detection has been experiencing a significant drop (it accounts to about 42% for serious crime) which may explain the dramatic increase in crime and delinquency in the 2000s. More recently Mohammed et al. (2009) indicate that past victimization, especially when no police action was taken to arrest the perpetrator, perpetuated and increased the perceived fear of crime in T&T. Nevertheless, research on criminal activity in Trinidad and Tobago (and the Caribbean) has been generally scarce.

This is therefore a timely paper that aims to examine the effect of police crime detection measured by the proportion of crimes which are cleared up and various socio-economic factors on crime rates in T&T over the last four decades. Serious crime and some specific crimes are examined in this literature. Our modelling strategy is based mainly on the economic crime literature, which developed following Becker (1968) and Ehrlich (1973) path-breaking work, and to a lesser extent references to criminological literature are also made. Our empirical methodology is based on Johansen's (1995 and 1998) procedure, which is the most commonly used system method in cointegration analysis.

The rest of the paper is organised as follows: in section 2 we examine the main characteristics of the crime rate in Trinidad and Tobago. Following this, Section 3 presents the data and an examination of the independent variables in the model. Section 4 presents and discusses the results. The conclusions are presented in Section 5.

2. Crime in Trinidad and Tobago: Some Stylized Details

Data collected from the Crime and Problem Analysis (CAPA) Unit of the Ministry of National Security indicate that violent crime rose rapidly in the 1980s, began decreasing during the mid-1990s, and rose again in the 2000s. At the same time, property crime rose significantly in the 1970s, levelled off in the 1980s and 1990s, and increased sharply in the 2000s. In fact, property crime by 2007 has almost quadrupled the figure for 1970. Turning to the overall crime rate, it reached its zenith in 1988, with a dramatic rise during the 1980s. During this decade the country was in the trough of an economic recession, but there were more minor crimes than serious crimes[1]. The incidence of minor crimes is more likely to occur during periods of economic downturns when social and political instability seem more likely to occur. It was only in the 1970s that serious crimes out-numbered minor crimes and this pattern began to reoccur in 2000s[2]. Significantly, these two decades represented periods of economic prosperity. Figure 1 summarises criminal activity in T&T during the last four decades.

Focusing on serious crime, we further discuss two of its more heinous components, that is, murder and kidnapping. These two types of crime have traumatised the society as they have increased significantly over the recent years. It is possible that changes in government, with the accompanying changes in policy and focus, could have impacted on the serious crime rate. For example, there were two changes in government during the period 1995 to 2007[3]. In 1994 143 murders were committed, but by the end of 1995 the murder figures were reduced to 122. Over the

[1]Minor crime are all crimes carrying a penalty of under 5 years. Serious crime includes both violent crime and property crime as well as other serious crimes, such as fraud offences, firearm offences and narcotic offences.

[2] Although from the year 1996 signs of an economic turn around were clearly visible it was not until the second oil boom starting in 2002 that the economy fully recovered from the past recession.

[3] In 1995 the opposition party attained government and in 2001 the former ruling party was once again in government.

next four years (1996 to 1999) the murder rate steadily declined. Added to the increase in number of murders, a new type of violent crime emerged: kidnappings and kidnappings for ransom (see Table 1).

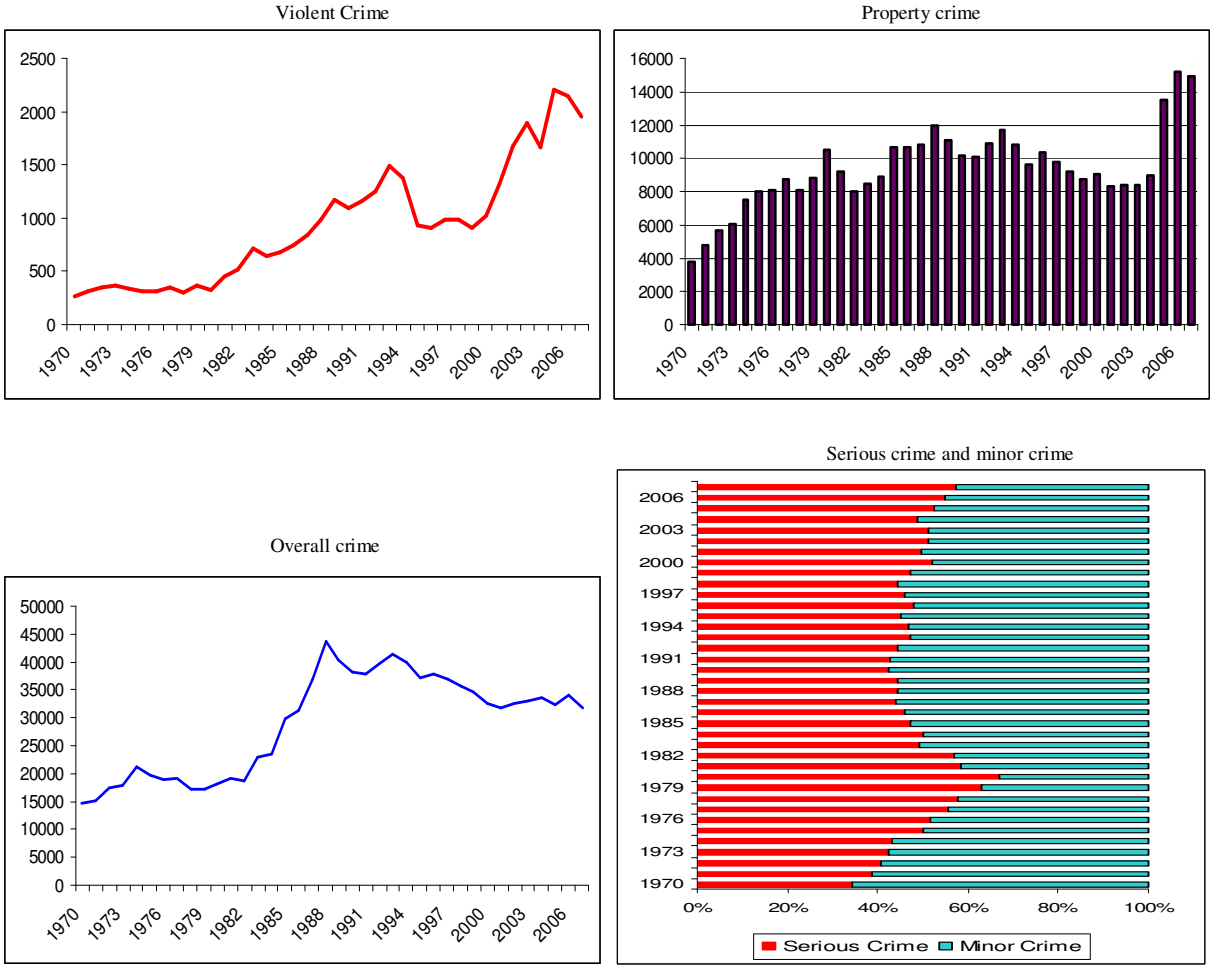
By the end of 2000 and the beginning of the new millennium the murder rate began to rise again. In 2001 murders increased by 23 percent as against the 1995 figures; 2002: 40 percent; 2003: 88 percent; 2004: 113 percent; 2005: 216 percent; 2006: 202 percent and 2007: 224 percent. While in general there has been an upward trend in the number of murders, there have been fluctuations in the number of kidnappings.

Table 1: Number of Murders and Kidnappings: 1995-2007

Year	Murders	Kidnappings
1995	122	
1996	106	
1997	101	
1998	98	
1999	93	
2000	118	
2001	151	
2002	171	29
2003	229	51
2004	260	28
2005	386	58
2006	368	17
2007	395	155

Source: Crime in Trinidad and Tobago. http://www.ttcrime.com/stats.php
Accessed 10th July 2008

Figure 1. Crime in T&T, 1970-2007



Clearly the increasing number of murders and the prevalence of kidnappings are areas for serious concern for the relevant authorities, policy makers and the citizenry. Another area of concern seems to be the rate of detection for serious crimes. Over the period 1997 to 2003 there were significant declines in the rate of detection for crimes such as: Murder and Wounding and Shootings (see Table 2). With regard to the other types of serious crime the rate of detection either slightly

Table 2. Serious Crime and Detection for Selective Years, 1997-2003

Type/ Year	**1997**			**2000**			**2003**		
	No.	**Det.**	**Rate of Det. (%)**	**No.**	**Det.**	**Rate of Det. (%)**	**No.**	**Det.**	**Rate of Det. (%)**
Murder	101	77	**76**	118	62	**52**	229	92	**40**
Wounding and Shootings	370	215	**58**	383	188	**49**	784	333	**42**
Rapes, Incest and Sexual Offences	514	367	**71**	516	364	**70**	643	468	**72**
Serious Indecency	206	145	**70**	170	127	**74**	88	64	**73**
Kidnappings	0	0	0	0	0	0	235	96	**41**
Robberies	3393	719	**21**	4052	608	**15**	4590	758	**16**
Burglaries and Breakings	6682	1070	**16**	5625	644	**11**	4863	710	**15**
Larceny of Vehicles	2686	318	**12**	3008	267	**9**	3210	335	**10**
Larceny of Dwelling Houses	432	61	**14**	385	52	**13**	365	80	**22**
Total	14384	2972	**21**	14257	2312	**16**	15007	2936	**20**

Source: The Government of Trinidad and Tobago, Ministry of Planning and Development, Central Statistical Office., 2008

improved, or remain stabled in light of increases in the incidence of these crimes such as, Rape, Incest and Sexual Offences; Robberies and Larceny.

For the years 2006 and 2007 there have been some positive changes in the numbers of the different types of crimes. Wounding and shootings; Sexual Offences; Serious Indecency; Burglaries; Abductions and Kidnappings for Ransom were

slightly down in some instances, but the figures for Murders and Larceny of vehicles went up. However, the levels of criminal activities and the number of serious crimes committed seem to be much higher in 2007 than that of the baseline year of 1970. In 2007 there were 8,236 incidences of serious crimes whereas, in 1970 there were 5015. The difference between the numbers of crimes for the two years; 3,221 represents an increase of 64 percent. It seems, therefore, that the Trinidad and Tobago society has become more violent over the past thirty seven years.

Table 3. Crime statistics T&T, 2006-2007

Type	2006	2007
Murders	368	395
Wounding and shootings	657	645
Sexual Offences	903	759
Serious Indecency	81	66
Burglaries	4973	4851
Abductions/ Kidnappings	214	162
Kidnappings for Ransom	16	13
Larceny- motor vehicles	1496	1740
Total	8340	8236

Source: Geisha Kowlessar, "Joseph: I never said we failed." Trinidad Guardian, 8th January 2008, and Crime in Trinidad and Tobago. http://www.ttcrime.com/stats.php Accessed 10th July 2008

3. Data

The data used in this study was obtained from the Central Statistical Office (CSO) of Trinidad and Tobago[4]. Since time-series data for the detection rate are only available for serious crime, we restrict our analysis to this type of crime.

Finally, the independent variables used in the study are based primarily on the economics of crime literature and to a lesser extent on theories developed by criminologists. Specifically, the independent variables are (see Table 4 for summary statistics for the raw data over the 37-year period):

[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.

i) the unemployment rate; high rates of unemployment could be taken to influence the opportunity cost of illegal activity (Witte and Witt, 2001). Existing research suggests that higher unemployment is associated with greater occurrence of property crime, but this relationship turned to be insignificant or negative for violent crime (e.g. Saridakis, 2004; Raphael and Winter-Ebmer, 2001; Entorf and Spengler, 2000)

ii) the percentage of the labour force with tertiary education; from an economic point of view there are two main reasons why education could have an important role in combating and reducing crime[5]. Firstly, an education increases the returns to legitimate work and raises the opportunity cost of engaging in criminal activity. Further, and in most cases the penalty for illegal behaviour often leads to imprisonment and being in prison translates to wages forgone. Secondly, education may change an individual's preferences in some indirect ways, which could then affect the decision to commit a crime (see Becker and Mulligan, 1997)

iii) the employed female population; 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

[5] Conversely, the lack of education can be a cause of crime and criminal behaviour (Usher, 1997 and Becker and Mulligan, 1997).

guardianship (see theory developed by Cohen and Felson, 1979) which in turns may increase property crime

iv) the crime detection rate; deterrence variables (i.e. detection rate, probability of apprehension and severity of punishment) have been used in economic studies to analyse property crime, since in effect it impacts on expected returns to crime. Among others commentators, however, Saridakis (2004, 2008, 2009) found a weak effect of the deterrence hypothesis on violent crime.

Table 4: Summary Statistics

Variable	Mean	Std. Dev.	Minimum	Maximum
Serious Crime (per 100,000); *scr*	.195	.041	.050	.195
Unemployment Rate; *unemp*	14.06	4.25	6.2	22.3
Labour Force with Tertiary Education (%); *educate*	6.79	5.19	2	21
Rate of Detection (%) ; *det*	25.58	4.31	17.45	33.71
Employed Female Population (%) ; *female*	43.28	9.19	28	54

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

4. 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) or the time series are non-stationary). The results of the ADF test are presented in Table 5. It shows that the null of a unit root of the variables at levels cannot be rejected for any one of the variables at the 5% level of

significance. However, the series become stationary after first differencing[6]. Finally, given that we have only 38 observations, we use a lag length of 2 in the VAR and treat only the crime and deterrence variables as endogenous variables (see, for example, Saridakis, 2009). We also found that there is no evidence of serial correlation in the each of the endogenous equations using the LM test for up to second-order serial correlation.

Table 5. Results of the Augmented Dickey-Fuller test for Unit Roots

Variable(s)	**Levels**	**First Diff.**
lscr	-2.87 (0)	-5.20 (1)
lunemp	-1.65 (2)	-2.23 (2)
leducate	-0.76 (4)	-5.72 (3)
ldet	-2.56 (7)	-4.89 (0)
lfemale	-1.57 (0)	-5.03 (8)

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

We then employ Johansen's (1988, 1995) ML-framework to test for the existence of cointegration relations. Johansen's ML-framework uses a rank test to identify the number of co-integrating vectors 'r' that can be found in the data. The results of the cointegration analysis based on the trace of the stochastic matrix support the rejection of the null hypothesis *r=0* and indicates that there is one cointegrating relationship (*r=1*). Table 6 presents the results of the cointegration test.

[6] With the sole exception being 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.

Table 6. A Cointegration Analysis of Serious Crime

Null	Alternative	Trace Statistics	95% Quantile
r=0	*r>=1*	42.50*	40.37
r<=1	*r>=2*	13.06	20.47

*Significant at the 5% level.

The long run relationship among the variables can be summarised in the following estimated cointegrating relation in which the coefficient of *ln(scr)* is normalized to 1 (estimated standard errors appear in parentheses):

$$lscr = \underset{(0.08)}{-0.85}ldet + \underset{(0.05)}{0.65}lunemp - \underset{(0.15)}{0.53}female - \underset{(0.07)}{0.15}leducate + \underset{(0.01)}{0.05}trend$$

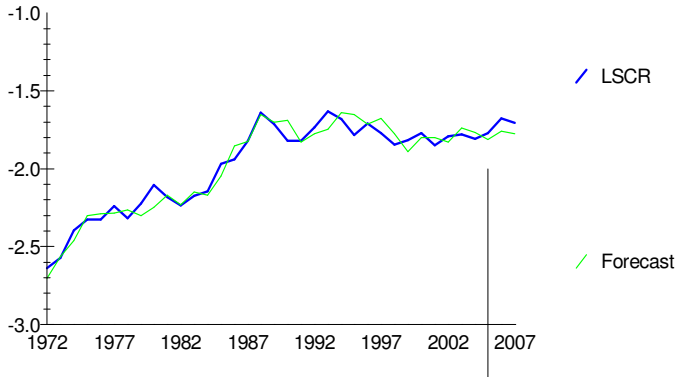
Our findings indicate that during the period under study the detection rate, the unemployment rate, the percentage of females in the labour force and the percentage of persons with tertiary education had significant impacts on serious crime. Specifically, our results indicate that the detection rate and crime are negatively related, as the detection decreases the crime rate increases, providing support for the deterrence hypothesis. Furthermore, we found a positive relationship between unemployment and serious crime; high rates of unemployment indicate lack of legal income opportunities, and thus serve to reduce the opportunity cost of engaging in criminal activity.

In contrast to the argument developed in the data section and vast empirical work (e.g. Witt and Witte 2000; Kapuscinski et al. 1998), we found a negative relationship between the employed female population and crime. It is possible that this result was obtained because the 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-head households. 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 level of education would have access to legitimate earnings which increases the opportunity cost of committing a crime. Further, persons who have an education tend to have different preferences, some of which negatively affects the choice to engage in criminal activity.

Furthermore, we estimated that the error correction coefficient to be at -0.723 (std. err. = 0.218), which is statistically highly significant and suggests a fast speed of convergence to equilibrium. Finally, a good test of forecast performance is to examine whether the VAR model predicts the turning points of the crime movements. Figure 2 plots in-sample fitted values and out of sample forecasts and suggests that the size of forecast errors and the in-sample residuals are very similar.

Figure 2. Multivariate dynamic forecasts for the level of serious crime



5. Conclusions

In this study we have empirically examined the impact of the crime detection rate, the unemployment rate, the percentage of females in the labour force and the percentage of the labour force with tertiary education on serious crime in T&T over the last four decades. Our study concluded that all of these variables were very important in determining the crime rate. Particularly, we found that the detection rate and crime are negatively related. It is therefore likely that part of the increase in serious crime in the

2000s is due to the significant drop in arrest rate. In accordance with the existing crime theory, we also found that unemployment is an important cause of crime whereas education exerts a negative effect. Interesting, however, we found that rising female employment is associated with reduction in crime. A plausible explanation may be that the increase in the employed female population may have raised family income, but this association needs to be explored further. Moreover, our data does not distinguish between property and violent crime, in which case the above factors may behave differently. This is an issue for further research.

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