

THE ECONOMIC DETERMINANTS OF CRIME RATE IN 7 SELECTED COUNTRIES: A PANEL DATA ANALYSIS APPROACH

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ABSTRACT

As the statistic of crime rates has become the main concern in any parts of the world, criminologists and policymakers have focused much in preventing crime rates from rocketing. This is where the economics of crime was generated. Thus, this study employs annual panel data from 2000 to 2013 to investigate the economic determinants of crime rate in 7 selected countries. The 7 selected countries are Honduras, Venezuela, El-Salvador, Jamaica, South Africa, Colombia and Bahamas. The methodologies used included panel unit root, panel cointegration, panel granger causality and Dynamic Ordinary Least Square (DOLS). The result shows that all the variables are stationary at the first difference and are cointegrated in the long run. From panel granger causality test, there are three short run granger causality relationship exist that run from number of tourist arrivals to GDP per capita, from GDP per capita to unemployment rate and from unemployment rate to crime rate. In addition, the result of DOLS shows that there is a long run and positive relationship between unemployment rate and crime rate. Therefore, the government and the related agencies around the world need to cooperate with one another in providing or designing the best policy in reducing crime, especially in the case of homicide.

Contribution/Originality: This study is one of very few studies which have investigated the crime rates in 7 countries which have reported highest crime rates among all developing countries. Additionally, this study employed panel data analysis, instead of time series analysis as used by the most previous studies.

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1. INTRODUCTION

As the statistic of crime rates has become the main concern in any parts of the world, criminologists and policymakers have focused much in preventing crime rates from rocketing. This is where the economics of crime was generated. Becker (1968) is the first scholar that formally started the study in the economics of crime. The word crime itself comes from the Latin word "Crimen" which means judgement or offence. Crime is closely related to law, in other words, crime means doing something that violate law that can be punished by the related authority. The first crime that ever recorded in the history of humankind is committed by Cain, the son of Adam and Eve.

Criminologist comes out with the theory stated that unemployment is the main factor that induces people to commit crime (Becker, 1968; Brenner, 1978). However, according to Brush (2007) increasing in the crime rates comes from unequitable distribution of resources among society but of course there are many factors that can affect the crime rates. The countries included in this study are Honduras, Venezuela, El-Salvador, Jamaica, South Africa,

Colombia and Bahamas. These seven countries were listed in the top ten countries with the highest homicide rate in the world by the United Nations Office on Drugs and Crime (UNODC) in 2012. Based on the statistics given, Honduras was reported as the country with the highest homicide rates in the world with 92.7 homicides per 100,000 people. Venezuela was ranked as the second country with the highest homicide rates in the world with 53.8 homicides per 100,000 people. Meanwhile, El-Salvador and Jamaica were ranked as the fourth and fifth country with the highest homicide rates in the world with 42.7 homicides per 100,000 people and 39.8 homicides per 100,000 people respectively. For Colombia, South Africa and Bahamas, they were ranked as the eighth, ninth and tenth country with the highest homicide rates in the world. The homicide rates of Colombia, South Africa and Bahamas in 2012 are 31.3 homicides per 100,000 people, 30.8 homicides per 100,000 people and 29.8 homicides per 100,000 people respectively.

The selected countries in this study are all categorized as developing countries based on the [International Monetary Fund's World Economic Outlook \(2015\)](#) which show the causes and pattern of crime rate in these countries. Besides, 5 out of 7 countries are from Latin America region. Thus, this study would help in answering the reason why Latin America countries have a high crime rate and the factors behind it. There are many approaches used by scholars to determine the factors that affect crime. This is important to policymakers in order to deal with the problem of crimes. Hence, this study is important as it will investigate the economic determinants of crime rates in seven selected developing countries.

2. LITERATURE REVIEW

[Khan, Ahmed, Nawaz, and Zaman \(2015\)](#) examined the socioeconomic determinant of crime rate in Pakistan from 1972 to 2011. They found that unemployment rate has become the main factor on the increment of crime rates in Pakistan. They included GDP per capita, unemployment rate, higher education enrolment rates and head count ratio as their independent variables. However, higher education is negatively related to crime rates. In the short run, GDP per capita found to lower the crime rates. Conversely, in the long run GDP per capita found to increase the crime rates. Poverty has a negative relationship with crime rates in the short run but it has a positive relationship with crime rates in the long run. (see also [Cerro & Meloni, 2000](#); [Coomer, 2003](#)). As found by [Tang and Lean \(2007\)](#) and [Ajimotokin, Haskins, and Wade \(2015\)](#) in United States, unemployment rate has a negative relationship with crime rates in the short-run. In Iran, the study on the relationship between unemployment and theft crime was studied by [Maddah \(2013\)](#). He found that there is a positive relationship between unemployment rate and theft crime. Other than that, theft of car and houses is positively related to unemployment. [Gilliani, Rehman, and Gill \(2009\)](#) includes poverty, unemployment and inflation rates as their variables to investigate the relationship of these variables to crime rates. It involves the data from 1975 to 2007 in Pakistan. The result shows that unemployment and inflation granger cause poverty. There is also unidirectional relationship from unemployment, poverty and inflation to crime rates.

Findings of [Janko and Popli \(2013\)](#) in Canada had supported by [Tang \(2009\)](#) as they found that the unemployment rate has a positive relationship with crime rates. They also found that police civilian ratio have a negative relationship with property crime rates. [Altindag \(2012\)](#) also found the same result as [Janko and Popli \(2013\)](#) and [Tang \(2009\)](#) that unemployment rate and property crime are positively related. [Baharom and Habibullah \(2009\)](#) used fixed and random effect model together with Hausman test to investigate the relationship of crime rate with unemployment rate and income from 1993 to 2001 in 11 European countries by including the aggregated and disaggregated crime. The crimes involved in their study are drug trafficking, total crime, motor vehicle crime, domestic burglary and violent crime. They found that crime rate was positively related to income except for domestic burglary which shows a negative relationship with income. Crime rate also has a positive relationship with unemployment rate except for violent crime. Another study by [Habibullah and Baharom \(2008\)](#) was conducted in Malaysia that involves the data from 1973 to 2003, investigate the relationship between economic condition and crime rate. The real GNP per capita is used as a proxy of economic condition. They employed Autoregressive Distributed Lag (ARDL) bounds test and found that there is a positive and long-run relationship between real GNP per capita and crime except for armed robbery. The Granger causality result shows the real GNP per capita granger cause crime rate but not vice versa. (see also [Hamid, Habibullah, and Noor \(2013\)](#)).

In Spain, study done by [Buonanno and Montolio \(2008\)](#) from 1993 to 1999 found that crime rates have a positive relationship with the number of immigrant and urbanisation rate. In the history of Spain, it depends too much on immigrants in developing their economic growth that will eventually affect much on the crime rate of the country. Clearance rate is found to have a negative relationship with crime rate. Whereas in Greece, [Nikolaos and Alexandros \(2009\)](#) found that increase in the wages has an 'opportunity effect' or negative relationship with crime rates, while increase in the unemployment has a 'motivation effect' or positive relationship with crime rates.

[Tamayo, Chavez, and Nabe \(2013\)](#) study the relationship between crime and inflation rates in Philippines and found that the crime rate is at the highest when the inflation rate is high. Meanwhile, the crime rate is at the lowest when the inflation rate is low. In other words, crime rate and inflation rate have a positive relationship in Philippines. The study done in Nigeria by [Terande and Clement \(2014\)](#) found that there is unidirectional causality from unemployment and inflation to crime rates. Unemployment rate also granger cause crime in Nigeria because when many people are unemployed, the opportunity to earn income will increase that will then cause the cost of committing crime to be lower for unemployed people. [Baker and Stockton \(2014\)](#) investigate the relationship between crime and number of tourist arrivals in two American tourist cities which is Honolulu and Las Vegas. They found that increasing in the tourist arrival rate of the high crime city will increase the crime rate. In Honolulu, the violent crime is negatively related to the number of tourist. However, in Las Vegas, crime and number of tourist are found to be correlated only.

Another study done in Malaysia by Syazwani (2013) found that crime rate has a positive relationship with unemployment, inflation and tourist arrivals. In addition, unemployment, tourist arrivals and inflation rate granger cause crime rates. Lastly, Umaru, Donga, Gambo, and Yakubu (2013) study on the relationship between crime rate, inflation rate, unemployment rate, poverty rate and corruption level from 1980 to 2009 in Nigeria found that crime rate has a negative relationship with unemployment, corruption and poverty. Other than that, Inflation rate is positively related to crime rates in Nigeria. There is also a unidirectional causality from poverty to crime rate and from corruption to unemployment. Meanwhile, there is a bidirectional causality relationship between corruption and crime rate. Corruption and inflation also has a bidirectional causality relationship.

3. DATA AND METHODOLOGY

3.1. Data

The data were drawn from United Nations Office on Drugs and Crime and World Bank Data. The sample period is comprises of annual data from 2000 to 2012. The dependent variable used in this study is crime rate represented by intentional homicide count per 100,000 populations. The independent variables used are GDP per capita, unemployment rate and number of tourist arrivals. All variables are converted to the log form.

3.2. Methodology

3.2.1. Panel Unit Root

There are two types of panel unit root that used in this study. First panel unit root is Levin, Lin, and Chu (2002) (hereafter referred as LLC). LLC is considered the first generation of panel unit root test and it also test the unit root by assuming that all the autoregressive are the same across the series. LLC is also considered as homogeneous as it assumes that the autoregressive coefficient is the same across cross-sections. Hence, LLC is also known as homogenous panel unit root test. The power of LLC is more compared with the individual unit root that test the cross-section individually. There are three steps involved in order to run LLC test. First, this test will carry out augmented Dickey-Fuller (ADF) regression individually on each cross-section separately. Second, this tests evaluate both the ration of short-run and long-run standard deviations. Lastly, this test estimate the panel unit root where it group together all the cross section and time series observation. There are two limitations of LLC. First, LLC assumes that there are no cross-sectional correlation exist across the cross-section, and if there is correlation between the cross-sections this test cannot be applied. Second, LLC assumption on the presence and the absence of unit root in all the cross-section is uncertain.

The second type of panel unit root test is Im, Pesaran, and Shin (2003) test (hereafter referred as IPS). IPS is also considered as the first generation of panel unit root test same as LLC. However, the difference between both tests is in terms of heterogeneous, where IPS assumes that the autoregressive coefficient is different across the cross-sections. Hence, IPS is also known as heterogeneous panel unit root test. The reason behind the assumption of heterogeneity of autoregressive coefficient is that it is inappropriate to use the same lag length to every country, as each of country might experience different level of economic conditions and development. Hence, it is more appropriate to choose the lag length based on the level of economic and development of the country instead of equating the country as a whole. The assumption of IPS is only applicable to the data that has no cross-section correlation. Both LLC and IPS is an ADF-based unit root test. Basically, the null and alternative hypothesis of LLC and IPS test is the same. Thus, the null hypothesis is rejected if p-value is less than 1% significance level which indicated the panel data has no unit root or stationary. Conversely, when p-value is more than 1% significance level, null hypothesis is accepted which indicates the panel data has unit root or non-stationary.

3.2.2. Panel Cointegration

The panel cointegration test used is the panel cointegration that proposed by Pedroni (1999) to test the long run relationship that might exist between the variables, with the condition that all the variables are stationary at the first difference. The general equation of panel cointegration test proposed by Pedroni (1999) is shown below:

$$y_{it} = \mu_i + \omega_i t + \psi_i x_{it} + \zeta_{it} \quad (1)$$

Where $t = 1, \dots, T$; $i = 1, \dots, N$, T is the time dimension; N is the specific country, ψ_i represent the coefficient, μ_i represent the fixed-effects parameter, y represent the dependent variables which is crime rate that proxy by homicide rates and x represent the independent variables which are GDP per capita, unemployment rate and number of tourist arrivals.

The coefficient stated in the general equation of panel cointegration is also allowed to differ based on the country individually. Hence, the vector of cointegration might be heterogeneous across cross section (Pedroni, 2004). Under the panel cointegration proposed by Pedroni (1999) it provide seven residual-based test that is divided into two part. First group of residual test is using the approach of within-dimension. In the within-dimension approach, there are four listed statistics, such as panel v -statistic, panel ρ -statistic, panel PP-statistic and panel ADF-statistic, where the autoregressive coefficient were grouped together across every cross section. The second group of residual test is using the approach of between-dimension. The statistics listed are group ρ -statistic, group PP-statistic and group ADF-statistic. Under between-dimension approach, the estimated coefficient of every cross section will be averaged. Since all of these seven statistics is normally distributed, hence, it requires standardization stated in Brownian motion function. Out of these seven statistics, panel-ADF and group-ADF statistics is better as they have small sample properties that will give more reliable result (Pedroni, 2004). The null hypothesis is rejected if the p-value is less than 1% significance level which indicates that there are no co-integration exist between variables. Conversely, when the

p-value is more than 1% significance level, we do not reject null hypothesis which indicates that there are co-integration exist between variables used in this study.

3.2.3. Panel Causality

Panel causality test is divided into two: First is granger causality based on Hohansen's VAR model and second is the two step (Engle & Granger, 1987) with VECM model. Granger causality test with VAR model can only be employed if the result of panel cointegration test shows there is no long run relationship between the variables used. However, if the result of panel cointegration test shows there is a long run relationship between the variables used, granger causality test with VECM need to be employed. However, this study does not run the error correction term (ECT) since Dynamic Ordinary Least Square will replace ECT. Basically, the role of ECT and DOLS is actually the same which is to estimate the coefficient of the long run relationship that exist. Hence, panel granger causality with VECM model is done in order to investigate the short run relationship that might exist between the variables used in this study. Below shows the panel VECM model for all the variables used in this study.

$$\Delta LCR_{it} = \alpha_0 + \sum_{j=1}^k \eta_{1j} \Delta LCR_{it-j} + \sum_{j=0}^k \varphi_{1j} \Delta LGDP_{it-j} + \sum_{j=0}^k \gamma_{1j} \Delta LUN_{it-j} + \sum_{j=0}^k \vartheta_{1j} \Delta LTOURIST_{it-j} + \pi_1 \varepsilon_{it-1} + \mu_{1it} \quad (2)$$

$$\Delta LGDP_{it} = \alpha_0 + \sum_{j=1}^k \varphi_{2j} \Delta LCR_{it-j} + \sum_{j=0}^k \eta_{2j} \Delta LGDP_{it-j} + \sum_{j=0}^k \gamma_{2j} \Delta LUN_{it-j} + \sum_{j=0}^k \vartheta_{2j} \Delta LTOURIST_{it-j} + \pi_2 \varepsilon_{it-1} + \mu_{2it} \quad (3)$$

$$\Delta LUN_{it} = \alpha_0 + \sum_{j=1}^k \varphi_{3j} \Delta LCR_{it-j} + \sum_{j=0}^k \eta_{3j} \Delta LGDP_{it-j} + \sum_{j=0}^k \gamma_{3j} \Delta LUN_{it-j} + \sum_{j=0}^k \vartheta_{3j} \Delta LTOURIST_{it-j} + \pi_3 \varepsilon_{it-1} + \mu_{3it} \quad (4)$$

$$\Delta LTOURIST_{it} = \alpha_0 + \sum_{j=1}^k \varphi_{4j} \Delta LCR_{it-j} + \sum_{j=0}^k \eta_{4j} \Delta LGDP_{it-j} + \sum_{j=0}^k \gamma_{4j} \Delta LUN_{it-j} + \sum_{j=0}^k \vartheta_{4j} \Delta LTOURIST_{it-j} + \pi_4 \varepsilon_{it-1} + \mu_{4it} \quad (5)$$

Where; Δ = first difference operator, ε_{it-1} = one period lagged error-correction term that come from long-run equation and μ_{it} = error term (assume that it is white noise and normally distributed). We will reject null hypothesis when the p-value of X^2 statistic less than 1% significance level which indicates there is granger causality exist from independent variable to dependent variable. Conversely, when the p-value of X^2 statistic is more than 1% significance level, we do not reject null hypothesis which indicates there is no granger causality run from independent variable to dependent variable.

3.2.4. Dynamic Ordinary Least Square (DOLS)

Dynamic Ordinary Least Square (hereafter referred as DOLS) proposed by Stock and Watson (1993) is used to estimate the coefficient of long run relationship between variables. Actually there are many alternative test that the researchers can choose other than DOLS to estimate the coefficient of long run relationship. Some of it are panel granger causality with ECT based, fully modified OLS (FMOLS), the pooled mean group estimator (PMG), Generalized Method of Moments (GMM) or Quasi Maximum Likelihood (QML). All of the recommended test above including DOLS is using single equation approach to estimate the coefficient of long run relationship. Hence, this means that the cross section of the long run relationship is assumed to be homogenous. DOLS test is also preferred in this study as it is simple to be conducted compared to the other tests. Besides that, DOLS proposed by Stock-Watson is also better for a small sample size. We estimate the DOLS by analysing its coefficient and p-value. If the p-value is less than 1% significance level, hence the variables are significant.

4. RESULTS

4.1. Panel Unit Root Tests

In the long run, Equation 2 assume that when there is a permanent changes in the log of homicide rate, there will also be a permanent changes in the log of GDP, log of unemployment rate and log of tourist arrivals. Hence, this indicates that, all variables in this study need to be stationary and co-integrated. If the variables used in this study are not stationary and are not integrated in the same order, Equation 2 will give a spurious regression. In addition, in order to test the long run relationship between homicides, GDP, unemployment rate and tourist arrivals, panel unit root and panel co-integration test will be used. Hence, panel unit root test is done in order to test whether the variables used in this study is stationary at the first difference or non-stationary. Table 1 shows the result of Panel Unit Root tests. From Table 1, both IPS and LLC results shows that all p-value is more than 1% significance level. Hence, when p-value is more than 1% significance level, we do not reject null hypothesis. Both results of IPS and LLC shows that all p-value is less than 1% significance level. Thus, we can conclude that the panel data does not has unit root or stationary at first difference. As a whole, both panel unit root test result shows the panel data is stationary at first difference but non-stationary at level.

4.2. Panel Co-integration Test

Since the result of panel unit root tests shows the panel data is stationary at first difference, so we will proceed to panel co-integration test by using the co-integration test that proposed by Pedroni (1999). Panel co-integration test

is done to test whether the variables used in this study is co-integrated in the long run or not. In Pedroni panel co-integration test, we will analyse the value of panel and group PP and ADF t-test. Table 2 shows the result of panel co-integration test as proposed by Pedroni (1999).

Table 1. Panel unit root tests result.

Variables	Deterministic terms	IPS statistics	LLC statistics
Levels			
LHOMICIDE	Individual intercept, Trend	-0.461 [0.323]	-2.206 [0.014]
LGDP	Individual intercept, Trend	-0.418 [0.338]	-2.037 [0.021]
LTOURIST	Individual intercept, Trend	0.436 [0.669]	-0.973 [0.165]
LUN	Individual intercept, Trend	0.042 [0.517]	-1.414 [0.079]
First Differences			
LHOMICIDE	Individual intercept	-4.397 [0.000*]	-5.729 [0.000*]
LGDP	Individual intercept	-2.427 [0.008*]	-5.266 [0.000*]
LTOURIST	Individual intercept	-4.035 [0.000*]	-5.766 [0.000*]
LUN	Individual intercept	-3.753 [0.000*]	-5.458 [0.000*]

Notes: The number of lag is automatically determined by the Akaike Info Criterion. Value in [] parenthesis represents p-value. * indicates statistically significant at 1% level.

Table 2. Panel co-integration result.

Individual Intercept	
Pedroni (1999)	
Panel PP t-statistic	-2.664 [0.004*]
Panel ADF t-statistic	-3.837 [0.000*]
Group PP t-statistic	-3.336 [0.000*]
Group ADF t-statistic	-3.530 [0.000*]
Individual intercept and trend	
Panel PP t-statistic	-5.427 [0.000*]
Panel ADF t-statistic	-5.774 [0.000*]
Group PP t-statistic	-5.407 [0.000*]
Group ADF t-statistic	-4.221 [0.000*]

Notes: The number of lag is automatically determined by the Akaike Info Criterion. Value in [] parenthesis represents p-value. * indicates statistically significant at 1% level.

Based on the results summarized in Table 2, it shows that at individual intercept and individual intercept and trend, all p-value is less than 1% significance level. Hence, when the p-value is less than 1% significance level, we will reject null hypothesis. Thus, we can conclude that there are co-integration exist between variables used in this study. In other words, the variables used in this study has a long run relationship.

4.3. Panel Causality Test

Since, the variables used in this study has a long run relationship or co-integrated to one another, it allows us to test the short run causality relationship that might exist between the variables. Hence, Panel causality test is done to test the possible short run causality relationship that might exist in this study. Table 3 shows the result of panel causality test.

Table-3. Panel causality result.

Dependent variables	X^2 statistic (p-value)			
	Δ LHOMICIDE	Δ LGDP	Δ LTOURIST	Δ LUN
Δ LHOMICIDE	-	0.676 [0.644]	0.966 [0.449]	3.505 [0.009*]
Δ LGDP	0.895 [0.493]	-	0.400 [0.847]	1.568 [0.189]
Δ LTOURIST	2.977 [0.021]	3.574 [0.008*]	-	1.061 [0.394]
Δ LUN	0.803 [0.553]	6.056 [0.000*]	1.896 [0.114]	-

Notes: Asterisk (*) indicates statistically significant at 1 percent level. [] parenthesis represents the p-value. The Panel Causality test was estimated with lag 5.

The result from Table 3 shows that there are only three causality relationship that exist in this study as the p-value is less than 1% significance level. The results is summarize as in Figure 1:

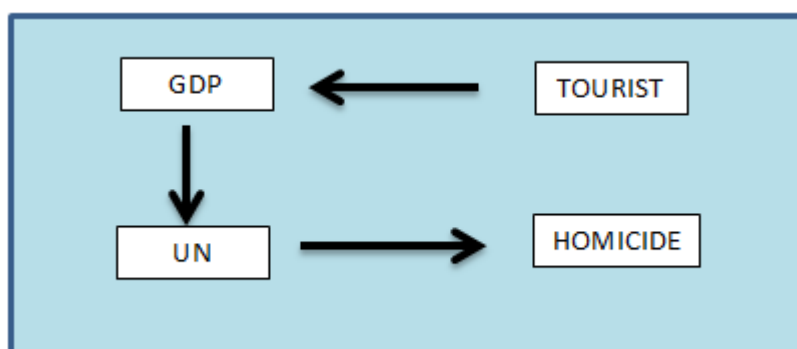


Figure 1. Causality test result.

Based on the result shows in Figure 1, there are three short run granger causality relationship that exist in this study. First, there are unidirectional short run granger causality relationship that run from tourist arrival to GDP. Second, there are unidirectional short run granger causality relationship that run from GDP to unemployment rate. Third, there are unidirectional short run granger causality relationship that run from unemployment rate to homicide rate. From the result shown, tourist arrival, GDP, unemployment rate and homicide rate for a chain of causality relationship where tourist arrival affect the country GDP, then the country's GDP affect its unemployment rate, and lastly the unemployment rate affect the homicides rate of the country involved in this study.

4.4. Panel Dynamic OLS

Next, we run Dynamic OLS test to estimate the long run relationship that exist in this study. The result of DOLS test is summarized in Table 4.

Table 4. Dynamic OLS result.

Dynamic OLS		
Grouped estimation DOLS	Coefficient	P-value
LGDP	-0.730	0.557
LTOURIST	0.523	0.484
LUN	0.962	0.000*

Notes: Leads and lags specification is based on Akaike Info Criterion. Asterisk (*) indicates statistically significant at 1% level.

The result shown in Table 4 shows that only unemployment rate is significant as the p-value is less than 1% significance level. However, GDP and tourist arrivals does not significant at 1% level as the p-value of GDP and tourist arrivals is more than 1% significance level. Hence, unemployment rate is statistically significant. The coefficient of unemployment rate which is 0.9622, indicate that unemployment rate has a positive relationship with homicide rate.

When there is an increment of one percent in unemployment rate in the long run, the homicide rate will also increase by 0.9622. Hence, unemployment rate is positively and statistically significant at 1% significance level. Referring back to the result of granger causality before this where there is a unidirectional causality relationship running from unemployment rate to homicide rate, this causality relationship is further supported by the result found from DOLS test.

5. DISCUSSION

The comparison will only involves the unemployment rate as it has a short run and long run relationship with crime rate in these countries. The result of the previous study can be compared with the results of this study by referring to the summarized [Table 5](#).

Table 5. Related results of the previous study.

No	Authors	Country	The economy status of the country	Findings	
				Long Run	Short Run
1.	Khan et al. (2015)	Pakistan	Developing	UN & CR (+)	-
2.	Tang and Lean (2007)	United States	Developed	UN & CR	UN → CR
3.	Tang (2009)	Malaysia	Developing	UN & CR (+)	UN → CR
4.	Maddah (2013)	Iran	Developing	UN & CR (+)	-
5.	Gilliani et al. (2009)	Pakistan	Developing	UN & CR	-
6.	Cerro and Meloni (2000)	Argentina	Developing	UN & CR (+)	
7.	Coomer (2003)	United States	Developed	UN & CR (+)	
8.	Janko and Popli (2013)	Canada	Developed	UN & CR (+)	
9.	Baharom and Habibullah (2009)	11 European Countries	Developed	UN & CR (+)	
10.	Hamid et al. (2013)	21 countries	-	UN & CR (+)	-
11.	Ajimotokin et al. (2015)	United States	Developed	UN & CR (-)	
12.	Altindag (2012)	33 European Countries	Developed	UN & CR (+)	
13.	Nikolaos and Alexandros (2009)	Greece	Developed	UN & CR (+)	
14.	Terande and Clement (2014)	Nigeria	Developing	UN → CR (+)	
15.	Syazwani (2013)	Malaysia	Developing	UN → CR (+)	
16.	Umaru et al. (2013)	Nigeria	Developing	UN & CR (-)	

Notes: Sign in parenthesis () represent the sign exist. '+' represent positive relationship. '-' represent negative relationship. '→' represent unidirectional relationship. UN represent Unemployment and CR represent Crime Rate.

After analysing the table above, all the previous study that involved developing countries in the table found the same result as of these 7 selected developing countries used in this study, where there is a positive relationship between unemployment rate and crime rate. However, only the result found in Nigeria by [Umaru et al. \(2013\)](#) shows the contradict result compare to other developing countries. Hence, we can conclude that mostly, in the developing country, crime rate and unemployment rate has a positive relationship. There is a positive relationship between unemployment rate and crime rate. However, only the result found in Nigeria by [Umaru et al. \(2013\)](#) shows the contradict result compare to other developing countries. Hence, we can conclude that mostly, in the developing country, crime rate and unemployment rate has a positive relationship.

In addition, theoretically, the relationship between unemployment rate and crime rate is positive because as the unemployment rate is getting higher, the rate of return of crime activity will also increase. [Becker \(1968\)](#) is the first researcher that analyse unemployment and crime rates formally. According to [Brenner \(1978\)](#) the reason behind why people involved in criminal activities is because they cannot maintain their standard of living due to unemployment. Hence, unemployment acts as *shock effect* that cause people to involve in criminal activities. Thus, the finding of this study is also correlated with the theory.

Additionally, 5 out of 7 countries used in this study is located in Latin America which suffer from the problem of youth unemployment. Basically, one of the cause of unemployment rate in these 5 Latin America countries is due to the increment of wage. As of 2012, the real wages in Venezuela itself has increased by 4.9 per cent. The differential wage is mostly obvious when comparing the skilled and unskilled labour. The increment of wages cause the producers to take less workers that leave more people to be unemployed. Besides that, these Latin America countries also experience slow growth in job creation since 1990 ([Lora & Marquez, 1998](#)). Based on [Hassan \(1997\)](#) the cause of unemployment to happen in these countries is also due to the labour supply that exceeded the labour demand. The labour supply has increase drastically due to the increment of the population growth. Besides that, the gap of wage between rural and urban area in these countries also high. The growth of average wages in the non-agriculture sector rise rapidly compare to the growth of average wages in the agriculture sector. Other than that, the increasing usage of capital has reduce the employment opportunity of the citizen especially in traditional sector such as textile and garments and in advanced industries such as transportation products and fabricated metal goods. The usage of more capital than labour is because the cost of using capital in the production process is much lower than the usage of labour. In Jamaica itself, the causes of unemployment to increases are due to drought, political instability and the exchange rate that overvalued.

In South Africa, the cause of unemployment rate to increase is due to the lack of skilled labour force in South Africa. This increases the opportunity of people from outside of South Africa to overtake the job opportunity from the local as outsider have more skills. Many economist link the shortage of skilled labour force due to the failure of post-apartheid education system to produce the citizens with jobs that is important to drive the economy such as

engineers, accountant and managers. Besides that, the downturn of economy globally also severe the problem of unemployment in South Africa that force millions of people to remain jobless. Other than that, the reduction of tariff barriers in the garment sectors since 1994 has increase the opportunity of locals to be employed as the China increase the building of factory in South Africa. As in 1996, the entrance of China factory in garment sector has provided 150,000 employment. However, these China-factory has been shut down due to the violation of minimum wages set by the government. The shutdown of 300 factories itself can cause 20,000 to loss their job. Hence, the intention of the government to protect the local from being oppressed due to the violation of minimum wages actually bring severe problem in terms of unemployment in South Africa (The New York Times, 2010). South Africa also suffer from youth unemployment where in 2014 the youth unemployment rate is 52.9 per cent as reported by the International Labour Organization (ILO). South Africa also ranked as the country with the highest youth unemployment in the world (Trading Economics, 2016). Once again, the youth unemployment is due to the port-apartheid education system that fail to prepare the student with the necessary skill to the labour market. The problem of youth unemployment also due to the increment of education cost that force many students dropout from university (Business Insider, 2016). In Bahamas, the youth unemployment is also become one of the major problem there (Dean, 2016).

Hence, the problem of unemployment in these 7 selected countries has become one of the major concern by their government and also the citizens. Specifically, the type of unemployment that suffer by these 7 selected countries is the increasing of the youth unemployment.

6. CONCLUSION

There are several step can be taken by the government of these 7 selected countries in order to curb the problem of crime in their countries. First, this study found that there are a short run granger causality that run from number of tourist arrivals and GDP per capita. In other words, number of tourist arrivals has a direct impact on the GDP per capita of these 7 selected countries. Hence, the government need to develop their tourism sector as one of the source to increase the GDP of their countries. When the GDP of their countries has increase, the possibility to increase the GDP per capita of the citizen is high as it might create more employment. As these 7 selected countries is a developing countries, thus their currency value is smaller. Hence, this can be one of the attraction to the tourists especially Europe tourists because, with the small value of currency, spending in these countries by the tourists is more attractive as it is cheaper compared to the tourists country itself. The government of these countries also need to develop the tourism sector and popularize the tourism places through media and technology in order to commercialize the interesting places globally. Besides that, the government need to preserve their historical places as historical places is usually are more attractive to the tourists. For example, in Honduras, the Copan has been announced by UNESCO as one of the world Heritage (UNESCO, 2015). Hence, the historical and unique places in these counties need to be preserve and utilize wisely so that it can contribute to the GDP and employment of these countries.

Second, we found that there is a short run granger causality relationship that run from GDP per capita to unemployment rate. In other words, GDP per capita of these countries affect unemployment rate in the short run. When the GDP per capita (income) of these countries increases, the opportunity to create more employment is high. This is because, with more income per capita they can venture to a new business which will then create more employment. Thus, the government need to provide programme that can help the citizens to increase their GDP per capita.

Lastly, we found that there is a short run and positive long run relationship between unemployment rate and crime rate. In other words, unemployment problem in these 7 selected countries affect positively towards their crime rate. When unemployment rate is increases in these countries, their crime rate also tend to increase. According to Brenner (1978), the reason behind why people involved in criminal activities is because they cannot maintain their standard of living due to unemployment. Hence, unemployment acts as *shock effect* that cause people to involve in criminal activities. Hence there are several steps or strategies that the government can do in order to curb the problem of unemployment rate in these countries. First strategy is, the government need to encourage the value of entrepreneurship among the citizens. The government can provide campaign and talk related to entrepreneurship in order to arise the importance of entrepreneur towards the employment as well as the economy of the country itself. Second strategy is to transform the education system in these countries. These countries might want to increase the establishment of technical and vocational school as it can improve the skills of the student. All of these countries have the problem of youth unemployment (especially South Africa). Thus, by establishing more technical and vocational school the student will be equipped with necessary skill that can match the labour market. This will indirectly help to reduce the youth employment problem faced by these countries. Third, the government absolutely need to spend some portion of its budget to reduce unemployment rate through providing various programmes and scheme. Scheme need to be provided to the citizens that want to start up a new business. This can motivate the citizens to venture in a new business as the financial source is provided to them. Most of the citizens does not have a sufficient financial support to start up new business as the income that they earn is only sufficient to support their basic needs. When the citizen start up a new business, they indirectly will create more job opportunity. Initially, the number of employment created is of course small, however, in the long run as their business starts to grows, the number of employment created will also grows. Thus this can help to reduce the unemployment rate in short run and long run and it also reduce the incentive to commit crime. The spending on many programmes and scheme to reduce the unemployment rate initially might need a huge spending. However, this spending has a multiplier effect. When there are more business established, the unemployment rate will fall and it will also increase the income per capita of the citizens. As the income per capita of the citizen increases, the standard of living will also increase. Besides that, with the

establishment of many business, the GDP of the countries also will increase as the production of goods and services increases. Other than that, this investment will also help the countries to increase their GDP growth that is important to move from a developing country to the developed countries. Hence, the economic problem that faced by these countries such as underemployment, poverty, crime, unequal distribution will be settled down by investing and spending in the business programme and scheme that help to reduce the unemployment rate. The government also can provide a subsidy to the new businesses in order to motivate the people to start a new business instead of working with others. Fourth, the business that used too much robots and technology in their production process also need to be tax by the government. The usage of too much robot and technology in the production process eventually will reduce the employment opportunity as the work will be replaced by the robot and technology. It is undeniable that the importance of robot and technology in the production process is important to increase the productivity. However, the government need to set certain rule on the portion of robot or technology against human in the production process that can be used. The business that exceed the portion will need to pay tax for it. This will indirectly reduce the unemployment rate. Besides that, it also can become a source of government revenue that will then can be used for unemployment programme. Even though the usage of robot and technology in the business is less in these countries as they are a developing countries compared to the developed countries. However, this strategy need to be started earlier so that in the future the problem of human replaced by technology is not severe. Lastly, the government also can collaborated with the commercial bank in these countries to reduce the interest rate for the loan that they make in order to start up a new business. By reducing the interest rate, the amount of loan that will be return back are much lower that will then motivate them to start a new business. The reasons why starting a new business strategy should be more emphasized in these countries because it will help to boost the economy of these developing countries. Besides that, businesses also can help the citizens to become more independent and become more innovative. Other than that, venturing into a new business will also help the citizens to become more competitive domestically as well as globally. When they are more competitive, foreign businesses that establish in their country will not bring a huge impact on them.

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REFERENCES

- Ajimotokin, S., Haskins, A., & Wade, Z. (2015). The effect of unemployment on crime rates in the U.S. Retrieved from <https://smartech.gatech.edu/bitstream/handle/1853/53294/theeffectsofunemploymentoncrimerates.pdf>.
- Altindag, D. T. (2012). Crime and unemployment: Evidence from Europe. *International Review of Law and Economics*, 32(1), 145-157.
- Baharom, A. H., & Habibullah, M. S. (2009). *Income, unemployment and crime: Panel data analysis on selected European countries*. Paper presented at the 9th Global Conference on Business & Economics.
- Baker, D., & Stockton, S. (2014). Tourism and crime in America: A preliminary assessment of the relationship between the number of tourists and crime in two major American tourist cities. *International Journal of Safety and Security in Tourism*, 1(5), 1-25.
- Becker, G. (1968). Crime and punishment: An economic approach. *Journal of Political Economy*, 2(76), 169-271.
- Brenner, H. M. (1978). Crime in society. In Economic crises and crime, Eds., L.Savitz & N. Johnston (pp. 555-572). New York: Wiley.
- Brush, J. (2007). Does income inequality lead to more crime? A comparison of cross-sectional and time-series analyses of United States counties. *Economics Letters*, 96(2), 264-268.
- Buonanno, P., & Montolio, D. (2008). Identifying the socio-economic and demographic determinants of crime across Spanish provinces. *International Review of Law and Economics*, 28(2), 89-97. Available at: <https://doi.org/10.1016/j.irle.2008.02.005>.
- Business Insider. (2016). South Africa's unemployment rate just surged to a 12-year high. Retrieved from: <http://www.businessinsider.com/south-africa-unemployment-rate-rises-2016-5>.
- Cerro, A. M., & Meloni, O. (2000). Determinants of the crime rate in Argentina during the '90s. *Economics Studies*, 27(2), 297-311.
- Coomer, N. (2003). America's underclass and crime: The influence of macroeconomic factors. *Issues in Political Economy*, 12(1).
- Dean, B. (2016). Youth unemployment. Retrieved from http://www.thenassauguardian.com/index.php?option=com_content&id=25045:youth-unemployment&Itemid=87.
- Engle, R., & Granger, C. (1987). Co-integration and error correction: Representation, estimation and testing. *Econometrica*, 55(2), 251-276. Available at: <https://doi.org/10.2307/1913236>.
- Gilliani, S. Y. M., Rehman, H. U., & Gill, A. R. (2009). Unemployment, poverty, inflation and crime nexus: Co-integration and causality analysis of Pakistan. *Pakistan Economic and Social Review*, 47(1), 79-98.
- Habibullah, M. S., & Baharom, A. H. (2008). Crime and economic conditions in Malaysia: An ARDL bounds testing approach. *International Journal of Social Economics*, 36(11), 1071-1081.
- Hamid, B. A., Habibullah, M. S., & Noor, Z. M. (2013). Crime and its socio-macroeconomics determinants: A panel-error-correction cointegration analysis. *Malaysian Economic Journal*, 47(2), 13-24.
- Hassan, M. F. (1997). Unemployment in Latin America: Cause and remedies. *The American Journal of Economics and Sociology*, 32(2), 179-190.

- Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1), 53-74. Available at: [https://doi.org/10.1016/s0304-4076\(03\)00092-7](https://doi.org/10.1016/s0304-4076(03)00092-7).
- International Monetary Fund's World Economic Outlook. (2015). Uneven growth: Short- and long-term factors. Retrieved from: <https://www.imf.org/~media/Websites/IMF/imported-flagship-issues/external/pubs/ft/weo/2015/01/pdf/textpdf.ashx>.
- Janko, Z., & Popli, G. (2013). Examining the link between crime and unemployment: A time series analysis for Canada. *Applied Economics*, 47(37), 4007-4019.
- Khan, N., Ahmed, J., Nawaz, M., & Zaman, K. (2015). The socio-economic determinants of crime in Pakistan: New evidence on an old debate. *Arab Economic and Business Journal*, 10(2), 73-81. Available at: <https://doi.org/10.1016/j.aebj.2015.01.001>.
- Levin, A., Lin, C.-F., & Chu, C.-S. J. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, 108(1), 1-24. Available at: [https://doi.org/10.1016/s0304-4076\(01\)00098-7](https://doi.org/10.1016/s0304-4076(01)00098-7).
- Lora, E., & Marquez, G. (1998). Employment in Latin America: What is the problem and how to address it? Working Paper No. 371. Cartagena; Inter-American Development Bank.
- Maddah, M. (2013). An empirical analysis of the relationship between unemployment and theft crimes. *International Journal of Economics and Financial Issues*, 3(1), 50-53.
- Nikolaos, D., & Alexandros, G. (2009). The effect of socio-economic determinants on crime rates: An empirical research in the case of Greece with cointegration analysis. *International Journal of Economic Sciences and Applied Research*, 2(2), 51-64.
- Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and statistics*, 61(S1), 653-670. Available at: <https://doi.org/10.1111/1468-0084.61.s1.14>.
- Pedroni, P. (2004). Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric Theory*, 20(3), 597-625. Available at: <https://doi.org/10.1017/s0266466604203073>.
- Stock, J. H., & Watson, M. (1993). A simple estimator of cointegrating vectors in higher order integrated system. *Econometrica*, 61(4), 783-820. Available at: <https://doi.org/10.2307/2951763>.
- Syazwani, N. A. (2013). A study on relationship between tourist arrivals, inflation, and unemployment with crime rates in Malaysia. Retrieved from <http://ssrn.com/abstract=2276771>.
- Tamayo, A. M., Chavez, C., & Nabe, N. (2013). Crime and inflation rates in the Philippines: A co-integration analysis. *International Journal of Economics, Finance and Management*, 2(5), 380-385.
- Tang, C. F. (2009). The linkages among inflation, unemployment and crime rates in Malaysia. *International Journal of Economics and Management*, 3(1), 50-61.
- Tang, C. F., & Lean, H. H. (2007). Will inflation increase crime rate? New evidence from bounds and modified Wald tests. *Global Crime*, 8(4), 311-323. Available at: <https://doi.org/10.1080/17440570701739694>.
- Terande, T. J., & Clement, A. C. (2014). The relationship between unemployment, inflation and crime: An application of cointegration and causality analysis in Nigeria. *Journal of Economics and Sustainable Development*, 5(4), 131-137.
- The New York Times. (2010). Efforts meant to help workers squeeze South Africa's poorest. Retrieved from <http://www.nytimes.com/2010/09/27/world/africa/27safrica.html?pagewanted=all>.
- Trading Economics. (2016). Youth unemployment rate. Retrieved from <http://www.tradingeconomics.com/country-list/youth-unemployment-rate>.
- Umaru, A., Donga, M., Gambo, E., & Yakubu, K. (2013). Relationship between crime level, unemployment, poverty, corruption and inflation in Nigeria. *Global Advanced Research Journal of Management and Business Studies*, 2(8), 411-422.
- UNESCO. (2015). Maya site of copan. Retrieved from <http://whc.unesco.org/en/list/129>.