South Asian Studies
A Research Journal of South Asian Studies
Vol. 35, No. 2, July – December, 2020, pp. 421 – 430

Macroeconomic Determinents of Crime in South Asian Countries: A Panal Data Approach

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ABSTRACT

This research explores the economic determinants of crime in case of a panel of South Asian countries (Pakistan, India, Sri Lanka and Bangladesh). To empirically determine the relationship between crime and its determinants, data for the concerned variables are collected for the period of 2003 to 2017 from different sources like World Development Indicator (WDI), National Police Survey and UNESCO. In this study, education, economic growth, population and unemployment are used as the determinants of crime. To find out the relationship Random Effect Model (REM) and Fixed Effect Model (FEM) models are constructed. After applying diagnostic test, it is found that Fixed Effect Model is appropriate. But the FEM model violates the assumptions of classical linear regression model (CLRM) because there is hertoscedasticity and autocorrelation problem in the data. To robust these problems, feasible generalized least square (FGLS) model has been applied. The results of FGLS revealed that education has negative and significant impact on crime. Contrary, population, economic growth and unemployment have positive and significant impact on crime. The study recommends that government should give preference to education sector. On the other hand, government should control the population growth and unemployment rate.

Key words: **Crime, Education, Economic Growth & Panel data Model**

Introduction

The world's most significant and wide spreading issue is Crime. Since the birth of the human beings, this issue has continued and is now faced by all developed and developing nations. History shows that the first murder in the world was committed by Cain. He killed his brother Abel brutally just because of jealousy as he wanted to get married with Aclima. (Gillani, Rehman, & Gill, 2009); Jalil and Iqbal (2010).

Crime means any activity which is against the law or any action that is prohibited by the law. There are numerous definitions of crime available but the

most authentic definition is that crime is a punishable act. Many authors explain the crime in different manners and also provide many reasons of committed crimes. According to Curzon (1973) "Crime is any act or omission resulting from human conduct which is considered in itself or in its outcome to be harmful and which the state wishes to prevent, which renders the person responsible liable to some kind of punishment; the result of the proceedings which are usually initiated on behalf of the state and which are designed to ascertain the nature, extent and the legal consequence of that person's responsibility". Crime has become a blood cancer all over the world and is growing rapidly, especially in the developing countries. Public or private crime, both violate the human being's emotions. Public crime occurs when people enrolled in the government and other dominant personalities use their authority without any explanation to facilitate their love one. It creates insecurity for any developing economy.

Economic growth is an increase in the production of goods and services in a specific period. It plays a vital role in social uplift and harmony and is one of the most challenging development issues for under-developed states. Economic growth is the main source that enables the present world to attain the objectives of the development. The sustained growth route of the economy provides a suitable environment for new domestic and foreign investment. For this domestic and foreign investment, government role, economic, political and the law conditions of the country play an important role. If economy of any country has poor law and order situation then it will discourage foreign investor and they will not feel secure to invest in such an economy.

According to Robert Longley (2019) "Human capital is the sum of knowledge, skills, experience and social qualities that contribute to a person's ability to perform work in a manner that produces economic value". There are many components involved in human capital like training, migration to new job, skills and health but the most important factor is education (Goode, 1959). To develop new institutions for education, investments in education system produces best quality and equality which plays vital role in enhancing the economic growth (Chaudhry & Rahman, 2009). Education is obviously an important element to discourage offenders involved in criminal activities. Schooling aims to educate young people and improve the return to legitimate work relative to crimes. With the increase in education, some types of property crimes are decreasing, but other types of white-collar crimes may increase, such as misappropriation, bankruptcy and fraud (Lochner & Moretti, 2004). Education helps to reduce the rate of crime, child labor and terrorism through reduction in Poverty (Veron & Fabre, 2004; Kruger & Maleckovca, 2003).

The population size of South Asian countries is rapidly increasing. The constant increase in population has become a basic reason of crime. When there is a consistent growth of population and inadequate employment opportunities, services and resources for the people. In such a situation people feel a sense of underachievement as they cannot achieve desires and basic needs of their families,

then they will be attracted towards illegal activities for earning money and will finally be involved in criminal activities. There is positive relationship between crime and population which is also found in many research studies e.g Nolan III (2004) and Haider & Ali (2015). This rapid increase in population converts in many other socio-economic glitches in the economy. It increases the rate of unemployment which is very alarming situation for developing nations. If people of any nation are unable to find jobs, they may attract toward illegal ways of earing. So there exist positive relationship between unemployment and crime. This positive relationship is also confirmed by Lin (2008) and Raphael and Winter-Ebmer (2001).

Crime is a serious issue in all over the world but it become quite alarming in case of South Asian countries like Pakistan, India, Sri Lanka and Bangladesh. The most important reasons of crime are low education, ineffective economic growth, rapid increase in population and unemployment. There is a great need to address this issue. That's why, the role of these factors is needed to be studied to understand that how government of South Asian countries can tackle the problem of crime.

Research objectives

- To empirically examine the macroeconomic determinants of crime in selected south Asian countries (Pakistan, India, Sri Lanka and Bangladesh).
- To investigate the effect of education on crime in sample countries.
- To probe the impact of unemployment on crime in sample counties.

Literature review

Becker (1968) did a preliminary research as "Crime and Punishment". This study presented a model of crime on the basis of cost-benefit analysis and considered number of offences and probability of conviction in the model. The study concluded that an individual commits crime when financial benefit of doing illegal activity is greater than the financial benefit of doing a legal work. In this paper financial benefit of illegal activity is described in the form of psychological and financial gain and cost represented in the form of punishment.

Cerro and Meloni (2000) examined the determinants of crime in Argentina. Study used Crime rate as dependent and GDPPC, unemployment rate, Gini Coefficient, probability of imprisonment and inequality as independent variables. Their research study used panel data of 22 provinces for time span of 1990 to 1999, taken from Household Survey (INDEC). Descriptive statistics and fixed effect techniques were used to read quantitative messages. The results revealed

that unemployment, GDP and income inequality had positive significant effect on crime.

Lochner and Moretti (2004) studied "The Effect of Education on Crime: Evidence from Prison Inmates, Arrests, and Self-Reports". Their paper used three data bases for period 1960-1980 which was collected from Census on Incarceration, Uniform Crime Reports (UCR), and the National Longitudinal Survey of Youth (NLSY). OLS, 2SLS techniques were employed for the purpose of estimation. Education, criminal activity, arrests and incarceration were the variables of interest. Results of the study concluded that higher the schooling rate caused decrease in criminal actions.

Buonanno and Leonida (2006) reviewed the relationship between crime and education in case of Italy. This study used panel data of 20 regions for the period of 1980 to 1995. The Data were gathered from Centre for North South Economic Research (CRENOS) and Italian Statistics Bureau (ISTAT). Three types of crime, namely, theft property and total crime considered for proxy of crime and GDPPC used for economic growth's proxy and average year of schooling population used for education proxy. The researchers used OLS and GMM for estimation. The Results revealed negative and significant relationship among crime rate and education and positive relationship between crime rate and GDPPC.

Kumar (2013) examined the crime and the economic growth relationship in case of India. This study utilized 25 states panel data from 1991-2011 which were gathered from National Crime Records Bureau, Reserve Bank of India and Ministry of Home Affairs New Delhi. Study used homicide rate, robbery rates and economic growth as variables. OLS and GMM estimator used to test the hypotheses. Researcher found negative and significant relationship among violent crimes and economic growth of per capita income in Indian states. This study recommended that justice institutes should be reformed and modernized to reduce the criminal activities and at the same time per capita income should grow.

Yildiz, Ocal, and Yildirim (2013) examined the effects of income, education and unemployment on crime. This study included 13 types of crime for period of 2002-2009, collected from Police Department of Kayseri and used fixed effect Panel OLS and GMM approach. Study used suspect crime types, unemployed suspects, and number of suspects with, middle and high income, number of suspects with low, middle and high education and clearance rate as variables. Results of the study showed firstly, number of crime decreases as income increases, secondly, effects of low education and unemployment has positive impact on crime. On the basis of these results, study suggested that education policy, security policy and income policy should be rationally employed in reducing the crime rate.

Nordin (2018) explored the effect of tertiary education on crime rate in Sweden. In this research study panel data of 287 Swedish provinces was used for the period of 1998-2010, obtained from National Agency for Education and National Council for Crime Prevention (NCCP). Author used Violet crime and

property crime as proxy of crime while upper-secondary student's tertiary education used for education proxy. The result of the study revealed that due to increase in tertiary education eligibility, property and violent crime substantially decreased.

Haider and Ali (2015) did a study on "Socio-Economic Determinants of Crime in all districts of Punjab". This study considered population density, education, unemployment, industrialization and remittances as independent and reported crimes as dependent variables. OLS technique was applied to empirically test the hypothesis. Data were collected for period 2010-2011, taken from Punjab Development Statistics, Federal Bureau of Statistics, Punjab Crime Statistics and Pakistan Social and Living Standard Measurements Survey (PSLM). The findings showed that population size and unemployment have positive significant and education has inverse relationship with crimes in Pakistan. This paper suggested that government of Pakistan should take some steps to improve socio-economic conditions.

Nolan III (2004) investigates a relationship between crime and population in the study of "Establishing the statistical relationship between population size and UCR crime rate: Its impact and implications". This study selects the 1,294 U.S cities as sample and then further divides the cities into four groups. The results of research study show positive relationship between crime rate and growth of population.

In existing literature, there are many studies available about crime and its determinants. In the field of crime, economists made several developments and almost end up with same results. But the present study is going to examine some important determinants of crime. The impacts of education and economic growth on crime have not contributed much with respect to South Asian countries (Pakistan, India, Sri Lanka and Bangladesh). Authors have used different social and economic factors that have effect on crime but this study mainly considered education and economic growth that affect crime and some other controlled variables like population and unemployment are included. There are some other factors also that have influence on crime but due to shortage of time and availability of data for some countries, only above mentioned variables have been included in this study.

Data and methodology

This study is exploring the macroeconomic determinants of crime on the behalf of balanced panel data set for South Asian countries i.e. Pakistan, India, Sri Lanka, and Bangladesh. Panel data is used for the period of 2003-2017 which is collected from World Development Indicators (WDI), National Police reports and UNESCO.

Methodology

To find out the nexus between crime, education and economic growth, Feasible Generalize Least Square (FGLS) estimator has been used. The general and econometric equation of model is as follow

$$CR = f(GDPG, GER, POPG, UN)$$

$$LCR_{it} = \gamma_0 + \gamma_1 GDPG_{it} + \gamma_2 GER_{it} + \gamma_3 POPG_{it} + \gamma_4 UN_{it} + \mu_{it}$$

Where

LCR	=	Log of Total reported crime
GDPG	=	Gross domestic product per capita growth
GER	=	Gross Enrollment Ratio
POPG	=	Population growth
UN	=	Unemployment rate
μ	=	Error term

The economic model is established to find the relationship between crime, education and economic growth. In the model, crime is dependent variable and GDP, education, unemployment rate and population are independent variables. Subscript (*it*) shows both cross section 'i' and time series't'. The symbols $\gamma_0, \gamma_1, \gamma_2, \gamma_3, and\ \gamma_4$ are regression coefficients of the model.

Advantages of panel data

There are some advantages of using panel data rather than time series data. Firstly, it is more convenient if we use panel data as compare to time series data because it provides more reliable and flexible information and estimation with minimum chance of co-linearity among variables. Secondly, it controls the heterogeneity problem individually and gives unbiased estimation results. Thirdly, advanced models are easily created and tested sophisticatedly in this dataset. Panel data can be balanced or unbalanced. The data is consider balanced when number of observations in the form of time series are equal for every cross sectional unit or country while if the number of observation are not same for cross sectional countries then data is considered as unbalanced panel data. The present study uses balanced panel data for analysis. The general form of panel data regression model can be written as:

$$Y_{it} = F(x_{it}) + \mu_{it} \qquad (1)$$

To estimate the model, FEM and REM models are estimated. To distinguish between FEM and REM, Hausman specification test is applied. According to the Hausman Specification test, null hypothesis is FEM is appropriate. The result shows that FEM is appropriate as probability value is less than 5% level of significance.

Diagnostic tests are also applied to check the assumptions of OLS. Pesaran's test is applied to check the cross sectional dependence. Results indicate that null hypothesis is not rejected as probability value is greater than 5 % level of significance. Hetroskedasticity is check through modified wald test. The outcomes of test fail to reject H0 because the probability value is less than 5% significance level. To find out the presence of serial correlation, Wooldridge test is applied. The result fails to reject null hypothesis and indicates that there is problem of serial correlation in the given model as probability is less than 5 %.

To robust the problem of hetrocedasticity and autocorrelation, Feasible Generalized Least Square (FGLS) estimator is considered, proposed by Parks (1967). This estimator is applicable only if the number of cross sections 'N' is larger than the number of time period 'T' (Reed & Ye, 2011); (Beck & Katz, 1995). It provides more flexible co-variance structure for random effects and error terms. The general form of estimated β_{FGLS} and variance of estimated β_{FGLS} are given below

$$\hat{\beta} = \left(X'\hat{\Omega}^{-1}X\right)^{-1}X'\hat{\Omega}^{-1}y \qquad (2)$$

$$var\left(\hat{\beta}\right) = \left(X'\hat{\Omega}^{-1}X\right)^{-1} \qquad (3)$$

Where $\widehat{\Omega}$ is non-parametric estimator which show combine assumptions related to autocorrelation and hetroscedasticity.

Table 3: FGLS Results

Variables	Dependent variable: Crime
	Feasible Least Square (FGLS)
Intercept	5.087 (0.000)
GDPG	0.059 (0.027)
GER	-0.031 (0.000)
POPG	0.832 (0.003)
UN	0.096 (0.000)
Wald Test	157.8 (0.000)
Obs.	60
No. of cross sections	4

Empirical estimation and interpretation

This section of study includes empirical estimation and interpretation of the results. Descriptive statistics tells about the basic features of data that included in this study. It includes mean, standard deviation as well as maximum and minimum values. The result of descriptive statistics is given in appendix.

The present study also finds out the relationship between variables through correlation coefficient. The results indicate that there is moderate positive correlation among LCR and POPG with a 0.561 value. The value of GDPG is 0.001 which is near to zero and indicates that there is no correlation between LCR

and GDPG. On the other hand, LCR highly negatively correlated with UR and GER with the value of -0.038 and -0.433. The table of coefficient correlation is also available in appendix.

Results of table 3 indicate that if there is one percent increase in GDP per capita growth causes 5.087 percent increase in crime. The coefficient of GDP per capita growth is significant as p-value (0.000) is less than the level of significance that is 1% and shows positive relationship between crime and GDPG. These results are consistent with Cerro and Meloni (2000) and Khan, Ahmed et al. (2015). The gross enrollment ratio is negatively related with crime and it is significant at 1% level of significance (0.000). The coefficient of gross enrollment ratio is 0.031, which shows that as 1% increase in gross enrollment ratio, there is 0.031 % decrease in crime. This negative relationship between crime and gross enrollment ratio is also estimated by Lochner and Moretti (2004), Buonanno and Leonida (2006), Jalil and Iqbal (2010), Haider and Ali (2015) and Nordin (2018). The population growth has positive impact on crime and significant at 1% significance level as its p-value is 0.003. The coefficient of population growth shows that if there is one percent increase in population growth, there is 0.832 percent increase in crime. Outcomes of population are showed by Haider and Ali (2015) and Nolan III (2004). The results depicts that the impact of unemployment rate on crime is positive and significant at 1% level of significance as its p-value is 0.00. The coefficient value of unemployment rate is 0.096 indicates that if there is 1% increase in unemployment rate, there is 0.096 percent increase in crime. This positive relationship among unemployment rate and crime is also proved by Khan.et al (2015), Edmark (2005), Cerro and Meloni (2000), Papps and Winkelmann (2000) and Gillani, Rehman et al. (2009).

Conclusion

The present study is conducted to explore the macroeconomic determinants of crime in South Asian countries. To check this relationship, panel data of four South Asian countries Pakistan, India, Sri Lanka and Bangladesh considered for the time period of 2003 to 2017. Feasible Generalize Least Square (FGLS) estimator is used to estimate the model by using the stata. According to the results, education has negative and significant impact on crime while economic growth, unemployment and population have positive and significant impact on crime.

Recommendations

On the basis of results, the present study recommends the following guidelines for crime prevention in selected South Asian countries and these suggestions will also be helpful for the government's devise policies that may be useful in curtailing crime.

- Government should give preference to education sector in South Asian countries because when people are educated, they are able to find suitable jobs to fulfill their basic needs and in this way they will not involve in criminal activities.
- Government of South Asian countries (Pakistan, India, Sri Lanka and Bangladesh) should invest in those areas where major part of the population belongs to poor class families and they are unemployed. Government should start the new projects and create the job opportunities that absorb the unemployed persons in the economy.
- These South Asian countries are facing the problem of over population that is the major cause of the crime. Government should develop the policies which are helpful to control the population of these countries.

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Appendix

TABLE 1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
LCR	5.474	0.663	4.116	6.486
POPG	1.366	0.488	0.54	2.117
GDPG	4.629	2.104	-0.485	8.763
UR	13.226	8.057	0.833	27.886
GER	73.747	21.081	34.037	102.648

TABLE 2: Correlation

Variables	LCR	GDPG	GER	POPG	UR
LCR	1.000				
GDPG	0.001	1.000			
GER	-0.433	0.491	1.000		
POPG	0.561	-0.523	-0.925	1.000	
UR	-0.038	0.526	0.874	-0.736	1.000