

EMPIRICAL EVIDENCE ON THE DETERMINANTS OF CRIME IN DEVELOPING  
COUNTRIES

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## Testimonial

This is to testify that the thesis entitled “Empirical evidence on the determinants of crime in developing countries” done by Muhammad Irfan Siddique having (Regd # 02092113001) is approved in its current version by the Quaid-I-Azam University's School of Economics in Islamabad, this fulfills every prerequisite for the award of the degree of Master of Philosophy in Economics.

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## ABSTRACT

This study empirically tested Becker's hypothesis that by increasing the opportunity cost of crime, criminals could be retrained from doing criminal activities. This hypothesis is empirically tested by employing panel data analysis for 26 developing countries for the time period 2003-2020. The independent variables of this study have been categorized into four categories: economic, demographic, governance and deterrent variables. The economic variables include GDP per capita, inflation, unemployment and expenditure on education; demographic variable include the urbanization rate; governance indicators include the rule of law, control of corruption and political stability and the deterrent variable include the total number of convicted persons. First of all, the standard panel data estimations techniques of fixed effects and random effects were applied. The choice between these two was made by Hausman specifications test, and the fixed effects model was found to be appropriate. As this study used a short panel where N (26) is greater than T (18), applying Generalized Methods of Moments (GMM) estimations technique was appropriate which tackles the possible presence of Autocorrelation, Heteroscedasticity and endogeneity<sup>1</sup> and is also used to check the consistency of results. The results of both techniques showed that the inflation rate, urbanization rate, and expenditure on education are positively associated with crime, while governance and deterrent variables are negatively associated with crime, while unemployment and GDP per capita have asymmetric results from the two methods.

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<sup>1</sup> Roodman, D. (2009).

# CHAPTER 1

## INTRODUCTION

### 1.1 BACKGROUND AND MOTIVATION OF THE STUDY

If we talk about the root word of crime, its origin could be traced to the Latin word “*crimen*”<sup>2</sup>, which means judgement or offence. In common language, crime could be defined as the intent to cause harm, to obtain illegal gains and to violate the rights and wellbeing of the people. More formally, any activity or action that violates the established laws of the country and is subjected to punishment upon the violation of the law is considered as crime.

Throughout human history, every society has been affected by crime. Just like economics, crime is also as old as the history of mankind. Crime is a significant source of instability and insecurity in every society. No one can dispute on the fact that crime has serious negative financial and psychological repercussions on society. Even people who have not been victims of crime experience a sense of anxiety and insecurity due to the possibility of becoming a victim, which has a detrimental effect on their wellbeing.

#### 1.1.1 THE START OF “ECONOMICS OF CRIMINOLOGY”

There are a lot of discussions about whether economic analysis should be implied for analyzing the behavior of the offenders. The disagreement surrounds around the point that “the amount to which the prospected criminals respond to the incentives”. As one of the basic economic principles is that people respond to incentives;<sup>3</sup> similarly, criminals or potential offenders also respond to incentives. These incentives could be positive, or they could be negative. The positive incentive for the offenders could be the possible gain, in the form of money or in the form of any physical asset they steal or snatch or maybe in the form of satisfaction by taking revenge on their foes by harming or killing them. The offenders positively respond to these incentives, as the more benefit they gain, there is more chance of their involvement in committing the crime.

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<sup>2</sup> Stevenson, A. (Ed.). (2010). *Oxford dictionary of English*. Oxford University Press, USA.

<sup>3</sup> Mankiw, N. G. (2021).



Similarly, negative incentives restrain the offenders from committing the crime as these incentives may harm and create problems for criminals, and as human nature, a rational person would not involve himself in danger; these negative incentives include all the repercussions that the potential offender could face if he commits the crime, these could be in the form of being caught and sent into the prison or the possible punishment and the severity of the punishment.

Gary S. Becker's groundbreaking study on crime in 1968 served as the foundation for the economics of crime.<sup>4</sup> He uses the same economic principle that “people respond to incentives” and extends his idea of relating economics with crime. He describes the conduct of the criminal in his important essay "Crime and Punishment: An Economic Approach (1968)" by utilizing the choice analysis employed in microeconomics by considering the concept of expected utility. He stated that the offenders respond to incentives, and they are rational enough that before deciding whether to commit a crime or not, they decide or compares the relative cost and benefit of indulging themselves in criminal activities. This argument is presented by Becker through choice analysis which states that an offender while committing a crime, compares the cost and benefit of doing crime. The benefit of doing a crime may be in terms of material or financial gain, and the cost of crime may include the possibility of being apprehended and being sentenced or the opportunity of foregone earnings available in other legal activities. So an offender compares the expected utility of both doing crime and not doing a crime. If the probability of being caught or being sent to jail is high or there are high-income opportunities available in other legal activities, then the opportunity cost of doing a crime will be high, and the expected utility from doing a crime will be low hence a rational offender will not commit a crime in this case. Furthermore, if the gains from illegal activities are greater or the probability of being caught is so small, or if caught, then the probability of being convicted and being held sentenced is small, which means there is low opportunity cost of doing crime and the expected utility loss from doing crime is low hence the offender will prefer to enter into illegal activities. This idea of Becker presented as the basis of the analysis of economics and crime.

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<sup>4</sup> Becker, G. S. (1968).

### **1.1.2 WHY STUDY ECONOMICS AND CRIME**

The question about how economics is related to crime and the criticism that crime is a social phenomenon and cannot be directly related to economics are addressed by the economists by answering that crime and economics are directly linked as it leads to the financial loss of the victims. The damage that crime does to property, lives, and misery is well-documented. Freeman (1996) examined and analyzed the overall cost of crime in a study on the United States of America. He estimated that in 1995 the overall loss done through criminal activities was around 2 per cent of the United States of America's GDP. He also found that 2% of the GDP's resources were implied to combat and restrain illegal activities. Freeman claimed an eye-opening fact that the state of California spends more on the offenders in jail than on other productive activities like health and education; he supported his argument through data by claiming that in California, compared to a decline in higher education spending (12.6 per cent in 1980 to 9.5 per cent in 1995), budget allocation for prisons went up from 2 per cent to 9.9 per cent in 1995.<sup>5</sup>

Along with Freeman, many other studies have evaluated and estimated the economic loss caused by crime. Moreover, it is logical to believe in this relationship between economics and crime because, in a society where crime is more often, there will be less trade and economic activities; from the international point of view, we can see that the countries where there is no peace the foreigners are not inclined to make the investment in these countries which means a loss of capital inflow which is an economic loss, and it could be escaped if there were peace, as crime is the source of instability and conflict, so combatting with crime also need resources from the government which means fewer resources available for other productive activities. Hence this lays the justification for studying economics and crime together end, exploring their relation and coming up with solutions for reducing crime and making the economic resources drive towards the productive heads.

### **1.1.3 DIFFERENT DETERMINANTS OF CRIME**

Before combatting crime, we have to know what are the possible factors which lead to crime. When we look around or more formally see the literature, we find that there is not a single

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<sup>5</sup> Freeman, R. B. (1996).

determinant of crime; rather, there are a lot of socioeconomic, demographical, institutional, geographical, and historical factors which can determine the rate of crime in any country. For instance, if we talk about the demographic factors discussed in the literature, we can see how variations in crime rates are correlated with factors such as age, sex, race and ethnicity, concentration of immigrants, marriage, family structure, and residential mobility.<sup>6</sup> Similarly, economic factors like unemployment, inflation, income, and the legal opportunities available for earning also determine the level of crime. Institutional or governance factors, which include the institutional quality, law and order situation in a country, the level of corruption and political stability, all are related to crime in one way or another.<sup>7</sup> Similarly, demographic factors like an increase in the population of cities accompanied by fewer working opportunities and the age structure of the young's and old because young people are theoretically more prone to crime.

## **1.2 SIGNIFICANCE OF THIS STUDY**

Promoting Peace and Justice is one of the sustainable development goals that the world should pursue, and this study is an effort for knowing the true determinants of crime and the factors that can reduce the crime rate as crime has different economic, social and other harmful consequences for the economy and for the society that results in conflict and insecurity, and this can be reduced through proper policy making if the causes and factors of conflict and insecurity are known by well documented research. This study is an effort for knowing the true determinants of crime rate and the factors that have potential of reducing the crime rate, specially evaluating the potential of negative incentives, and to recommend policies based on the findings so that the crime could be reduced.

If we talk about the economic and social consequences of crime, then it could be understood in the form of increasing the financial loss for the victims in the form of damage of their properties, and increased medical expenses and shoe-leather cost of visiting courts and paying legal fees for demanding justice, which increases the opportunity cost of their time which otherwise could be used in other activities such as leisure, family time etc. Similarly, the countries where there is high crime rate, which is a source of insecurity and disturbs the peace of a country which make

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<sup>6</sup> Adeyemi, R. A., Mayaki, J., Zewotir, T. T., & Ramroop, S. (2021)

<sup>7</sup> Habibullah, M. S., H. Din, B., & Abdul Hamid, B. (2016)

that country less attractive for investors and discourage both the domestic as well as foreign investment which is a big economic loss<sup>8</sup>.

Moreover, criminal activities have always been a cause of stress for people. Crime is a big source of anxiety and worry in any culture. We as a society cannot ignore the significant psychological and financial effects that crime has. People feel uneasy and dreadful even when they haven't participated in the illegal activity. One's wellbeing is negatively impacted by the dread of persecution.<sup>9</sup> Crime victims frequently undergo psychological trauma, which can cause long-term problems with their emotional and mental health. This may put pressure on healthcare resources and harm people's general wellbeing. Due to widespread criminality, trust in institutions like the court system and law enforcement is damaged which may result in less cooperation with the government and impede community-based solutions.

Along with economic and social consequences, crime has also other harmful effects for the society which may include the disruption of educational environment, which has a negative impact on the affected people's future opportunities of success as well as their ability to attend school and complete their education.<sup>10</sup> Violent crimes specifically culminate in health problems, and with limited access to quality health facilities can make health disparities worse, which in turn effects the productivity of the victims.

Hence, in order to develop sensible policy solutions to lessen these socio-economic and other harmful consequences of crime, it is crucial to explore and investigate the actual determinants of crime. Societies can work to enhance economic opportunities, reduce crime, and build safer, more unified communities by understanding the root causes of crime. This study is an effort to identify the actual causes of crime as well as potential deterrents, and to suggest appropriate policies based on the results in order to lower crime.

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<sup>8</sup> Hamid, B. A., Habibullah, M. S., & Noor, Z. M. (2013).

<sup>9</sup> Aboya, Y., Ansari, N., Chishty, B. A., & Hussain, A. (2022)

<sup>10</sup> Wang, C., Liu, X., Yan, Z., & Zhao, Y. (2022)

As we mentioned earlier that there is no unique determinant of crime, rather a lot of factors are presented in the literature which possibly affects crime; these factors may differ from country to country, but there are some factors which are general in a sense that they determine the rate of crime irrespective of the country we are studying.

The current study examines the factors that contribute to crime from Gary Becker's perspective, which he presented in his seminal paper; actually, he used the choice analysis, which incorporates the expected utility approach while analyzing why offenders commit a crime and how the crime could be reduced, according to him crime could be reduced by decreasing the expected utility of doing crime for offenders because according to Gary Becker, the offenders before entering into illegal activities compares the expected utility of both entering into illegal activities and not entering, they will enter into illegal activities if the expected utility of doing crime to them exceeds the expected utility of not doing crime.

Hence, this study focuses on variables capable of decreasing the expected utility from doing crime and can result in the declining crime rate. In this study, overall four types of variables are used as explanatory variables, firstly there is a group of economic variables which includes the GDP per capita, unemployment, inflation, educational expenditure as a percentage of GDP. Second group relates to demographic variables which include the urbanization rate. Thirdly there is a group of variables which relates to the governance or institutional quality of a country which includes, rule of law, political stability and control of corruption. The fourth group belongs to the deterrent variables which includes the number of convicted persons.

This study focuses on the role of negative incentives which increases the opportunity cost of doing crime and decreases crime rate which is captured by the governance and deterrent variables because a good governance or good institutional quality and increase in the number of convicted persons decreases the expected utility from doing crime by raising the opportunity cost of doing crime. Only the focus variables of this study reflects the negative incentives portion all other variables are used as control variables and may not necessarily are reflective of negative incentives.

Contrary to previous studies which just only focused on one angle as a determinant of crime, for example some studies just only focused the economic factors as a determinant of crime while some other only focused on demographic or other factors, this study focus on Becker's approach

which is missing in the empirical literature at country specific as well as panel related studies. The governance variables are used in some studies but not from the point of view of choice analysis while this study used these variables from an approach of choice analysis. Similarly, the use of “number of convicted persons” as a deterrent variable which also increases the opportunity cost of doing crime is very near to the analysis of Becker because he also thought that the high Probability of conviction or the high Probability of punishment if convicted has potential of increasing the opportunity cost of doing crime, so the current study used the “number of convicted persons” as a deterrent variable which also belongs to the family of the variables presented by Becker as a factors which increases the opportunity cost of crime, so the used of this variable is new in the literature , which adds to the significance of this study.

Similarly, this study has made significant contribution to the existing literature due to its treatment of the dependent variable crime. Most of the previous studies used overall or total crime reported as a dependent variable without the segregation of the crime, irrespective whether the crime is violent or it is related to property crime or any else category of crime. This approach of merging all the crimes into one category could lead to the aggregation bias<sup>11</sup> which could lead to inconsistent results, because the nature of the violent crime is different from the nature of the property crime and their determinants or driving factors are also somehow different. Even the studies who segregated the crime into violent and property crimes and made sub-categories of the mentioned categories, they only in the end just simply added the sub-categories and treated it as overall violent or property crime. Contrary to previous studies this research just focused on the violent crimes segregating all other type of crimes from violent crimes, the violent crime used in this study includes five sub-categories namely kidnapping, robbery, serious-assault, sexual violence and intentional homicide, and these categories are not simply added to made the total violent crime rather this study have constructed the violent crime index through Principal Component Analysis (PCA) so that each sub-category should be given due weight in violent crime, hence the making of Violent crime index is new in the literature and maybe used as a reference point for future studies. Moreover, there is no study on the developing countries which has used all the group of variables i.e. economic, demographic, governance and deterrent variables as a determinant of crime, so in this sense this study is relatively new one.

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<sup>11</sup> Cherry, T. L., & List, J. A. (2002).

### **1.3 OBJECTIVE OF THE STUDY**

This study aims to investigate the Gary Becker (1968) hypothesis<sup>12</sup> that offenders respond to incentives which could be positive or negative, here we focus on the negative incentives (which reduces the expected utility from crime) which restrain the offenders from committing the crime. This study wants to empirically test this hypothesis for developing countries and see whether the data supports this hypothesis, or whether the people of these countries also respond to these negative incentives and restrain themselves from doing illegal activities.

### **1.4 HYPOTHESIS OF THE STUDY**

H0: Governance and deterrent variables increases the opportunity cost of doing crime and decreases the expected utility of doing crime for offenders, hence it culminates in decrease in crime rate.

H1: Otherwise.

### **1.5 ARRANGEMENT OF THE STUDY**

This study has been arranged in chapters where the second chapter discusses the literature review related to the models of crime, and empirical studies. In the third chapter theoretical framework is discussed which explains the logical and theoretical channels through which the regressors of this study effect the outcome variable which is crime. In chapter four data source, the detailed description of the variables and the estimation methodology is discussed. In the fifth chapter estimation and findings have been discussed in detail. Finally, chapters six and seven include the study's conclusion and provide some policy recommendations based on its findings.

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<sup>12</sup> Becker, G. S. (1968)

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

Crime, as a complex and complicated social phenomenon has long attracted the interest of academics, decision-makers, and society at large. Therefore, it is crucial to comprehend the determinants of criminal behavior since doing so has significant ramifications for community health, public safety, and social order. This survey of the literature sets out on a journey across the huge body of academic research devoted to identifying the causes of crime. This review aims to provide a thorough synthesis of the complex elements that influence people's decisions to engage in criminal activities by examining a wide range of methodologies, techniques, and theoretical frameworks. As we make our way through the maze of literature, certain important themes become the main areas of investigation. Economic context is a significant component that has been extensively researched for its possible impact on criminal activities which includes unemployment, poverty, and income inequality as a potential factor that determines the crime rate. The context in which criminal decisions are formed is also shaped by social factors, which include family structure, peer influences, social cohesion, and community support. Psychological and institutional factors also play vital role in offender's decision to commit crime which may include character qualities, psychological problems, each person's views of risk and reward, and institutional factors like the effectiveness of justice, the judicial system, and the accessibility of social services are key drivers of determining the level of crime.

As we read the literature, it becomes clear that understanding the causes of crime calls for a multidisciplinary strategy that incorporates sociology, psychology, economics, criminology, and other fields. Therefore, this literature review aims to give a thorough overview of the complex factors that influence criminal activities, ultimately leading to a greater comprehension of the dynamics behind crime and the approaches to develop successful prevention and intervention policies.



Before presented the empirical literature review, we will present the theoretical models of crime presented by classical criminologists like Becker and Isaac Ehrlich.

## **2.2 AN OVERVIEW OF THE THEORETICAL MODELS**

### **2.2.1 MODEL BY GARY S. BECKER (1968)**

Gary S. Becker (1968) attempted to respond to the questions of how much resources and punishments should be utilized to implement the various types of legislations that are deterrent to crime, he discussed this in his essay "Crime and Punishment: An Economic Approach. The optimum amount of resources to be used for legislation depends on a variety of factors, such as the cost of apprehending and prosecuting criminals, their reaction to these actions, and the type of punishments meted out. For this, to determine the optimum level of legislation to combat with the crime Becker presented a model which states that to declare an activity as illegal, one has to compare the Benefit or Gain and Harm inflicted by these activities and also the overall Damage done by these activities to the society. As offenders get Gain in the form of monetary reward or other and victims got Harm by crime, therefore, if the harm to victims outweighs the benefit to the perpetrators, the activity should be declared as illegal; otherwise, it should not. Similarly, Becker while talking about the sources/determinants of offenses concluded that considering upon all the diverse theories of crime we can state that an increase in the likelihood of conviction or punishment if convicted will cause a decrease in crime, assuming all other factors remain constant. This argument is presented by him through choice analysis which states that an offender while committing a crime compares and the cost and benefit of doing crime. The benefit of crime maybe in terms of the material or financial gain and the cost of crime may include the possibility of being apprehended and being sentenced or the opportunity of foregone earnings available in other legal activities. So an offender compares the expected utility of both doing crime and not doing crime. If the probability of being caught or being sent into jail is high or there are high income opportunities available in other legal activities, then the opportunity cost of doing crime will be high and the expected utility from doing crime will be low hence a rational offender will not commit crime in this case. Further discussing about the forms of punishments Becker discusses the case of imposing "fines" on offenders and argues that out of other forms of punishments "fines" are more suitable and feasible as they increase social welfare.

In support of this argument Becker quoted that several early writers on the subject of criminology acknowledged the advantages of imposing fines as they are more economical since they compensate the victims and restore their status quo ante, also the burden of fine is felt by the offender and advantage is felt by receiver rather than just imprisoning the offender as this does not satisfy revenge. The main contribution of this essay is that it explains the optimal policies to deal with the illegal activities and this is a type of optimal resource allocation. As resource allocation is the main concern of economics, so by discussing the analysis of illegal activities economically through resource allocation has enriched this analysis.

### **2.2.2 MODEL BY EHRLICH (1996)**

Analogous to Becker's analysis, Isaac Ehrlich (1996) in his article entitled "Crime, Punishment, and the market for Offenses" has drawn focus on two of the main subject matters that characterize the literature on the subject of criminology. In this paper Ehrlich presented a "Market model" to perform economic analysis to illegal activities. The model has been built on the assumption that offenders respond to incentives. Similar to Becker, Ehrlich also addresses the issue of what factors should constitute as optimal control policy for offenses. Further discussing about incentives, Ehrlich describes that there are two types of incentives to which offender responds. Firstly, negative incentives, these incentives deter the crime and make the offenders less likely to commit crime, the likelihood that criminals would be apprehended or punished, as well as the severity or type of punishment to be meted out, are some of these incentives. In addition to negative incentives, positive incentives like lowering income inequality in society and providing earning opportunities through legal activities, also have a tendency to lessen the crime rate. Secondly, positive incentives which include the income opportunity available in legal activities, rehabilitation programs and lower income inequality in the society, these incentives also tend to reduce crime. According to Ehrlich there has been a debate in the literature on the issue of whether positive or negative incentives are more suitable and efficient to reduce crime and which type of incentives should constitute as a policy to deter crime. Ehrlich has made an effort to assess some of the controversy's points.

#### **The market model for offenses**

The market model for offenses discussed in this paper is not physical rather an abstract notion of a walrasian market where demand and supply coordinated with relative prices. This market model is based on certain assumption which include that the victims, offenders and law enforcement agencies all act in a way of maximizing behavior. The model presented by Ehrlich focuses on supply of offenses, demand side of the market for offenses and then the equilibrium.

### **Supply of offenses**

While discussing the supply side of the market, Ehrlich said that as the supply of offenses come through offenders hence while deciding whether to enter into illegal activities offenders compare the cost and gain from such an activity or they consider the expected net return from such activity. The projected net return from offenses is functionally related to an offender's supply of offenses, where offenders will increase the supply of offenses if they project or expect a higher return from offenses. If the cost of committing crime which include the cost of self-protection to escape from expected punishment, the foregone income opportunities available in other legal activities and the eventual punishment if convicted is greater than the expected illegal gain, which means the expected net return from such an activity is negative and offender will not enter into illegal activity, similarly if the gain per offense is greater than the cost from that offense the net return will be positive and the supply of offense will be a positive amount.

### **Demand for offenses**

While discussing about the demand side of the market, when we talked about illegal goods and services we can thought that there is a direct demand for illegal goods and services as there is a demand for stolen goods in the market. But in case of crime related to person and person's property, there is also a demand for crime but here the demand is not direct rather derived or hidden demand for crime. The need for private protection is inversely connected to this concealed or derived demand. Demand for private protection means that individuals in order to remain safe from crime adopt certain protective measures which include the use of locks, burglar alarm system, living in a safer neighborhood by paying high rent or maybe hiring a private guard. But because the protection is not free rather costly, its optimum level will be where the marginal benefit from private protection will be equal to its marginal cost. The ideal amount to spend on private security is closely correlated with perceived victimization risk and potential victim losses from crime. Higher the risk of victimization and loss from crime means a higher

demand for private protection by the individuals. Now if for example there is a low demand for private protection due to less perceived risk of victimization, this means that a given rate of crime is tolerated by society which means there is a derived demand for crime.

### **Market equilibrium**

When the supply of offenses equals the derived demand for offenses, the equilibrium or ideal level of crime will be found, the determined equilibrium quantity of crime against the optimal net return per offense will be the level of crime which is tolerable in the society.

The bottom line of the model suggests that crime is a normal social fact which means there is always a positive amount of crime that prevails in a society that is tolerable by the society.

In the end while discussing about the public enforcement to reduce crime the author discusses that the law enforcement authority maximizes the social welfare by minimizing the losses from crime by applying the optimum level of law enforcement. Its optimum level will be where the marginal benefit from law enforcement in the form of crime prevention just equals the marginal cost of law enforcement. Further while talking about the policy decision as to which mean should be used as a policy instrument to control crime. He added it's not just depends upon the relative effectiveness of a mean rather it also depends upon the relative cost associated with that mean to be used as policy instrument.

## **2.3 EMPIRICAL EVIDENCE ON THE DETERMINANTS OF CRIME: COUNTRY- SPECIFIC STUDIES**

Nabeela Khan et al. (2015) in their article “The Socio-Economic Determinants of Crime in Pakistan” estimated the link between the socioeconomic factors that determines the rate of crime. The regressors used in this study include GDP per capita, the level of education measured through higher education enrollment rates, poverty level measured by poverty headcount ratio and the unemployment rate. Time series data on these variables is collected for the period ranging from 1972 to 2011. In order to obtain the results for long run, Johansen and Juselius (JJ) approach for cointegration is used to estimate the model and for the short run results the Vector Error Correction Model (VECM) is used. The results showed that unemployment rate has a positive short- and long-term relationship with crime rate, while education level has a negative

short- and long-term relationship with crime rate. Other variables showed mixed results for short run and long run, for example GDP per capita is positively associated with crime rate in long run but negatively in short run. On the basis of the results the policy implication given is that the government of Pakistan should create sound economic environment which is conducive in strengthening the economic conditions of the country, and should create more employment opportunities and should introduce such programs that alleviate poverty.

Rasheed A. Adeyemi et al. (2021) in their paper entitled “*Demography and Crime: A Spatial analysis of geographical patterns and risk factors of Crimes in Nigeria*” examined the relationship between geographic characteristics and socioeconomic causes of crime and examined the spatial distribution of the incidences of the crime rate for Nigeria. The analysis of the spatial pattern of crime is performed by taking four type of crimes namely kidnapping, armed robbery, theft and rape. The explanatory variables used in this study are Gross National Income, population density, the index made for education, unemployment rate, the structure of the police and the percentage of male population. The study was carried out for Nigeria by using the crime statistics for Nigeria for the year of 2017, these statistics were obtained from the National Bureau of Statistics for Nigeria. Instead of using traditional regression methods, this study estimated the model using the Markov Chain Monte Carlo simulation method, the findings revealed that Gross National Income and percentage of male population are positively effecting all types of crimes while the rate of unemployment was found to be negatively related to theft but positively linked with kidnapping, rape and armed robbery.

For the population of workers in Brazil, Diogo G. C. Britto et al. (2022) in their paper entitled “*The effect of job loss and unemployment insurance on crime*” examined the effects of job loss on crime and the deterrent effects of unemployment insurance benefits on crime. The data on the population of workers is mainly collected through *Relação Anual de Informações Sociais* (RAIS), which is data set which contains the employer-employee data set in which the whole population of the formal workers of Brazil is covered, and this data is provided by the Brazilian Ministry of Labor and it ranges from 2002-2017. This data set is very rich with respect to information that it contains such as the start or end date of the job, the location of the job, similarly it also contains the nature and typo of the job the wage and related education of the worker etc. The data is estimated through difference-in-difference method and the findings

revealed that if the workers are get fired or laid-off their probability or likelihood of committing the crime increases by 23 percent, but if these workers are provided with the unemployment insurance this likelihood of committing crime is completely faded away, but this offset totally disappears when the unemployment insurance benefits ends. Moreover, the study investigated that the liquidity constraints in providing long-term unemployment insurance and the mental stress or strain caused by the displacement of the workers are the main drivers of the criminal behavior of the workers. Hence they recommend that along with the temporary insurance benefits the government should devise such Labor market policies which speed up the process of return of workers to jobs, and there should be a stable and long-term guarantee of the income for the workers if got fired.

In their article, Guido de Blasio and Carlo Menon (2013) examined the effect of Italy's economic slump on crime. The study has been carried out by focusing on the conditions of the local labor markets of the Italy specially analyzing the short-term response of the crime to the deep economic downturn or famously known as Global Financial crisis of the 2007-2009. The study has used the data set which is unique in nature, the data set on criminal facts has been made available by the police department of Italy in which day by day criminal activities are recorded and it less erroneous data with greater reliability, this data set is famously known as “Sistema di Indagine” (Investigation System or IS) data, the data is confidential in nature and is not easily available. The study has used the “total revenues of the plants of private firms” as a proxy/measure for local economic conditions of the Italy. The findings of the research showed that the offenses that do not require any expertise in crime i.e. theft or some other minor crimes are significantly increased with the economic downturn and for the crimes for which there needs to be expertise or special tools are required for committing that sorts of crimes are negatively associated with the economic crisis. Moreover, in locations where organized crime is substantially more prevalent, there is a weaker correlation between the economic downturn and crime. The study also suggested to the government of Italy that along with other social problems in the period of recession, she should also consider and tackle the problem of increasing crimes and should devised the policies accordingly. The results of the study revealed that even the developed or high income economies like Italy could be effected by the recession in the economy which could produce many social and economic evils like crime.

In their study, Chuhong Wang and colleagues (2022) examined how reforms to higher education in China affected the rate of crime for Chinese economy. The data used for this study were collected through various sources, if we talk about criminal statistics, they were gathered from the Procurator Yearbook of China (1989-2013) and the China Law Yearbook (1989-2013), whereas the data on higher education came from the China Statistical Yearbook (1989) and the Educational Statistics Yearbook of China (1989-2012). The explanatory variables which were used along with the education level were employment rate, population (10000), male/female ratio, income inequality, trade openness, police and welfare expenditure of the government and immigration rate. The results are estimated through the partial identification Difference in Difference (DID) method. The findings of the DID point estimate revealed that there is a strong evidence and strong deterrent effect of education on crime in china and these effects are more clear and significant after many years after the implementation of the education reform policy program.

Muzafar Shah Habibullah et al. (2014) in their paper tried to explore the relationship between the governance quality and crime rate for Malaysia. They have used the time series data ranging from the 1996-2009. The crime rate was measured by the number of reported crimes per 100,00 populations, moreover the crime rate has been categorized into three categories namely total crime, property crime and violent crimes. six indicators were used for measuring the quality of governance in Malaysia. A few examples of governance indicators used are political stability, rule of law, regulatory quality, corruption control, and voice and accountability. Data on crime was derived from yearly statistical book published by the Malaysian statistics department, while the data on governance indicators has been collected through the world Bank. The long-run model was estimate through the famous technique Autoregressive Distributed Lag (ARDL). The findings suggest that as the quality of governance improves the total crimes reduces, similarly due to improved governance quality property crimes also tend to reduced but the violent crimes does not. The results also showed that out of all the governance indicators, control of corruption was found best in a sense that it reduces the crime more than the other indicators used in this study.

Devika Hazra and Zhen Cui (2018) in their paper entitled “Macroeconomic Determinants of Crime” investigated the relationship between major macroeconomic indicators and crime rate for India. The macroeconomic variable used in this study includes level of unemployment, inflation rate the GDP per capita. The National Crime Records Bureau (NCRB) of India provided national-level crime statistics for the study for the period 1991–2015. The NCRB published two types of data one is SLL (Special and Local Laws) and the other is IPC (Indian Penal Code), this study has used total crime as a sum of both IPC and SLL. The results are estimated through Vector Autoregressive (VAR) model, hence through the use of the Augmented Dickey Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests, the stationarity of the variables was examined. The results showed that, with the exception of the unemployment rate, which is integrated of order zero  $I(0)$ , meaning it is stationary at level, all other variables are integrated of order one  $I(1)$ . In order to determine whether there is any long-term association between the variables, cointegration analysis was performed, and through Johansen cointegration test it is confirmed that there cointegration exists between the variables. The findings through VAR model revealed that the macroeconomic indicators significantly affect the crime rate in India. Unemployment was found to be positively effecting to all type of crimes. The OLS was also applied for the Robustness of the results which stated that only inflation is positively effecting the crime rate all other variables do not significantly associate with the crime.

## **2.4 EMPIRICAL EVIDENCE ON THE DETERMINANTS OF CRIME: COUNTRY: CROSS-COUNTRY STUDIES**

Baharom Abdul Hamid et al. (2013) in their work entitled “Crime and Its Socio-Macroeconomics Determinants: A Panel-Error-Correction Cointegration Analysis” analyzed the relationship between crime rate and some socio-macroeconomic determinants which include GDP per capita, inflation rate, interest rate, unemployment, political violence and income inequality by using the data for the years 1960-2001 for 21 countries. The model is estimated using a panel error correction based cointegration (Persyn and Westerlund, 2008). The results suggest that in the long run income and political violence are negatively associated with the crime rate while all the other variables including unemployment and inflation are positively associated with the crime rate. All of the variables utilized in the study have coefficient signs that



are logical and consistent with previous assumptions or expectations. This suggests that in order to combat the crime rate the government of the countries used in the study must correct their macroeconomic indicators and devise such policies which increased the level of per capita income in the country and which boosts and create the employment opportunities which could result in declining the crime rate.

Yousuf Aboya et all (2022) in their article entitled “Comparative Study on The Socioeconomic Determinants of Crime in Pakistan and India: An Econometric Analysis” have tried to determine the socioeconomic determinants of crime in both countries and compared the results for the given countries. This study uses four variables as a determinants of crime namely, unemployment rate, poverty rate, education level and GDP growth. The time series data for the period 1996-2020 has been used in this study and ARDL bound testing approach to integration is applied to estimate the results. The results of the study suggest that in the long run for Pakistan education level and poverty are the key determinants of crime (measured by intentional homicide), as the increase in level of education reduces the crime rate and poverty level is associated with higher level of crime rate. For India in the long run there was no association found between the repressors and regressand but in the short run education level is marginally significant (at 10%) and negative which means education level has the potential to reduce the crime rate. The suggestion given on the bases of the obtained result is that both countries should focus on increasing the education level of their residents because knowledge has the power the see the difference between right and wrong and education could help the people to get better jobs which also leads to lower crime rate by lowering the unemployment rate which is the key determinant of crime. According to me this study has certain limitations as it uses very few variables as a determinants of crime which means model could be misspecified as it does not include many other important variables that determine the crime rate.

Giovanni Cerulli et al. analyzed some primary determinants of crime for 50 sates of United States of America by using the Responsive Score approach. The study has been carried out for the time-period ranging from 2000 to 2012. The responsive scores approach captures the heterogeneity of the individual units and allow for the more thorough analysis of the relationship between crime and its determinants. The study used six primary determinants of the crime including Wage The study looked at six main factors that influence crime, including wage

income, economic disparity, educational attainment, job status, public spending on police, and the presence of people who were not native-born Americans. The study has constructed the panel for 50 states and data is collected through American Community Survey (ACS) microdata available from IPUMS USA, and they used the Consumer Price Index 2010 in order to deflate nominal measures. All the regressors have been lagged by one year in order to capture the delayed effects (if any) of the variables on crime. They also categorized the total crime into violent crime and property crimes so that their separate effects could be captured and in order to escape the aggregation biased problem. The results of the study found that the education is weakly but positively effecting the crime, while on average the response of employment found to be near zero and not very eruptive. On the other hand, income inequality and the share of foreign born population are positively linked to criminal activities while the expenditure on police tend to reduce the crime.

Ming-Jen Lin (2007) in his paper analyzed the relationship between democracy and crime by combining various international data sets. These data sets include International Crime Survey (ICS), conducted by the International Criminal Police Organization (Interpol), Comparative Freedom Survey (CFS) and International Crime Victimization Survey (ICVS). The other control variables used in this study were GDP, urbanization rate, GDP growth rates, crime clearance rates, income inequality and inflation rate. The findings of the paper reveals that the effect of democracy on major or serious crimes is negative and for minor crimes is positive in countries with democratic system. Out of other control variables, GDP and crime clearance rate are associated negatively with crime rate while unemployment and income inequality increases the crime rate.

Noorishah Binti Shafiq and Dayang Haszelinna Abang Ali (2022) in their paper investigated the economic determinants of crime for seven selected developing countries which includes El-Salvador, Jamaica, Honduras, Bahamas, Venezuela, South Africa and Colombia. The study used GDP per capita, number of tourist arrival and the unemployment rate as independent variables. The crime rate was measured by the intentional homicide per 100,000 populations. The data was collected through United Nation Organization on Drug and Crime (UNODC) for the time period 2000-2013. The model was taken in log form and estimated through Panel cointegration method and Dynamic Ordinary Least square DOLS method. The findings revealed that all variables

found to be stationary of the same level and are co-integrated in the long-run, moreover the estimates of the DOLS suggested that there is a positive and long-run relationship exists between unemployment and crime.

A.H. Baharom and Muzafar Shah Habibullah (2008) in their paper entitled “Is crime cointegrated with income and unemployment” analyzed whether there is a causal effect between the income, unemployment and crime. Their study was carried out for 11 European countries which include France, Greece, Hungary, Cyprus, Denmark, Switzerland Finland, Netherlands, Norway, Sweden and Estonia. The data on crime was collected at both aggregated which means total crime and at disaggregated level which means for different categories of crime, these categories include domestic burglary, violent crime, drug trafficking and motor vehicle theft. The data for total and subcategories of crime was collected from the Home Office Statistical Bulletin 12/03 and Home Office, United Kingdom, while the data on income and unemployment was obtain through international financial statistics(IFS). The data was collected for the time period 1993-2001. The default panel data estimation techniques fixed effects and random effects were applied to estimate the model, Hausman test proposed that the random effect model is more appropriate. The results of both the regressors are in lined with the theory and expectations. Moreover, income was found to be positively associated with violent crime, total crime, crime related to motor vehicle and drug- trafficking, similarly unemployment was also found to be positively related to total crime as well as other subcategories of crime except the violent crime with which it has found to be associated negative.

## **2.5 CONCLUSION**

In conclusion, this literature has shown the complexity of crime determinants. Collectively, institutional, demographic, economic, social, psychological, and sociological determinants make up the complex web of criminal behavior. This study establishes the framework for our empirical research, with the goal of advancing the continuing discussion on the causes of crime and directing evidence-based strategies for safer communities.

## CHAPTER 03

### THEORETICAL FRAMEWORK

This chapter explain the theoretical as well as logical reasoning or channels through which the independent variables used in this study effect the outcome variable of this study which is the crime. The dependent variable of the study is total violent crime and the independent variables are GDP per capita, unemployment rate, inflation rate, expenditure on education, urbanization rate, Governance indicators which include rule of law, control of corruption, and political stability, and lastly the deterrent variable which is number of convicted persons. Before presenting the theoretical framework of this study, the model of crime which is presented by Becker in his seminal paper (1968) is presented below:

#### 3.1 MODEL OF CRIME PRESENTED BY BECKER USING CHOICE ANALYSIS

While discussing the determinants of crime, the approach followed by Becker includes the choice analysis in economics, which states that a person, while committing a crime, compares the cost and benefit of doing a crime. When the expected utility of committing a crime outweighs the expected utility of spending his time engaged in other activities, a person is more inclined to commit crime. This argument could be represented as follow:

$$O = O(C, P, e)$$

Where O= number of offences

C= Probability of conviction

P= Probability of punishment if convicted

E= other variables (income available in other legal activities, frequency of arrest and offenders' willingness to commit crime)

Where “C” and “P” are negatively associated with O because an increase in C and P will decrease the expected utility of doing crime.

$$O_c^s = \frac{dO}{dc} < 0$$

$$O_p^s = \frac{dO}{dP} < 0$$

The direction of the variables included in "e" may also be predicted as an increase in the earning opportunities in legal activities would raise the opportunity cost of committing crimes and lower its expected utility, which would lead to a decrease in crime.

Further going beyond, Becker discussed that by increasing "P" and "C" crime could be reduced, but it is costly to increase "P" and "C" because increasing these involves spending more on police, courts and other law enforcement agencies, which is a cost to society because it is done from the tax revenue collected from society, hence increasing "P" and "C" involves social cost. So in order to decide whether a crime should be made illegal involves a comparison of the social gain from deterring crime in the form of peace and safety of citizens and the social cost of deterring crime. In other words, we have to measure the social loss function from offences which are as follows:

$$L=L(D, E, bf, O)$$

Where  $D(O)$  is the damage done by a particular offense which is equal to harm done by that offense  $H(O)$  minus the gain done by that offense  $G(O)$ , that is  $D(O)= H(O) - G(O)$

Where  $bf$ = loss per offence punished

$E$ = amount spent in combatting offences

$O$ = A particular offense

Now to declare a crime illegal or to deter the crime, the social loss function of that offence should be minimized.

Suppose the cost of punishing, convicting and apprehending the offenders is zero, which means social loss is zero. Then the social loss function could be minimized by setting the punishment levels high enough so that the crime could be reduced if and only if the Harm induced by crime is greater than the private gain by Harm.

### 3.2 THEORETICAL FRAMEWORK OF THIS STUDY

The model of this study has the following functional form:

$VCI$

$$= f(GDPPC, UNEMP, INFL, EDUEXPPOGDP, URBRATE, RLAW, CCOR, PLSTAB, CONP) \dots eq(1)$$

In the above model VCI stands for violent crime index which is the dependent variable of this study. Similarly, GDPPC is the GDP per capita. UNEMP, INFL, EDUEXPPOGDP, URBRATE are unemployment rate, inflation rate, educational expenditure as a percentage of GDP and urbanization rate respectively. RLAW, CCOR and PLSTAB are governance indexes having description Rule of Law, Control of corruption and political stability respectively., in the end the number of convicted persons is represented by CONP.

The model presented above contains the variables necessary to test the Hypothesis presented by Becker (1968) that the negative incentives has the potential to reduce the crime rate. Specifically, the model used in this study contains the governance indicators (which include rule of law, control of corruption, political stability) and deterrent variable “number of convicted persons” which are the true representatives of the cost of crime to the offenders, as a good governance and higher rate of conviction both increases the opportunity cost of doing crime as the expected utility of doing crime will be decreased if there is good governance situation in the country, which means the probability of being caught, held sentenced and severity of punishment is high. Hence the model used in this study is a good one in a sense that it contains all the variables necessary to test the Becker’s Hypothesis of choice analysis.

The theoretical background and channels through which regressors of this study effect regressand are presented below:

#### 3.2.1 UNEMPLOYEMNT AND CRIME

Unemployment could lead a person to commit crime through various channels, one of them is strain or stress. The loss of job or in other words loss of a part of income causes a strain and mental disorder to a person which could lead a person to go for illegal activities. Similarly, when a person got unemployed he/she is no more enjoying the status in which he/she was

previously living, so for some persons it is attractive to go for illegal activities to maintain their status quo.

Gumus (2003) differentiated between the long-run and short-run effect of unemployment, he stated that in the short-run after being unemployed the individual look for another job but in the long-run if he continues to be unemployed, there is a more chance of him to be indulge in criminal activities.

### **3.2.2 INFLATION AND CRIME**

Inflation could also be a perpetuator of crime as increase in the general price level decreases the purchasing power of money, it is like a hidden tax because the money in your pocket now buy less, this could also lead to strain because people are unable to enjoy their pre-inflation status and hence culminate in doing illegal activities. From the early works on the connection between inflation and crime the book by David Hackett Fisher (2000) entitled “The great wave” is a reference point on this literature in which he theoretically builds his argument that the crime is high when inflation is high and vice versa. For example, in the era of great depression when there was low demand for goods and hence low prices the crime rate was recorded low contrary to prosperous years of 80’s when crime was high, in this book he also iterated the connection between murders and inflation rate in England for over 700 years.

### **3.2.3 PER CAPITA INCOME AND CRIME**

Income is considered one of the main determinant of the welfare of the society and individual, hence any variation in income could be attributed to the welfare of the individuals directly, a welfare loss of the individuals causes strain and stress in the society which could lead individuals to commit crime. Income can be a source of leading towards crime through different ways. A low per capita income of the individuals means a low level of standard of living and facing hardships of the life and feeling deprived from the basic and necessary things of life, a sense of feeling deprived is major root of committing crime. Another argument is that a high level of per capita income for some part of the society low for another also leads to sense of deprived and it is also more attractive for offenders to commit crime as the benefits of doing crime more when done to wealthy victims. More income suggests that people are wealthier and there are more opportunities of doing crime as more affluent areas are more attractive for

criminal activities and this is known as the opportunity effect, Furthermore, a high level of income means less time spent in house and more in outdoor activities which increase the probability of being victimized by criminals (Beki, Zeelenberg & Van Montfort (1999)). Similarly, per capita income is source of country's economic condition, a higher level of per capita income suggests that country is in a good economic position and there are more legal opportunities for work and higher salaries for workers and in this case it is less attractive to commit crime because opportunity cost of doing this will be higher in this case because a worker can earn higher by indulging him/herself in legal activities.

Additionally, according to Buonanno (2003), the income of both the perpetrator and the victim is a significant factor in determining the decision of whether to commit crime or not because the former symbolizes the cost of committing crime and the latter serves as an incentive.

### **3.2.4 EDUCATION AND CRIME**

Machin et al. (2011) have discussed the three main channels through which education can effect crime, one is income effect which means a higher level of education increases the expected wages, because an educated and skillful person is more likely to earn better than an uneducated person, which means for educated person the return in legal activities is more as compared to illegal activities, which increases the opportunity cost of crime for educated persons , hence the result is reduced crime rate. Similarly, as more and more resources are diverted towards education it creates a time constraint for the young's (as young or teens are more prone to criminal activities if not involved in productive activities) and it keeps them away from indulging in criminal activities (called "incapacitation effect"). According to the findings of Witte & Tauchen (1994), more time spend in educational activities is associated with less probability of being engaged in criminal activities. Similarly, the higher level of education is correlated with high life satisfaction and educated people tend to be more rational, patient and risk averse which reduces the probability of indulging into illegal activities (Becker and Mulligan, 1997). Usher (1997) focused on another channel called a civic externality of education, which is going to affect one's willingness to commit crime. In general, an educated person is less willing to commit crime because he has a reputation in the society and it is less likely that he destroys or damage his image in the society. Similarly, there are positive externalities of the education, the people living around an educated person take inspiration and



shape their personalities accordingly, similarly education creates patience and law abidance and promotes good citizenship.

There are also different perspectives about how education level could lead to crime. One argument is that a higher level of education leads to the increase in sophisticated crimes and it is true in a sense that white color crimes like online frauds have increased in recent past. Secondly the most common and logical argument is that low education level culminates into illiterate individuals and if combine with low skills will lead to an individual which is more prone to commit crime as it has low opportunities as well as low abilities to go for legal activities.

### **3.2.5 GOVERNANCE AND DETTERENT VARIABLES**

From the remaining variables if we talk about the urbanization rate then it could be logically understood that as the cities grows along with development a lot of socioeconomic issues also emerge. Crime is one of that evils which emerge as the population density increases hence urbanization could be a source of encouragement for criminal activities since it is seen that the ratio of crimes in urban areas as compare to rural areas is high (Kriwo and Peterson 1996). Similarly, in rural areas it is difficult for people to indulge themselves in criminal activities because due to less population all people knows each other very well therefore it is difficult for criminals to hide themselves from recognition, to avoid this they move to big cities where population density is high enough that they couldn't be recognized easily and also due to overpopulation it is less likely that they could be caught (Glaeser and Sacerdotal 1996), which means the opportunity cost of doing crime in big cities is not high so this will lead to higher crime rates in big cities.

Similarly, if we talk about the governance variables which include (rule of law, control of corruption and political stability) so logically it is also obvious that the country or a place where there is a less corruption, high standards of rule and law, accountability, and politically stable environment is less likely that there will be high rates of crime, because if there is no supremacy of rule and law, there will be a law of jungle everybody with the power will bribe and attack on the life and property of others. If we thought this from the point of view of economics, then if the above mentioned indicators relating to governance are not good then there is incentive for offenders to involve in criminal activities because a low standard of rule of law and highly

unstable political environment means that the probability that the criminals will be caught, convicted and sent into prison and held sentenced is very low, hence the criminals found themselves in a better position to do crime and escape from the law. In other words, since there will be little opportunity cost of committing crime due of the low likelihood of being apprehended, the cost of crime will be very low.

Lastly the variable which is one of the focus variable of this study is “Number of convicted Persons” is directly related to the cost of committing the crime. If the probability of conviction, being sent into jail, held sentenced, the possible punishment and the severity of punishment is high then the criminals will hesitate to do crime because if they do crime, there is high probability that they will be caught and sent into prison which increases the opportunity cost of doing crime. Consider a scenario where if a criminal is involved in a criminal activity and being caught and sent into jail, convicted by the jury and held for sentenced for five years with some financial penalty, now a person spending five years in a prison could possibly earn a wage by doing some work or by doing business and having leisure time with his family, but the possible earning of five years and family time is the opportunity cost of doing that crime because these earnings has been foregone in order to that crime, now if the foregone earnings are higher than the reward of the crime then the opportunity cost of doing crime is high and the rational offender will decide not to enter into the crime.

Hence according to Becker’s analysis anything which adds to the cost of doing crime will culminate into lower crime rate because in that case a rational individual will not indulge himself into criminal activities as the opportunity cost of doing crime is higher in this case.

## **CHAPTER 04**

### **DATA AND METHODOLOGY**

#### **4.1 DATA AND VARIABLES**

Out of several socio-economic, demographic and deterrent variables which determines the crime rate, this study has selected some specific variables as a determinant of crime. The variables selected for this study belongs to four categories namely economic variables, demographic variables, governance variables and deterrent variables. The economic variables include GDP per capita, unemployment, inflation and expenditure on education, the demographic variables include urbanization rate. Rule of law, control of corruption, and political stability are all governance indicators utilized in this study. The number of convicted persons is the deterrence variable used in this study.

The per capita income is used as a measure of the income of the individuals, educational expenditure is used as a proxy for the country's educational level, the educational expenditure is calculated as a percentage of GDP. because the data on the level of education was missing for most of the countries so the study has used a near proxy as a representative of level of education in the country, for example a country with higher percentage of expenditure on education is representing a high literacy rate among people. Lastly the deterrent variables mean the variables which directly increases the cost of doing crime for offenders, so for this category the study have used “number of convicted persons” as a proxy which increases the opportunity cost of doing crime.

#### **4.2 WHY PANEL DATA**

This study has been carried out by employing the panel data. Panel data means that the same cross sectional units are surveyed overtime. Twenty-six (26) cross sectional units are used in the study which belongs to the group of developing nations. All the developing countries are not selected because of the non-availability of the data on crime, hence only 26 countries for which the data on crime were available are selected for this study, these countries include Armenia,

Cyprus, India, Azerbaijan, Pakistan, Srilanka, japan, Kyrgyzstan, Mongolia, Korea, Turkiye, Singapore, Thailand, Kenya, Morocco, Bahamas, Barbados, Bolivia, Chille, Colombia, Cost Rica, El Salvador, Guatemala, Mexico, Panama, Peru. These 26 countries are selected from Asian, African and Latin American countries which are all developing countries and the data on these cross sectional units is taken from 2003-2022.

There are certain benefits of using panel data which cannot be accrued in time series data. Panel data is very rich in a sense that it enables the researcher to control the effect of that variables whose effect cannot be captured or observed for example the difference in practices of businessmen across the companies or the cultural differences across different cross-sectional units, similarly it allows to incorporate the effect of time-invariant variables like the weather is country is land lock or not. Panel data enables us to include variables suitable for multilevel or hierarchical modeling at several study levels. (e.g., students, schools, districts, and states).

### **4.3 DETAIL DESCRIPTION OF THE VARIABLES USED IN THE STUDY**

#### **4.3.1 REGRESSAND OF THE MODEL**

The dependent variable of this study is crime, the study has used the violent crime as a representative of crime. The study has not merge all types of crime into one variable because it will create biasedness in the results because every crime has its own nature which is different from other types of crime hence have different determinants of crime. To avoid this biasedness one should study the determinants of crime separately for each type of crime and for this more than one regression equations will be estimated. The major types of crimes are violent crimes and property crimes and the study have chosen to study the determinants of violent crimes, because the proportion of major crimes are commonly found to be associated with violent crimes, also the most of the studies done in the past have used the violent crime as a dependent variable.

Under dependent variable of the study, we have taken five sub categories of violent crime which includes kidnapping, robbery, serious assault, sexual violence and intentional homicide. The definition of each category is given below:

KIDNAPPING: Illegal confinement and taking away of the people without their consent with the intention of demanding unlawful economic and other materialistic gain.

ROBBERY: Obtaining the property of someone forcefully or by the threat of using force with the intent of holding it temporarily or permanently from a person or organization.

SERIOUS ASSAULT: Intentional or heedless use of severe physical force against a person's body culminating in serious body injury.

SEXUAL VIOLENCE: Attempt to engage in sexual activity without sound consent or with consent by means of threat or coercion.

INTENTIONAL HOMICIDE: illegally killing someone with the purpose to kill them or seriously injure them. This include following:

1. Killing of a person by another (subjective element).
2. The offender's intent to badly injure the victim (subjective element).
3. The illegitimacy of the killing.

The International classification of crime for statistical purposes (ICCS) served as the source for these definitions for each crime category. The measurement unit for above categories of crime is COUNT which means that each incident related to a particular location and time counted separately. Each victim is counted just once, regardless of how many times they have been victimized. As a result, even if a person has been the victim of multiple instances of these crimes throughout time, only one victim is included. A person is considered one victim if they were a victim of more than one of these offenses in the same episode. The counting unit for intentional homicide represents the individual victim where every victim is counted only once.

The data were available by gender but we have taken the data by total amount of offenses committed irrespective of whether the crime is committed by male or female. Based on the respective populations of men and women, the male and female rates are determined and the total rate is based on the total population, which is calculated as below:

$$Ratetotal = 100,000 * \frac{Victimstotal}{Populationtotal}$$

This data is recorded and reported by the local police and other law enforcement agencies of the member states of the United Nations (UN) and is submitted through the United Nations crime trend survey (UN-CTS). The data is derived from administrative registers, which are frequently

controlled by law enforcement officials. Data are obtained at the time the crime is first reported to the police, or after the crime is first reported but before a full investigation, or after the crime has been investigated in order to be included in crime statistics.

For analysis to be made simple and easy we have made the index of all categories of violent crime through Principal Component Analysis (PCA) where each category of violent crime has been assigned due weights according to the variation in each category. The index has been named as Violent Crime Index (VCI) and this is the new contribution of this study in the existing empirical literature on crime as before this study no one has used the violent crime index in their studies, most of the studies just only have focused on one category of violent crime like intentional homicide as their outcome variable, but this study not only have taken five categories of violent crime but has made index of these categories instead of just simply adding them which creates biasedness because each category has different variations, like kidnapping and robbery are greater in numbers than the sexual violence which means kidnapping and robbery should be given more weight in the violent crime, so this cannot be possible in simple addition that's why it was found appropriate to made index in which each category has the weights according to their number of incidents.

#### **4.3.2 REGRESSORS OF THE MODEL**

The independent variables of this study are presented below along with their descriptions.

##### **GDP PER CAPITA (GDPPC):**

GDP stands for the market worth of all finished products and services produced inside a nation's borders during a given period of time, while GDP per capita, or average per-capita income for a nation's citizens, is computed by dividing a nation's GDP by its total population. GDP per capita is taken in current US dollars.

##### **UNEMPLOYMENT:**

According to Bureau of Labor Statistics (BLS) unemployment refers to a situation where a share of labor force is able and looking for a work for past four weeks but unable to find a work. Here

national estimate of total unemployment is taken which is defined as the percentage of labor force which is unemployed.

#### INFLATION:

Inflation refers to the phenomenon where there is increase in the general price level and it is calculated from consumer price index (CPI) which measures annually percentage change in the cost of living for a fixed basket of goods. Here inflation is taken as annual percentage change in consumer prices.

#### EDUCATIONAL EXPENDITURE AS A PERCENTAGE OF GDP (EDUEXPPOGDP):

It is taken as a percentage of GDP and relates to government spending on education.

#### URBANIZATION RATE (URBRATE):

Urbanization refers to the situation where people living in rural areas shift from rural to urban areas. Here the variable is taken as an annual percentage of urban population growth.

#### RULE OF LAW:

The "rule of law" describes how much people believe in and abide by the laws that govern society, particularly those that pertain to the quality of contract enforcement, property rights, the police, the courts, and the likelihood of crime and violence. This estimate gives a country's score on the overall indicator. It is an index in units of the standard normal distribution, and it falls roughly between -2.5 and 2.5.

#### CONTROL OF CORRUPTION (CCOR):

Control of Corruption looks at how much public power is perceived to be used for personal gain, including both small-scale and large-scale corruption as well as the "capture" of the state by elites and commercial interests. This assessment provides a country's total indicator score and is expressed as an index in units of the standard normal distribution, with a range of around -2.5 to 2.5.

#### POLITICAL STABILITY AND ABSENCE OF VIOLENCE/TERRORISM (PLSTAB):

Political Stability and Absence of Violence/Terrorism investigates opinions regarding the possibility of political instability and/or violence that is fueled by politics and includes terrorism.

This estimate gives a country's score on the overall indicator. It is an index in units of the standard normal distribution, and it falls roughly between -2.5 and 2.5

#### PERSONS CONVICTED (CONP):

This includes those who have been found guilty by any judicial authority qualified to issue a conviction under national criminal law, regardless of whether the verdict was later upheld. The measurement unit is count which refers to the total number of persons at a specific stage of criminal justice system. Regardless of the numbers of the crime they committed, each person is only counted once.

### 4.3.3 SUMMARY OF VARIABLES

*TABLE 1: SUMMARY OF VARIABLES*

Acronyms	Variables	Source	unit of measurement	Description
(VCI)	Violent Crime Index	UN-CTS/UNODC	Index	Each incident in the categories counted separately
GDPPC	GDP per capita	WDI	Current US Dollars	GDP/population
UNEMP	Unemployment rate	WDI	Percentage	Unemployment, total (% of total labor force) (national estimate)
INFL	Inflation rate	WDI	Consumer prices annual %	Inflation, consumer prices (annual %)
EDUEXPPOGDP	Educational expenditure as a % of GDP	WDI	% of GDP	Government expenditure on education, total (% of GDP)



URBRATE	Urbanization rate	WDI	Growth annual %	Urban population growth (annual %)
RLAW	Rule of law	World Governance indicator	Index	Standard normal distribution ranges approximately from (-2.5 to 2.5)
CCOR	Control of corruption	World Governance indicator	Index	Standard normal distribution ranges approximately from (-2.5 to 2.5)
PLSTAB	Political Stability	World Governance indicator	Index	Standard normal distribution ranges approximately from (-2.5 to 2.5)
CONP	Number of convicted persons	UN-CTS/UNODC	Count	Each convicted person is counted once

The definitions for the variables presented above are taken from the International Classification of Crime for Statistical Purposes (ICCS).

## 4.4 METHODOLOGY

### 4.4.1 MODEL SPECIFICATION

The functional form of the model used for this study is presented as follow:

$VCI$

$= F (LNGDPPC, UNEMP, INFL, EDUEXPPOGDP, URBRATE, RLAW, CCOR, PLSTAB, LNCONP) \dots eq(2)$

From the above presented functional form we can also write the econometric model to be estimated for this study, it is as follow:

$$\begin{aligned}
VCI_{it} = & \alpha_{it} + \beta_1 LNGDPPC_{it} + \beta_2 UNEMP_{it} + \beta_3 INFL_{it} + \beta_4 EDUEXPPOGDP_{it} \\
& + \beta_5 URBRATE_{it} + \beta_6 RLAW_{it} + \beta_7 CCOR_{it} + \beta_8 PLSTAB_{it} \\
& + \beta_9 LNCONP_{it} + \epsilon_{it}
\end{aligned}$$

In the above equation 2 econometric model is presented where VCI stands for violent crime index which is the dependent variable of this study, VCI is normalized between 0 and 1. Similarly LNGDPPC is the log of GDP per capita, as GDP per capita was in current US dollars so the log has been taken for interpretation of the coefficient in percentage as well as to make the variable in line with the other variables as all other variables are either index with limited range or in percentage. UNEMP, INFL, EDUEXPPOGDP, URBRATE are unemployment rate, inflation rate, educational expenditure as a percentage of GDP and urbanization rate respectively. RLAW, CCOR and PLSTAB are governance indexes whose range is from -2.5 to 2.5, in the end the number of convicted persons were in greater numbers hence the log has been taken to normalize the values and is represented by LNCONP. The it along with each variable shows that the variables are selected to be used for panel analysis as each variable varies both time wise as well as cross section wise.

#### 4.4.2 ESTIMATION METHOD

As this study has employed the use of panel data for analysis, the first feasible step to check the stationarity of the data, as this study has used short panel where the cross sectional units are greater (26) than the time period (18) hence no need to check stationarity in short time series. The next step is always to check the correlation between the variables of the study specially to check the correlation between the regressors to avoid multicollinearity problem.

Then the standard panel data estimation method of Fixed effects and Random effects is employed and then the choice between these two is selected through Hausman specification test. After applying fixed effects and random effects model, the study has used the Generalized Method of Moment (GMM) to tackle the problem of possible heteroscedasticity, Autocorrelation and specially endogeneity as the GMM have inbuilt solution to these data related problems. One more reason for using GMM is that this technique is specially recommended when there are few time periods and large cross sectional units, so because this study is based on short panel so it is more suitable to apply GMM, similarly it also tell us whether the model is stable or not, or in

other words it tell us the reliability of the regression results. For this the two step difference GMM is applied to get the results. The relevant details of the aforementioned estimation techniques are given below.

#### 4.4.3 FIXED EFFECTS

In fixed effects model each cross sectional unit or each entity has its own specific intercept which is fixed or there is no random variation in the intercept of each entity. It is presumed that these individual effects and the observed independent variables are correlated with each other. The fixed effects model could be understood through its general form as below:

$$Y_{it} = \alpha_i + \beta X_{it} + U_{it} \dots \dots eq(3)$$

Where in above model  $Y_{it}$  is the dependent variable which vary both entity wise as well as time wise,  $\alpha_i$  is the entity specific intercept which is fixed for each entity, we allow this fixed intercept to vary across entities  $i$  but not across time  $T$ . And  $\beta$  is a slope coefficient which is same for all entities and varies both time-wise as well as cross section wise.

When we have understood the idea of fixed effects in general form, we are now able to present the fixed effects model in the context of the model used in this study, it could be written as below:

$$\begin{aligned} VCI_{it} = & \alpha_i + \beta_1 LNGDPPC_{it} + \beta_2 UNEMP_{it} + \beta_3 INFL_{it} + \beta_4 EDUEXPPOGDP_{it} \\ & + \beta_5 URBRATE_{it} + \beta_6 RLAW_{it} + \beta_7 CCOR_{it} + \beta_8 PLSTAB_{it} \\ & + \beta_9 LNCONP_{it} + \varepsilon_{it} \dots \dots eq(4) \end{aligned}$$

Where  $\alpha_i$  in the above model is the country specific intercept which is fixed having no random variations, where  $i$  vary from 1 to 26, as the number of countries used in the study are 26. Moreover,  $VCI$  is the dependent variable and  $\beta$ 's from  $\beta_1$  to  $\beta_9$  are slope coefficient which varies in both dimensions  $i$  and  $T$ , and  $\varepsilon_{it}$  is the error of the model.

When using fixed effects, we assume that an individual trait may influence or bias the regressors or dependent variable, and we must take this into consideration. The correlation assumption between the independent variables and the entity's error term is justified by this. By using fixed effects model we can evaluate or assess the regressand's total response to the independent variables. By utilizing a fixed effects model, we may evaluate the variable by removing the

influence of those time-invariant factors. While controlling for the individual-specific effects the coefficients of the regressors in a fixed effects model represent the relationships within each individual or entity over time. Alternatively said, they capture the variation in the outcome variable that is specific to each individual or entity. The time-invariant elements are unique in nature and are not expected to be associated with the other individual traits, which is one of the key assumptions of the fixed effects model. Each cross-sectional unit is different therefore there should not be any correlation between the entity's intercept and its error term, if this correlation exists then the fixed effects model will not be appropriate.

The estimated coefficients of the fixed-effects models cannot suffer from the problem of omission of time-invariant characteristics because the fixed-effects model controls for all time-invariant factors between the individuals. [such as gender, race, religion, and other factors]

#### **4.4.4 RANDOM EFFECTS**

Just like the fixed effects model, in random effects model each entity has its own intercept which is different from another but contrary to fixed effects model here the entity's intercept is not fixed rather there are random variations in the intercept, that's why it is called random effects model. This can be understood easily from following equation of the random effect model:

$$Y_{it} = \alpha + \beta X_{it} + U_i + \varepsilon_{it} \dots \dots eq(5)$$

From the above equation we can see that  $\alpha$  is the entity's intercept which is not fixed rather there are random variations created by entity's specific error term ( $U_i$ ) which makes the intercept of the entity not fixed rather random. These random variations are supposed to be uncorrelated with the regressors included in the model. The ability to include time variant components in the model is one advantage of the random effects model; in contrast, these elements are absorbed by the intercept in the fixed effects model.

The random effects model in the context of the model used by this study, is written as below:

$$VCI_{it} = \alpha + \beta_1LNGDPPC_{it} + \beta_2UNEMP_{it} + \beta_3INFL_{it} + \beta_4EDUEXPPOGDP_{it} + \beta_5URBRATE_{it} + \beta_6RLAW_{it} + \beta_7CCOR_{it} + \beta_8PLSTAB_{it} + \beta_9LNCONP_{it} + U_i + \varepsilon_{it} \dots \dots \text{eq (6)}$$

From the above random effects model we can see that the  $\alpha$  which is a country specific intercept which is not fixed rather it is random, the random variations are created by country specific error  $U_i$  where  $i$  vary from 1 to 26.

#### **4.4.5 DECISION BETWEEN FIXED EFFECTS AND RANDOM EFFECTS MODEL**

Theoretically if we want to decide which model should be used for the estimation, it depends upon the selection of your sample. If the sample taken is random in nature then the random effects model is appropriate, for example if a researcher wants to test any hypothesis and he selects the countries to be included in the study randomly without any pre planned idea, then the appropriate model for this study will be random effects model, but if the researcher deliberately selects any region or group of countries i.e. Asian or European countries or any other specific sample then the appropriate model will be fixed effects model. As this study has consciously selected the sample of developing nations for the analysis then the appropriate model will be fixed effects.

The choice between random and fixed effects could also be done through Hausman specification test. This test basically tests the hypothesis whether the entity specific errors are correlated with the independent variables or not that is whether  $\text{corr}(U_i, X) = 0$  or not. The test's null hypothesis is that there is no link between entity-specific errors and the independent variables, in which case the random effects model should be used, else the fixed effects model is suitable.

#### **4.4.6 GENERALIZED METHODS OF MOMENTS (GMM)**

GMM is a panel data estimation technique. GMM is devised in such a way that it tackles the endogeneity problem. Contrary to instrumental variable technique which uses external instruments to tackle the endogeneity problem, GMM uses internal instruments i.e. the laggés of regressors at difference and at levels or at difference alone. Based on the use of instruments the GMM could be categorized into *System GMM* and *Difference GMM*.

The system and difference GMM estimators were primarily developed by Arellano and Bond (1991), Arellano and Bover (1995), and Holtz-Eakin, Newey, and Rosen (1988). for situations where there are small time period T and large cross sections N, also to tackle the problem of heteroscedasticity, Autocorrelation. and endogeneity.<sup>13</sup>

In both the system GMM and difference GMM methods, the endogeneity problem is tackled by taking the lags of the independent variables as their instruments. If the lags of the independent variables are used in differences as an instruments, then it will be difference GMM and it was developed by Arellano and Bond (1991). But if the lags of the independent variables are used in differences and levels as an instruments then it will be termed as System GMM and it was developed by Arellano and Bover (1995).<sup>14</sup>

In addition to the aforementioned distinction between system and difference GMM there is another distinction for these estimators which allow us to perform the analysis through two alternative ways, which is “*one step*” and “*two step*”. We can perform the analysis through one-step difference GMM or two step Difference GMM or one-step or twostep system GMM. This distinction into one-step and twostep is based on the use of weight matrix, one-step uses homoscedastic weight matrix and twostep uses heteroscedastic weight matrix. The existing stock of literature suggests that the twostep estimators are more efficient. Hence for this study we have used twostep estimator and because we have used the instruments the lags in differences so we have used difference GMM, which means this study has used twostep difference GMM for analysis.<sup>15</sup>

The consistency of the GMM estimators depends on whether the instruments used are valid or not or whether the model is over-identified or not. If the model is over-identified, then the estimates of GMM will not be consistent. Moreover, dynamic panel data presumes that there exists no serial correlation.<sup>16</sup>In order to check both whether there exists any serial correlation and whether the instruments are valid or not, two tests are used. The Arellano and Bond autocorrelation test, also known as AR (1) and AR (2), is a specification test that the GMM employs to determine whether the model exhibits autocorrelation. The null hypothesis for both

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<sup>13</sup> Roodman, D. (2009).

<sup>14</sup> Labra, R., & Torrecillas, C. (2018).

<sup>15</sup> Labra, R., & Torrecillas, C. (2018).

<sup>16</sup> Labra, R., & Torrecillas, C. (2018).

tests is that the model does not exhibit autocorrelation. Secondly, the study employed the Sarjan and Hansen tests for over-identifying restrictions to determine the validity of the instruments; the null hypothesis for these tests is that the instruments are exogenous/valid.<sup>17</sup> Hence for consistency of the GMM estimates the null hypothesis of both the Arellano and Bond tests and Sarjan and Hansen test should be accepted.

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<sup>17</sup> Labra, R., & Torrecillas, C. (2018).

## CHAPTER 05

### ESTIMATION AND FINDINGS

This chapter presents the estimation results of the econometric model through Fixed Effects Random effects and through GMM and results and findings are discussed in details. The model to be estimated is represented below:

$$VCI_{it} = \alpha_{it} + \beta_1 LNGDPPC_{it} + \beta_2 UNEMP_{it} + \beta_3 INFL_{it} + \beta_4 EDUEXPPOGDP_{it} + \beta_5 URBRATE_{it} + \beta_6 RLAW_{it} + \beta_7 CCOR_{it} + \beta_8 PLSTAB_{it} + \beta_9 LNCONP_{it} + \epsilon_{it} \dots \text{eq (7)}$$

First of we will check the correlation between the variables. It is done through the correlation matrix. The result of correlation matrix is presented below:

#### 5.1 CORRELATION MATRIX

TABLE 2: CORRELATION MATRIX

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) VCI	1.000									
(2) lngdppc	-0.186	1.000								
(3) unemp	-0.074	0.004	1.000							
(4) infl	0.190	-0.415	0.079	1.000						
(5) Eduexpogdp	-0.093	-0.054	0.071	0.014	1.000					
(6) urbrate	0.165	-0.467	-0.319	0.315	0.228	1.000				
(7) rlaw	0.007	0.727	0.078	-0.287	-0.049	-0.436	1.000			
(8) plstab	-0.304	0.595	0.086	-0.304	0.122	-0.424	0.667	1.000		
(9) ccor	-0.066	0.749	0.117	-0.305	0.066	-0.465	0.822	0.689	1.000	
(10) lncomp	0.447	0.089	-0.267	0.055	-0.149	0.327	0.139	-0.403	-0.011	1.000

The correlation between variables is checked in order to check the Multicollinearity problem among the independent variables if any. From the above table we can see that the correlation between the variables is not high enough to declare as a problem of Multicollinearity. Most of the researcher consider that if there is ninety percent 90% correlation among variables or the



value of correlation coefficient is 0.9 then there is a problem of multicollinearity<sup>18</sup>, and the variable must be dropped or transformed in such a way that the problem of multicollinearity shall be removed. As from above table no variable has correlation higher than 90% so no need to worry for the problem of multicollinearity.

## 5.2 SUMMARY STATISTICS

TABLE 3: SUMMARY STATISTICS

Variable	Obs	Mean	Std. Dev.	Min	Max
VCI	468	.047	.143	0	1
lngdppc	468	8.636	1.189	5.942	11.11
Unemp	468	6.581	3.869	.25	22.97
Infl	468	4.54	4.244	-2.1	27.96
Eduexppogdp	468	4.134	1.528	1.5	9.02
Urbrate	468	1.757	1.078	-1.475	5.322
Rlaw	468	-.011	.816	-1.383	1.87
Plstab	468	-.252	.924	-2.81	1.616
Ccor	468	-.022	.901	-1.329	2.301
lnconp	396	10.239	1.999	6.047	14.231

The provided summary statistics in above table 3 describe various variables within the dataset. The 'VCI' is the violent crime index contains 468 observations, with an average of approximately 0.047 and a relatively low standard deviation of around 0.143. Its values are within the range of 0 to 1. 'lngdppc', which is the logarithm of GDP per capita, has an average of 8.636 and a standard deviation of 1.189. The data spans from approximately 5.942 to 11.11. 'unemp', representing unemployment rates, has an average of 6.581% and a standard deviation of 3.869. The values range from 0.25% to 22.97%. 'infl', is indicative of inflation rate, having an average of 4.54% and a standard deviation of 4.244. The range extends from -2.1% to 27.96%. 'Eduexppogdp', is denoting education expenditure as a percentage of GDP, has an average of 4.134 with a standard deviation of 1.528. The values vary from 1.5 to 9.02. 'urbrate', reflecting urbanization rate, has an average of 1.757 and ranges from -1.475 to 5.322. 'rlaw' is representing rule of law which centers around -0.011, with a standard deviation of 0.816. It spans from -1.383 to 1.87. 'plstab', is representing political stability, which ranges from -2.81 to 1.616, with an

<sup>18</sup> Hall, S. G., & Asteriou, D. (2016). *Applied econometrics*. Palgrave MacMillan.

average of -0.252. 'ccor', is indicating control of corruption and ranges from -1.329 to 2.301, centered around -0.022. Lastly, 'lnconp', is the logarithm of number of convicted persons, having an average of 10.239 and ranges from 6.047 to 14.231, encompassing 396 observations.

## 5.2 RESULTS OF FIXED EFFECTS

TABLE 4: RESULTS OF FIXED EFFECTS

VCI	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lngdppc	.241***	.066	3.66	0	.112	.371	***
unemp	.007	.011	0.69	.493	-.014	.028	
infl	.004	.006	0.72	.472	-.007	.016	
Eduexppogdp	.087**	.036	2.44	.015	.017	.158	**
Urbrate	.006	.046	0.13	.893	-.084	.096	
Ymale	.009	.016	0.55	.58	-.023	.04	
Rlaw	-.215*	.12	-1.79	.075	-.451	.021	*
Plstab	-.189**	.073	-2.57	.011	-.333	-.044	**
Lnconp	-.101**	.046	-2.21	.028	-.192	-.011	**
Constant	-1.742*	.81	-2.15	.032	-3.334	-.15	**
Mean dependent var	-0.035		SD dependent var		1.018		
R-square overall	0.1276		Number of obs		396		
F-test	4.522		Prob > F		0.000		
Akaike crit. (AIC)	291.766		Bayesian crit. (BIC)		331.580		

\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .1$

As our dependent variable is an index and most of the independent variables are in percentage and if not we have taken the log of the variables to linearize their trend as well as to make the interpretation of the coefficients in percentage.

From the above table we can see that GDP per capita, educational expenditure as a percentage of GDP, political stability and number of convicted persons are significantly effecting the violent

crime index, all other variables are insignificantly associated with the crime, while rule of law is significant at 10% significance level.<sup>19</sup>

### **5.2.1 GDP PER CAPITA AND CRIME**

If we talk about GDP per capita then we can see from the table that it is positively and significantly effecting the violent crime index. More specifically a 1 percent increase in GDP per capita will increase the crime index by  $(0.24/100) = 0.0024$  index points. Which means a higher GDP per capita of the people of a residents of a country will induce more crimes. This result can be logically understood in such a way that a higher level of per capita income is providing an incentive for the offenders to commit crime as the benefits of doing crime is more when done to wealthy victims. A higher GDP per capita means the people of the society are rich and for offenders it is now more beneficial to do crime because in this case they have chance of getting more reward looting the rich and wealthy people and this is known as opportunity effect. A high income also causes one to spend more time outside and away from the house, which raises the possibility of becoming a victim of crime.

### **5.2.2 EDUCATION AND CRIME**

Just like the GDP per capita, educational expenditure is also positively and significantly effecting the crime index. Which means as the expenditure on education increases people commit more crime. More precisely, if the expenditure on education increases 1 percent of the GDP the crime index would increase by 0.08 points.<sup>20</sup> This result might appear strange because it is often understood that a higher level of education has a potential to reduce the crime rate as people become more literate and earn more in legal activities. This argument is true when understood in isolation but when we see that in an economy where educational level is increasing but the labor market has no capacity to absorb that educated class and have no jobs available in the market then this higher level of education can cause frustration, stress or strain which may lead individuals to indulge themselves into illegal activities because there are no legal opportunities

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<sup>19</sup> \* shows significance at 10%. \*\* shows significance at 5%. \*\*\* shows significance at 1%.

<sup>20</sup> *NOTE: Here by increase in index means that the measure related to the index is increasing i.e.*

*a higher value of crime index shows higher crime and vice versa.*

for them to earn their livelihood, similarly from another point of view we can say that as the level of education increases people become more smart and find ways to escape the law and involve in white color and sophisticated crimes. These are the possible explanations of the positive sign of the education on crime.

### **5.2.3 POLITICAL STABILITY AND CRIME**

On the other side if we see the political stability index from the above table, it is negatively and significantly associated with crime index. More specifically a 1-point increase in political stability index results in 0.18-point decrease in crime index. This result is according to theory as we have explained in chapter 3 that a country which is more politically stable will be having less crime because a stable government is likely to take actions against the crime and related social evils in the society then the politically unstable government who have less time to pay attention on these issues. A more stable government directly increases the cost of committing crime by making strict laws to control crime. When the offender compares the cost of committing crime in stable government's era than in an environment where there is less peace and security (politically unstable era), he found himself in danger in stable governments era and restrain himself from involving himself in illegal activities because now there is more probability that if he commits crime he will be caught and sent into the prison , which increases the opportunity cost of committing crime for offender and decreases his expected utility as a result, hence a rational offender will not enter into illegal activities and the result is reduced crime, and it is empirically approved from above results.

### **5.2.4 CONVICTED PERSONS AND CRIMES**

Similarly, number of convicted persons are also significantly and negatively related to the crime index. More specifically, a 1 percent increase in the number of convicted persons decreases the crime index by  $(0.10/100) = 0.001$  points. This result is also according to theory, as the number of convicted persons increases in a country, it is a sign of a strong judicial institution and high rate of law and order in a country, because the speed of recognition and conviction of the offenders is high. This is also directly increasing the cost of committing crime. Hence a rational offender is less likely to be involved in illegal activities when the rate of conviction is high, because in this case the opportunity cost of committing crime is high and the expected utility of the offender will

be decreases if involved in crime, so the result will be reduced crime, and this is empirically proved from above results.

### 5.2.5 SUMMARY OF FIXED EFFECTS RESULTS

From the above results we have come to know that only four variables out of 9 variables are significantly effecting the crime index, other variables are not reached the significance level. We have only interpreted the coefficients of the significant variables. If we see the R-square of the model, *then the 12% variation in violent crime index are explained by the regressors of the model, and this R-square is not low as we have used the panel data analysis in which R-square is generally low.* The overall model is significant because the F statistics is greater than 4. The hypothesis that we have made in the chapter one is also accepted as the governance indicators (political stability in this case) and deterrent variable (number of convicted persons) have reduced the crime rate and the Becker's hypothesis that the variables which increases the opportunity cost of doing crime has potential to reduce the crime rate is also accepted and empirically approved in this study.

## 5.3 RESULTS OF RANDOM EFFECTS

TABLE 5: RESULTS OF RANDOM EFFECTS

VCI	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lngdppc	.217	.064	3.38	.001	.091	.343	***
Unemp	.007	.01	0.72	.474	-.013	.028	
Infl	.005	.006	0.92	.359	-.006	.017	
Eduexppogdp	.077	.035	2.22	.026	.009	.146	**
Urbrate	.018	.045	0.40	.687	-.07	.107	
Ymale	.002	.016	0.16	.876	-.029	.034	
Rlaw	-.17	.111	-1.53	.127	-.387	.048	
Plstab	-.214	.073	-2.94	.003	-.356	-.071	***
Incomp	-.043	.042	-1.02	.309	-.125	.04	
Constant	-2.012	.81	-2.48	.013	-3.6	-.423	**
Mean dependent var	-0.035		SD dependent var		1.018		
Overall r-squared	0.028		Number of obs		396		
Chi-square	34.728		Prob > chi2		0.000		

R-squared within	0.096	R-squared between	0.071
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\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .1$

When compared to the results of the fixed effects model, the results of the random effects model are not significantly different. Except the significance of the deterrent variable “number of convicted persons” which is changed in random effects model (it has become insignificant), all other variables have same results with respect to sign as well as significance. The coefficients of the variables have slightly change but this change is very minor and negligible.

#### 5.4 HAUSMAN TEST

As we have discussed that theoretically the appropriate model for this study should be fixed effects because we have deliberately and specifically selected the sample of developing countries to be used for this study, means there is no randomness in selecting a sample. But from the Hausman test we could also confirm this.

*TABLE 6: HAUSMAN SPECIFICATION TEST*

	Coef.
Chi-square test value	26.315
P-value	.002

The Hausman test basically tests the null hypothesis that the difference in coefficients is not systematic or whether the entity’s error is correlated with regressors or not, the Null hypothesis of the Hausman is that they are not correlated, which means the random effects model is appropriate. The Hausman test findings also indicate that the fixed effects model is suitable, because the p-value is less than five percent and the null hypothesis that “Random effects model is appropriate” is rejected. So we have proved both theoretically as well as empirically that the suitable model is fixed effects model for this study.

## **5.5 GENERALIZED METHODS OF MOMENTS (GMM)**

### **5.5.1 WHY DIFFERENCE GMM**

As we have discussed earlier the panel used in this study is short panel, and for short panel it is recommend to use GMM estimators, as these estimators are specially designed for short panels. Moreover, we have applied the GMM because if there is any problem of Heteroscedasticity, Autocorrelation and Endogeneity, it will be removed as GMM estimators also tackle these problems. Moreover, GMM is applied in order to check the reliability of the results and stability of the model.

For this purpose, we have applied the two-step difference GMM. In which we have taken the internal instruments, the instruments are taken as “lags in differences” of the independent variables and we have taken two lags of the independent variables to be used as instrument. We have commanded Stata to use lag (2,2) structure for instrumental variables. All the independent variables are used as internal instrument for this regression. We have used “two-step” instead of “one-step” because it is more efficient and uses heteroscedastic weight matrix and the existing literature suggests that “two-step” is more efficient.

The main reason of using difference GMM instead of system GMM is the nature of panel used in this study, as the panel used in this study is short panel, hence we have used Difference GMM because it uses few instruments (difference GMM only uses instruments as lags in difference form) then the System GMM which uses instruments as lags in differences and at level, for which the instruments are not enough taking in consideration the time span of the variables. Moreover, Difference GMM in comparison to System GMM, is easier to implement. It may be necessary to choose and specify more complex instruments for System GMM because it requires estimate over both levels and first differences. One more benefit of using Difference GMM over System GMM is that System GMM may be sensitive to issues with weak instruments, particularly if there are few instruments available. In such circumstances, difference GMM might be more reliable. System GMM frequently calls for more rigorous instrument selection and validation, whereas Difference GMM may call for fewer instruments and less complexity involved setup. System GMM requires an additional presupposition that the differences used as instruments are uncorrelated with the error term, which in many circumstances may be

challenging to justify. The difference GMM estimator is an alternate since it does not need the additional mean-stationarity assumption of the system GMM estimator and has superior attributes than the system GMM estimator under high persistence.<sup>21</sup>

## 5.5.2 RESULTS OF TWO STEP DIFFERENCE GMM

TABLE 7: RESULTS OF TWO STEP DIFFERENCE GMM

VCI	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lngdppc	-.239	.049	-4.89	0	-.341	-.138	***
unemp	-.002	.003	-0.94	.357	-.008	.003	
infl	.008	.002	4.31	0	.004	.012	***
Eduexpogdp	.062	.02	3.10	.005	.02	.103	***
urbrate	.218	.037	5.85	0	.141	.295	***
rlaw	-.465	.075	-6.22	0	-.62	-.31	***
plstab	-.271	.032	-8.54	0	-.337	-.205	***
ccor	-.268	.072	-3.73	.001	-.417	-.119	***
lncomp	-.443	.068	-6.55	0	-.583	-.303	***
Mean dependent var	-0.027		SD dependent var		1.039		
Number of obs	374		F-test		.		

\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .1$

The results of two step difference GMM shows that except unemployment all the other variables are significantly<sup>22</sup> effecting the crime index. Out of which GDP per capita , governance indexes (including rule of law , political stability and control of corruption) and number of convicted persons are negatively associated with crime while inflation rate educational expenditure as a percentage of GDP and urbanization rate are positively associated with crime index.

More specifically, a 1-percent increase in GDP per capita decreases the crime by  $(0.23/100) = 0.0023$  index points. A 1-percent increase in inflation rate increases the crime by 0.008 index points. Similarly, if the expenditure on education increases 1 percent of the GDP the crime would increase by 0.06 index points. If urbanization rate increases by 1 percent the crime would increase by 0.21 index points. Similarly if the rule of law, political stability and control of

<sup>21</sup> Kripfganz, S., & Schwarz, C. (2019)

<sup>22</sup>All are significant at \*\*\* 1% level of significance.



corruption increases by 1 index point the crime will decrease by 0.46, 0.27 and 0.26 index points respectively. Lastly, if the number of convicted persons increases by 1 percent the crime index would decrease by  $(0.44/100) = 0.0044$  points.

### 5.5.3 ARELLANO AND BOND AUTOCORRELATION TEST

TABLE 8: ARELLANO AND BOND AUTOCORRELATION TEST

Arellano-Bond test for AR(1) in first differences: $z = 1.44$	$Pr > z = 0.149$
Arellano-Bond test for AR(2) in first differences: $z = 1.02$	$Pr > z = 0.310$

For consistency of the GMM estimators we have to check the Ar(1), AR (2) and Sarjan and Hansen tests. So from the above table we can see that both the tests of serial correlation AR(1) and AR(2)

are accepting the null hypothesis of “ No Autocorrelatio” as the p-value is far greater than 5 percent for both tests.

### 5.5.4 HANSEN TESTS FOR OVER IDENTIFYING RESTRICTIONS

TABLE 9: HANSEN TESTS FOR OVER IDENTIFYING RESTRICTIONS

Hansen test of overid. restrictions: $\chi^2(16) = 19.18$	$Prob > \chi^2 = 0.259$
(Robust, but weakened by many instruments.)	

We have not reported the results of sarjan test as it is used and appropriate for one step estimators rather we have used two step estimators in this study so for two step estimators it is recommended to use Hansen test.<sup>23</sup> The null hypothesis of the test is that “ Instruments are valid/exogenous”. By looking at the p-value for the Hansen we can conclude that the instruments used are valid and the model is not overidentified. Hence the estimates of the GMM are consistent in this case.

<sup>23</sup> Labra, R., & Torrecillas, C. (2018).

## 5.6 COMPARISON BETWEEN THE RESULTS OF FE AND GMM

TABLE 10: COMPARISON BETWEEN THE RESULTS OF FE AND GMM

VARIABLES	FIXED EFFECTS	GMM
LNGDPPC	1 percent increase in GDP per capita will <b>increase</b> the crime index by $(0.24/100) = 0.0024$ points.	1 percent increase in GDP per capita <b>decreases</b> the crime index by $(0.23/100) = 0.0023$ points.
UNEMP	INSIGNIFICANT <b>AND POSITIVE</b>	INSIGNIFICANT <b>AND NEGATIVE</b>
INFL	INSIGNIFICANT <b>AND POSITIVE</b>	1 percent increase in inflation rate <b>increases</b> the crime index by 0.008 points.
EDUEXPPOGDP	1 percent increase in eduexpogdp will <b>increase</b> crime index by 0.08 points.	if the expenditure on education increases 1 percent of the GDP the crime index would <b>increase</b> by 0.06 points
URB	INSIGNIFICANT <b>AND POSITIVE</b>	if urbanization rate increases by 1 percent the crime index would <b>increase</b> by 0.21 points.
RLAW	INSIGNIFICANT <b>AND NEGATIVE</b>	a 1 point increase in rule of law index results in 0.46 point <b>decrease</b> in crime index
PLSTAB	Crime index decreases by 0.18 points for every 1 point increase in the political stability index.	Crime index decreases by 0.27 points for every 1 point increase in the political stability index.
LNCONP	1 percent increase in the number of convicted persons <b>decreases</b> the crime index by $(0.10/100) = 0.001$ points.	if the number of convicted persons increases by 1 percent the crime index would <b>decrease</b> by $(0.44/100) = 0.0044$ points.

## 5.7 SUMMARY OF COMPARISON:

From the above table we can see that the significance of the variables in GMM has improved. In GMM estimation technique inflation rate, urbanization rate and rule of law become significant

previously they were insignificant in fixed effects model but the direction of the relation with the dependent variable remained the same, also the coefficients of the variables in both techniques does not differs much.

Only the major difference is that GDP per capita was previously positively associated with crime but in GMM its sign has become negative, which means an increase in GDP per capita of the people will decrease the crime rate, the justification for this result can be given as the Per capita income is a key indicator of a nation's economic condition; a high level of per capita income is indicative of a prosperous nation with plenty of legal employment possibilities and competitive wages for employees, which makes crime less attractive, in this case the opportunity cost for offenders of doing crime high because they can more from legal activities as there are high legal income opportunities available, therefore the results is overall less rate of crime.

Hence we can say that the results and model estimated in this study are reliable and stable because there is no big difference in the results of both the models, fundamentally they are both same, and it is a sign of the consistency of the results, which means the results are highly reliable and less biased which is one of the goal of analysis.

## CHAPTER 06

### CONCLUSION

This study has been carried out to empirically test the notion presented by Gary.S Becker in his seminal paper entitled “Crime and Punishment” (1968) that the offenders responds to incentives, and before entering into criminal activities they (offenders) act just like a rational consumer and compare the expected utility of entering into illegal activities and not entering. If the expected utility of doing crime is greater than they will decide to do crime. Becker said that if a society or a country wants to reduce the crime they should decrease the expected utility of doing crime through increasing the opportunity cost of doing crime, this could be done by increasing the probability of criminals to be caught and held sentenced, or by increasing the severity of the punishments or by increasing law and order and every method which has potential to increase the opportunity cost of doing crime for offenders. This hypothesis is tested for the sample of 26 developing countries by employing the panel data which ranges from 2003-2022. Four categories of independent variables are used in this study which belongs to economic, demographic, governance and deterrent variables. The model has been estimated through fixed effects and random effects, and the choice between random and fixed effects has been seen theoretically as well as through Hausman specification test and fixed effects model was found to be appropriate model. Moreover, the panel used in this study is short panel, and for short panel GMM is employed as it tackles the problem related to the data like Heteroscedasticity, Autocorrelation and endogeneity, additionally it is also used to examine the model's stability and to check the consistency of the results. And in the end the results of both the GMM and fixed effects are compared. The overall results of both the models are same except some minor differences, but additionally the number of the variables which are significant are more in GMM than in fixed effects model. The results have suggested that the governance and deterrent variables are reducing the crime significantly, which means the Hypothesis of the Becker is empirically accepted because a good governance and a high deterrent both have potential to increase the opportunity cost of doing crime hence decreasing the expected utility from illegal activities which culminates in lower crime rate. Moreover, inflation and educational expenditure and

urbanization rate was found to be positively associated with crime in both fixed effects and GMM while unemployment rate and GDP per capita has asymmetric results.

## **CHAPTER 07**

### **POLICY RECOMMENDATIONS**

On the basis of the results of this study, some policies are recommended for the control of the criminal activities. As there is a positive association between urbanization rate and crime it is recommended that the government should concentrate on implementing crime prevention programs in urban areas. These programs might include community policing initiatives, greater street lighting, and enhanced monitoring systems to make public spaces safer and discourage criminal activity. Similarly, the government should plan the cities and provide the jobs accordingly, because an increasing population with no or less availability of jobs will add to these type of social evils. It's critical to address inflation since greater inflation rates have the potential to increase crime rates and cause economic instability. Government should devise such monetary and fiscal policies which aim to control inflationary environment in the country, because a high inflation distorts the purchasing power of the consumers which has a potential to drag the individuals towards criminal activities due to financial distress.

On the other hand, the government should focus on the policies that increase literacy rate and educational level in the country, along with this the government should provide skills to the students who after their education can use these skills to earn, similarly along with this the focus of the government should be to absorb this educated population in the labor market otherwise with high unemployment a rising education could a source of leading towards crime due to financial strain. Policymakers can give people alternatives to criminal activities by expanding access to high-quality education, vocational training, and employment opportunities.

Government should ensure that the governance structure should be strong enough which ensures the efficient law enforcement, judicial processes, and public service delivery to deter illegal activities. Along with this government should ensures the enhancement in the deterrent measures which may include law enforcement, increase in conviction rate, severity of punishment and penalties, increasing the probability of being caught and held sentenced and swiftness of justice to discourage potential offenders. Moreover, in order to increase public trust and decrease opportunities for criminal activity, government should promote accountability, transparency in

affairs, and anti-corruption efforts inside the government institutions. Along with this government should utilize technical breakthroughs in criminal investigation, digital tracking, and surveillance to improve deterrent and law enforcement efficiency. All these will add to the cost of doing crime and the result will be the reduced crime rate.

## REFERENCES

- Wolpin, K. I. (1978). An economic analysis of crime and punishment in England and Wales, 1894-1967. *Journal of political Economy*, 86(5), 815-840.
- Becker, G. S. (1968). Crime and punishment: An economic approach. *Journal of political economy*, 76(2), 169-217.
- Aboya, Y., Ansari, N., Chishty, B. A., & Hussain, A. (2022). Comparative Study on The Socioeconomic Determinants of Crime in Pakistan and India: An Econometric Analysis. *Reviews of Management Sciences*, 4(1), 211-224.
- Stevenson, A. (Ed.). (2010). *Oxford dictionary of English*. Oxford University Press, USA.
- Hamid, B. A., Habibullah, M. S., & Noor, Z. M. (2013). Crime and its socio-macroeconomics determinants: a panel-error-correction cointegration analysis. *Jurnal Ekonomi Malaysia*, 47(2), 13-24.
- 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.
- 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.
- Cerulli, G., Ventura, M., & Baum, C. F. (2018). The economic determinants of crime: an approach through responsiveness scores. *Report, Department of Economics, Boston College*.
- Lin, M. J. (2007). Does democracy increase crime? The evidence from international data. *Journal of Comparative Economics*, 35(3), 467-483.
- Adeyemi, R. A., Mayaki, J., Zewotir, T. T., & Ramroop, S. (2021). Demography and Crime: A Spatial analysis of geographical patterns and risk factors of Crimes in Nigeria. *Spatial Statistics*, 41, 100485.
- Britto, D. G., Pinotti, P., & Sampaio, B. (2022). The effect of job loss and unemployment insurance on crime in Brazil. *Econometrica*, 90(4), 1393-1423.



- Shafiq, N. B., & Ali, D. H. A. (2022). The economic determinants of crime rate in 7 selected countries: A panel data analysis approach. *Asian Journal of Empirical Research*, 12(1), 44-53.
- Menon, C., & de Blasio, G. (2013). Down and Out in Italian towns: measuring the impact of economic downturns on crime.
- Cherry, T. L., & List, J. A. (2002). Aggregation bias in the economic model of crime. *Economics Letters*, 75(1), 81-86.
- Wang, C., Liu, X., Yan, Z., & Zhao, Y. (2022). Higher education expansion and crime: New evidence from China. *China Economic Review*, 74, 101812.
- Ehrlich, I. (1996). Crime, punishment, and the market for offenses. *Journal of economic perspectives*, 10(1), 43-67.
- Habibullah, M. S., H. Din, B., & Abdul Hamid, B. (2016). Good governance and crime rates in Malaysia. *International Journal of Social Economics*, 43(3), 308-320.
- De Blasio, G., Maggio, G., & Menon, C. (2016). Down and out in Italian towns: measuring the impact of economic downturns on crime. *Economics Letters*, 146, 99-102.
- Kripfganz, S. (2019, September). Generalized method of moments estimation of linear dynamic panel data models. In *London stata conference* (Vol. 17).
- Baharom, A. H., & Habibullah, M. S. (2008). Is crime cointegrated with income and unemployment? A panel data analysis on selected European countries.
- Hazra, D., & Cui, Z. (2018). Macroeconomic determinants of crime: Evidence from India. *Journal of Quantitative Economics*, 16, 187-198.
- Gull, R. H., Perveen, K., & Basit, A. B. (2021). Macroeconomic Determinants of Crime in South Asian Countries: A Panel Data Approach. *South Asian Studies*, 2(35).
- Jalil, H. H., & Iqbal, M. M. (2010). Urbanisation and crime: A case study of Pakistan. *The Pakistan Development Review*, 741-755.
- Buonanno, P. (2003). The socioeconomic determinants of crime. A review of the literature. *Working Paper Dipartimento di Economia Politica, Università di Milano Bicocca*; 63.

- Entorf, H., & Spengler, H. (2000). Socioeconomic and demographic factors of crime in Germany: Evidence from panel data of the German states. *International review of law and economics*, 20(1), 75-106.
- Freeman, R. B. (1999). The economics of crime. *Handbook of labor economics*, 3, 3529-3571.
- Levitt, S. D. (1995). Using electoral cycles in police hiring to estimate the effect of police on crime.
- Fleisher, B. M. (1963). The effect of unemployment on juvenile delinquency. *Journal of Political Economy*, 71(6), 543-555.
- Ajimotokin, S., Haskins, A., & Wade, Z. (2015). The effects of unemployment on crime rates in the US. *B. Sc project, Georgia Institute of Technology*.
- Hall, S. G., & Asteriou, D. (2016). *Applied econometrics*. Palgrave MacMillan
- Freeman, R. B. (1996). Why do so many young American men commit crimes and what might we do about it? *Journal of Economic perspectives*, 10(1), 25-42.
- Mankiw, N. G. (2021). *Principles of Microeconomics 9e*. Cengage Learning Asia Pte Limited.
- Gillani, S. Y. M., Rehman, H. U., & Gill, A. R. (2009). Unemployment, poverty, inflation and crime nexus: Cointegration and causality analysis of Pakistan. *Pakistan Economic and Social Review*, 79-98.
- Cantor, D., & Land, K. C. (1985). Unemployment and crime rates in the post-World War II United States: A theoretical and empirical analysis. *American sociological review*, 317-332.
- Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. *The stata journal*, 9(1), 86-136.
- Labra, R., & Torrecillas, C. (2018). Estimating dynamic Panel data. A practical approach to perform long panels. *Revista Colombiana de Estadística*, 41(1), 31-52.