

RESEARCH ARTICLE



Dynamics of crime rate, income inequality and urbanization across regimes in Pakistan

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Abstract

Objectives: This study concentrated on the association between crime rate, income-inequality and urbanization for the economy of Pakistan over the period 1973-2017. Interestingly, the study in hand has been discussed two regimes, i.e. democratic and dictatorship, that are almost equally prevalent in the economy. **Methods :** The study used the ARDL Bound testing approach to examine crime patterns that may be involved in or caused by income inequality and urbanization in Pakistan. Augmented Dickey-Fuller and unit root tests were used to check the stationarity of the data. The series was found to be stationary at mixed levels. This research work makes a number of contributions. First, it discusses how the income inequality and the urbanization are impacting the rate of crime in the economy. Second, the analysis in hand describes the crime rate in various political regimes and analyzes its effect on Pakistan's economy. **Findings:** The findings of the descriptive study demonstrate that in democracy, people are more offenders than dictatorships. Whereas, the Bound test result identified a significant relationship both in the short and long run. The result explored that income inequality and urbanization coefficients are strongly positive, which means that the widening income inequalities and rise in urban growth have increased crime rate in the country over the study period. **Applications:** The government might to make effective initiatives to decrease income inequalities and also to dissuade the factor of urbanization, so that the rate of crime in the country can decline.

Keywords: Crime rate; income inequality; political regimes; urbanization; Pakistan

1 Introduction

Pakistan has faced very crucial situations after the 9/11 incident and the American invasion of Afghanistan. Terrorism was at its peak, people were reluctant to come out of their homes. It was a big challenge to keep people safe and clear the country from the terrorists. Pakistan has decided to take an active part in the war against terrorism in order to sustain economic growth and better law and order in the region. Though

combating terrorism Pakistan is incurring direct as well as indirect costs, rising from \$2,669 billion in 2001-02 to \$13.6 billion in 2009-10, with a projected cost of \$17.8 billion in 2010-11. This unpredictable condition lowered the country's expenditure ratio to GDP. Pakistan needs to solve the issue judiciously and remove all the obstacles to growth⁽¹⁾.

Crime and government regimes in Pakistan

Democracy or a democratic system is a political system in which the state is under the direct or representative rule of its people. Under democracy the people rule the government, either directly or by elected representatives. In contrast, dictatorships are treated as non-democracies of the residual category. Any offense that is reported by the government or the legislative body of the state or the law of the nation is recognized as a crime. It varies from country to country, and intermittently. It is the government's responsibility to stop such activities that are harmful to society, and punish all wrongdoers. Every country defines series of crimes (forbidden and unlawful conduct) and punishes all those who violate them⁽²⁾.

Conversely, the democratic regime is the regime that scores more than or equal to 6 on the (-10 to 10) Polity Index (PI) while the comparatively dictatorial regime is the regime that scores less than 6 on the PI over the specific time. Pakistan today is the world's fifth largest democratic state on the globe. Pakistan is perceived to be the world's largest Islamic democracy in the Muslim world as distinct from the modern liberal democracy of the modern Turkish Republic⁽³⁾.

Democracy, known as *jamhooariat*, is one of the philosophies and structures from which Pakistan emerged as a separate state in 1947, by the nation's founder, Quaid-e-Azam Muhammad Ali Jinnah. Pakistan's political system consists of two eras: democracy, and dictatorship. It is not clear from the very beginning what form of government is better for Pakistan's economic growth, where less crime will occur. Many scholars are for democracy and others are for dictatorship. In Pakistan the creation of a true democracy is a very difficult challenge. Given the fact that Pakistan flourished in the soil of democracy, the plant of democracy has not yet borne fruit to make the country prosperous, unfortunately. During the democratic era, Pakistan experienced a phenomenal increase in crimes during the democratic eras. Criminals in most democratic times were in a good position and broke state law because of the protections of the political elite. Contrasted with the autocratic one, when crime figures of the democratic period are compared, the autocratic regimes have shown failure of crimes in the form of gang rape, ransom kidnapping and bank robbery. Crime remains a serious threat across developing nations and since its inception; Pakistan's economy has had nearly identical experiences. Crime networks and terrorist groups mostly target local businessmen and high-flying families to extract ransom for profit or finance their activities. Affected families frequently bargain and offer ransoms without any police warning or connection. Gangs involved in kidnappings are not usually arrested or brought to justice. Nowadays, it has been more organized and a number of offenders have obtained funding from high-ranking officials.

The on-hand crime figures in Pakistan show that there is a immediate increase in the overtime crime rate. It also points out that the country is not flourishing in the areas of economic, health, law and order, social, educational, moral and spiritual practice. Pakistan's government is taking different steps to have power over lawbreaking, and has succeeded in controlling crimes to some existing ones. There is no particular root-cause of crime but is the result of Pakistan's various social, cultural, economic, demographic, and family conditions. It is very important to consider the causes, meaning and origins of crime in order to put off crime. Rising rates of crime pose a challenge for new democratic governments. Failure to act fosters the country's development of vigilante groups and lawlessness. In fact, crime rates in a nation that embraces modern democracy and is surrounded by countries with autocratic governments are likely to be higher due to the disparity in law enforcement between the two forms of regimes. Consequently, income inequality increases that further drive crimes in society and can push the effected segment of society into violating country laws. On the other hand, cities have witnessed considerable unrest in recent years. Anger over high prices for housing and gentrification led to protests while, with less skilled labor the urban wage premium seems to have disappeared. Cities in the developing world are growing more rapidly, but the downsides of density are acute in those places⁽⁴⁾.

Pakistan's economy had gone through volatile movements of more crime and increasing income disparities at both the regional and sub-national levels in line with the rest of the developing nations. Nonetheless, the extent of the crime rate has usually been calculated by a mixture of socio economic elements for instance; inflation, poverty level, income inequality and people's tendency towards urbanization and unemployment⁽⁵⁾. In Pakistan's history, though, the prevalence of crime and inequality has been noted as a common factor; but their magnitude may vary across different regimes, i.e. democracy and dictatorship. Considerable rise in the atrocious crime rate across the country gives rise to a variety of questions for the prior couple of democratic regimes.

The widening crime rate and income inequality statistics across the developing countries have given rise to a variety of questions. At the same time, the government's role of nature has been universally recognized. Addressing the importance of the problem, the study in hand addresses primarily the set of objectives i.e. a). To identify the crime rate across Pakistani regimes. b) To observe the dynamics of income inequality in Pakistan over time.

The hand-held study seeks to identify and examine the economic, socio-economic and demographic factors responsible for the promotion of crime in Pakistan. The researcher seeks to empirically investigate the association between crime rate, inequality and urbanization, and to propose policy measures to assist in the control and prevention of crime in Pakistan. This research also builds on the Misery Index and the Crime function to determine their responsible factors.

Objectives of the study

This paper investigates whether and how income inequality may affect the crime rate of Pakistan? This paper also revisits the very general question: does urbanization increase crime rate? This paper also aims;

1. To analyze the association between rate of crime and income inequality in Pakistan.
2. To check the relationship between crime rate and urbanization in Pakistan.
3. To devise appropriate policy implications in the light of empirical results.

2 Literature review

It is imperative that the literature review of the relevant area is rooted in the issue while referring to the previous available literature on the subject. It is necessary to make the study hand-in-hand in a more authentic, accurate and well-recognized way. In this study, the researcher is trying to help make the paper more reliable on behalf of the existing literature. On-hand literature provides theoretical background to the study in order to accommodate new ideas in an appropriate manner. However, there is large-number of studies across the globe on the issue in hand, and some of the recent literature has been scanned as follows:

Numerous prior studies have identified a number of societal, political and economic factors accountable for crime in advanced and less developed countries (see, for instance, ⁽⁶⁾ and ⁽⁷⁾). Meanwhile, in ⁽⁸⁾ found a positive correlation between poverty and poor organization quality in Pakistan. In ^(9,10) proposed a crime-unemployment proposal that required the exit of a positive relationship between unemployment and crime. In ⁽¹¹⁾ determined a positive relation-ship between inflation and the rate of crime. ^(12,13) examined and establish a positive association between income-inequality and crimes in Iran and Pakistan respectively.

In ⁽¹⁴⁾ empirically examined the socioeconomic determinants of crimes like Per Capita Income, Income Inequality, Population and Black Population in the urban areas of United States by using well known regression technique OLS. The researcher concluded that income-inequality, per capita income, and existence of black population, high rate of unemployment and expenditures mad on police have significant effect in the crimes determination of in urban areas.

In ⁽¹⁵⁾ analyzed the role of income inevitability and economic growth in poverty incidence across 124 countries in 2010. The results of the study showed that there are clear ties between income inevitability, economic development and poverty to support the GIP triangle that forms the PPG mechanism. The study emphasized the need for stronger policies to ensure social safety nets and an equal distribution of income in order to make the development process more pro-poor.

While, in ⁽¹⁶⁾ argued that relative poverty is a good indicator of increasing national social costs that require successful economic policies to reduce crime rates. The study analyzed the social cost of poverty in terms of rising suicide rates, crime rates and overall violent rates in the United States and 15 European countries between 1993 and 2000. The findings indicate that suicides, violence and violent rates are rising dramatically as a result of the country-wide rise in relative poverty and infant mortality.

In ⁽¹⁷⁾ studied social inequality and crimes in the Indian economy using data set for 2005 to 2016. The results of the study explain that government action is important to achieve economic sustainability through the successful role of social sustainability by reducing various types of violence or crime. The study also highlighted the need for socio-economic infrastructure development that would help to provide safety nets for the poor in order to reduce crime rates in a region.

In ⁽¹⁸⁾ studied the relationship between poverty, inequality, growth and crime rates in a panel of 16 diverse countries. The analysis used the Generalized of Method Moment (GMM) estimator panel for robust inferences over the 1990-2014 timeframe. The findings of the study explained that there is no or flat correlation between per capita income and the rate of crime. But the U-shaped relationship between income inequality and economic development in a panel of selected countries is obviously reversed. At the same time, income inequality and unemployment rates raise the crime rate, while trade openness helps in selected countries to reduce the crime rate. The results of the study showed that income inequality and unemployment are the key predictors that have a devastating effect on the rise in crime rates in the selected panel of diverse countries.

In ⁽¹⁹⁾ has studied the impact of income inequality on crime in the United States. The research used panel data for the period 1960-2015. On the other hand, this study solves this problem by applying a well-known technique used in macro-economic structural vector ato-regressions (SVAR). The findings of the SVAR panel show that systemic shocks to inequality have increased

both violent and property crime in the U.S. over the study period. While the analysis of variance decomposition used in the study indicates that inequality has no explanatory power to crime movements.

In⁽²⁰⁾ examined the effect of inequality on the rate of crime in China. In their analysis, three separate proxies of disparities were used, namely the Gini coefficient, the income inequality between rural and urban residents and the Theil index. Their findings explain that all three distinct indicators of inequality are closely related to crime rates. While⁽²¹⁾ investigated that intra provincial regional disparities are positively associated with regional crime rates in China. However, education is found to be negatively associated with the rate of crime.

In⁽²²⁾ analyzed the determining factors of criminality rates in Brazil. The researcher concluded that income inequality has an encouraging and momentous role in crime rate determination and also income inequality Granger Cause crime rate. The authors propose that unemployment rate and urbanization are positively associated with crime rate.

In⁽²³⁾ studied the impact of the government type on the misery index in Iran for the period 1974 to 2011. They concluded that bad governance and maladministration are pushing the economy towards a high misery index, along with the lowest rate of economic growth. In their study, they found that economic growth had a negative relationship with the index of misery and a significant association between the governance type and the index of misery. Their study shows that bad governance raises the index of misery that can increase crimes in society.

In⁽²⁴⁾ examined that the assessment of criminal agents in the Economic Models of Criminal Behavior is being studied from a partial-equilibrium perspective. These models have not recognized that the possible act of punishment depends on the magnitude of the crime that is taking place. Similarly,⁽²⁵⁾ explained that, just as the total number of crimes increases, the police's ingenuity to prevent them from becoming anxious, jails can be congested and courts crowded. There are therefore fewer criminals apprehended and convicted. In addition, when prisons turn into unreasonably overcrowded, then the prison authority has a small choice but to let the criminals go as soon as possible. Consequently, when an individual commits more crimes, there is a possibility that further criminals will be caught, convicted and jailed.

In⁽²⁶⁾ have indicated that the higher income inequality gap is likely to lead to someone handing over crime. In order to meet some intimate social norms, lower income individuals may engage in a variety of criminal and harsh activities. It intends to increase crime value as income inequality step-ups. Similarly, in the period 1990 to 2011,⁽²⁷⁾ explored the affiliation between criminal activities and economic situations in Pakistan. The researcher used Johanson's co-integration technique to investigate the long-term relationship between rising inflation, rising income inequality and an increase in female labor. The results of the study show that the increase in income inequality; women's employment and inflation rates have positive and imperative consequences for crime.

In⁽²⁸⁾ indicated that income-inequality is likely to be the cause of violent crime. This is because greater income inequality intends a concentration of wealth in the hands of a few peoples that clears the way for crimes against criminals by engaging in violent crime. The extreme poverty of the poor has been practiced in order to cause aggravation and annoyance, which has led to violent crime. According to⁽²⁹⁾ income inequality induces higher rates of both murder and robbery even after the country works to control it at any cost.

In⁽³⁰⁾ examines the association between income inequality and property crime rates in Iran using data from 1984-2008. The Unrestricted Error Correction Model (UECM) was used to examine co-integration between the study variables. The results confirm the robust long-term relationship between income inequality and property crime in Iran. Researchers also identified by-directional causal relationships between income-inequality and property crime in their study.

In⁽³¹⁾ looked at the problem of crime rate, Barrow and Okun's misery indices and quasi-democracy for the era 1973-2013 by utilizing time series data for Pakistan. The researcher used the ARDL Bound testing technique to observe the association between the rate of crime and the incidences of misery. The researcher also used the Passaran model to perform the crime function. The investigator made a decade wise contrast to the crime rate and found that the crime rate remained higher for democratic regimes than the country's dictatorship. The study explored the long-term association between the crime rate and the poverty index in Pakistan. They also identified that the worsening situation is shifting from the poverty index to crime and suggested the eradication of socio-economic factors in order to mitigate the extent of crime in Pakistan. The average level of life-threatening crimes in Pakistan between 1973 and 2013 has increased. Violent crime in the form of burglary is the most frequent, while theft is below average in 2013. The study also explored that there is a long-term association between the crime rate and the misery index in Pakistan. They also identified that the worsening situation is shifting from the misery index to crime and suggested the eradication of socio-economic factors in order to mitigate the extent of crime in the country. The results also show that people were well off in a quasi-dictatorship compared to the quasi-democratic period in Pakistan.

In⁽³²⁾ analyzed the relationship between the incidence of terrorism, poverty and economic development in Pakistan. The research used time series co-integration techniques, including unit root, co-integration, vigorous least square regression, enhanced causality and impulse response function for robust inferences over the period 1980-2015. The study also points out

that it is imperative to look at the socio-economic problems of the country and to tackle the evils that involve unified and sustained policies. The results showed that unemployment and population growth also reduce the country's economic growth, while better education reduces the number of attacks in the country. On the other hand, the results of the study showed no positive correlation between unemployment and the incidence of terrorism in a region. The study concludes that Pakistan's government should provide better education and job opportunities in a country in order to monitor terrorist activities.

In⁽³³⁾ studied the political, societal and economic determinants of crime in Pakistan from 1984 to 2013. The study used annual data by applying the ARDL mechanism for evaluation purposes. The results of the study show that social, political and economic factors have a significant impact on crime in Pakistan. The result of the study affirmed the existence of a pessimistic relationship between government stability and crimes in Pakistan. Moreover, bad governance is also seen as a crime facilitator and is responsible for stagnant economic growth in Pakistan. The study also confirmed that poor governance exacerbates income inequality, misery and encourages criminal behavior. More crimes have been identified in Pakistan, where poor governance and weak political leadership are experienced.

In⁽³⁴⁾ indicated that lack of political balance or imbalance negatively affects economic-growth. Researchers argue that political stability provides a favorable atmosphere for trade growth, job creation and more urbanization that boosts demand and boosts economic growth. Similarly,⁽³⁵⁾ explained that the continued resurgence of Islam could potentially make it possible for material progress to be attached to moral reinforcement, integrity and social concordance, which are essential to the provision of the necessary social and ethical possessions for continued development. On the basis of the above-mentioned revelations and statements, it can be argued that Islam is a religious belief that increases peace and social welfare and promotes political stability in the country.

In⁽³⁶⁾ examined the political stability of the various regimes, the imbalances in communities and the growth of sub-Saharan African countries. The study fined the negative impact of political instability on growth.⁽³⁷⁾ also explained that political instability had a negative impact on economic growth, while growth had a positive impact on political stability. While,⁽³⁸⁾ stated that political stability is based on the government's legitimate use of corporal force. Any government may fail to meet basic needs such as security, food, health, education and shelter. Governments that fail to retain the power to impose laws are linked to the concept of failed states. In⁽³⁹⁾ furthermore found the negative impact of political instability on key macro-economic variables, for example GDP, inflation and private investment. Similarly,⁽⁴⁰⁾ also found that the impact of political conditions on Bangladesh's economic performance had been studied. The study found that political stability had a positive and significant impact on the country's economic growth.

3 Methodology

This part of the study gives an idea of the implementation of the research methodology to materialize the key objectives of the study. An analysis based on nationwide secondary time series data for Pakistan's economy. For the period from 1973 to 2017, the annual data on income inequality and urbanization with crime rates are used. The study in hand contains Pakistan's national economic statistics.

Data collection

The hand-held analysis used data from the secondary time series. Data on urbanization and income inequality were obtained from the International Financial Statistics (IFS) and the Federal Bureau of Statistics (FBS), Statistical Division, Islamabad for research purposes. At the other hand, crime statistics was extracted from the Bureau of Police Research and Development (BPRD) Ministry of the Interior, Islamabad, Pakistan. For this analysis, the dependent variable is the rate of crime while income inequality and urbanization are used as independent variables. Though, the dummy is used for democracy in Pakistan for the period from 1973 to 2017.

Model specification

In the present analysis, the dynamics of income inequality, urbanization and crime rates in various political regimes can be analyzed using two econometric models known as the Crime Model. The model proposes to show whether, rising income inequality and urbanization have an effect on the rate of crime in Pakistan. Similarly, the models also show that almost any democracy encourages more crimes than dictatorships.

In view of the above-mentioned debate, and taking into account^{(41) (42) (43) (44)} we are building a model wherein the following determining factor of crimes are used.

$$\text{Crime} = f(\text{GovReg}, \text{inequality}, \text{Urbanization})$$

The model can be written as:

$$CR = \beta_0 + \Upsilon_1 \text{Gov Reg} + Y_2 \text{II} + Y_3 \text{URBN} + \varepsilon_i \tag{1}$$

CR is the crime rate (per 10,000 people), GovReg is the government regime, II is the income inequality (GINI index) and URBN is urbanization (Growth rate of urban population). While ε_i is the error term that presumed to be independently and normally distributed with zero (0) mean and constant variance.

The study used Gini index for the purpose of income inequality. It is most favored index used to measure inequality (called after Gini who invented it in 1912). The Gini index (G) is the most common measured used to calculate inequality (called after the 1912 inventor Gini). Therefore the Gini coefficient ranks between the Lorenz curve and the diagonal by area and is a direct indicator of income disparities for each pair of incomes. Symbolically, if y is income, m is mean or average income, n is number of men, and $i=1, 2, n, ,$ then,

$$\sum_{i=1}^n Y_i = nm \tag{2}$$

$$G = 1/2n^2 m \sum_{i=1}^j \sum_{j=2}^n (Y_i - Y_j) \tag{3}$$

Where $G = 0$, each receives the same income; where $G = 1$, only one person gets all. Apparently, the real G value for most countries lies between 0 and 1. Note that G also shows the portion of income from different population groups⁽⁴⁵⁾.

It is quite important to test the existence of a unite root or the problem of non-stationarity before any time series data is processed. Data from unit root results in spurious regression that does not provide reliable information about the problem⁽⁴⁶⁾ In the presence of a unite root, we often consider high R-square value and large t-ratios, although the leading variables will be entirely unrelated. As an outcome, the result in hand would imply the presence of a substantive relationship between the variables, but this would not necessarily be the case. It is very necessary to test and avoid the problem of the unite root if it is found in any time series data. For the purpose of unit root problem, the researcher uses the following equation with the lagged difference term.⁽⁴⁷⁾

$$\Delta Y_t = \beta_1 + \beta_{2t} + \alpha Y_{t-1} + \sigma \sum \Delta Y_{t-i} + \mu t \tag{4}$$

ARDL mechanism

The present research uses the ARDL method to examine the relationship between dependent and independent variables proposed by⁽⁴⁸⁾ for a co-integration study and short-run Error-Correction analysis. In the present analysis, the ARDL Bound test corroborates the presence of inimitable long run relationship between variables, specifically crime, democracy, inequality and urbanization. The hypothesis of no long-run relationship is thus rejected in favor of the alternative hypothesis that there is a long run association between dependent and explanatory variables. The presence of a long-run relationship therefore suggests that the researcher will apply the ARDL methodology and interpret the long-term parameters derived from this estimate. Similar methods have been used by numerous researchers^{(49) (50) (51)}. Hence, the general form of the model is as follows:

$$dCR_t = \beta_0 + v_1 CR_{t-1} + v_2 \text{GovReg}_{t-1} + v_3 \text{II}_{t-1} + v_4 \text{URBN}_{t-1} + \sum_{i=1}^p \Upsilon_{1i} dCR_{t-i} + \sum_{i=0}^q Y_{2t-d} dI \sum_{i=0}^r \Upsilon_{3i} \text{URBN} + \varepsilon_i \tag{5}$$

Whereas, B_0 is constant, CR is the rat of crime (per 10,000 individuals), GovReg is government regimes (used dummy, 1 for democracy and 0 for dictatorship), II is income inequality (GINI index) and URBN is Urbanization (Growth rate of urban population). While p denotes optimum lag length and v_i, Υ_i are parameters of the variables in the given model.

The analysis in question assumes that there is no serial correlation, there is no hetroskedasticity and that the model is normally distributed. Various diagnostic tests such as Breusch-Goldfrey Serial Correlation LM Test, Hetroskedasticity Test, Ramsey's Reset Test and Jarque-Bera Test (Normality Test) are employed to fulfill the above assumptions.

Granger causality Test

Through the regression test, the dependency of a variable on other variable(s) does not necessarily mean causation⁽⁵²⁾. Suppose the two variables say the crime and the GovReg affect each other with their lags. In that case, it may be concluded that GovReg causes a crime (GovReg \rightarrow CRIME) or a crime that causes GovReg (CRIME \rightarrow GovReg) or both causes each other (GovReg \rightarrow CRIME and CRIME \rightarrow GovReg). In the same way, CRIME and II affect each other with their lags. It is then possible to

conclude that II causes CRIME (II → CRIME) or CRIME cause II (CRIME → II) or both causes both (II → CRIME and CRIME → II).

The direction of causality between dependent and independent variables is investigated by the Granger Causality Test⁽⁵³⁾ which is illustrated in the following general equation:

$$CR = \alpha_{10} + \sum_{i=1}^n \alpha_{1i} CR_{t-i} + \sum_{i=1}^n \alpha_{2i} GovReg_{t-i} + \sum_{i=1}^n \alpha_{3i} II_{t-i} + \sum_{i=1}^n \alpha_{4i} URBN_{t-i} + \epsilon_{1t} \tag{6}$$

4 Results and Discussion

Time series data may have several issues that could cause a lot of problems that result in misleading and biased consequences. The stationary dilemma was considered to be the most common problem of any time series data. When a time series is not stationary, it can be transformed to stationary and instead stationary data can be used for various purposes in most time series econometric models. As time series data is involved in this analysis, it is also important to confirm the stationary properties of each variable used in the models. There are a variety of statistical tests and techniques, such as correlogram and Ljung-Box (LB) statistics, graphical presentation, Dickey Fuller (DF), Augmented Dickey Fuller (ADF) and Philips Perron (PP) root tests, which confirm the presence of stationary time series data. In this study, however, the researcher used the ADF unit root test statistics technique to check the stationary in the current time series.

The study results clarifies that that crime rate is high in democracy regimes. It is because of the fact that people lives in more miserable conditions than that of dictatorship. Mostly poor economic policies are implemented during democracy government. There is also lack of strict law and order situation that support criminals. The reason behind the fact were bad impact and miserable conditions created & perpetuated by democracy in Pakistan is that democracy does not prevail in its true sense. The other reason is that there is lake of political wills in politicians and are not in a position to increase wellbeing level of the society. While on the other hand, in dictatorship eras strict law and order situations are practiced that succeeds to control crimes in the society. That is the reason where dictatorship contributes more to the economy than that of democracy.

In contrast, income inequality and urbanization are good predictors of the reduction of crime rates and the achievement of development targets, thereby aligning them with equitable monetary and fiscal policies to minimize human costs in terms of reducing chronic disparities and, as a result, crimes in society. There is a need for successful policies that can restrict urbanization by improving rural infrastructure and helping to reduce the disproportionate impact of crime in a country like Pakistan. The outcome of the study confirms the relationship between income inequality and crime rates. The economic consequence is that income distribution is the only contributor to the country’s rise in crime and violent crime rates. The economic consequence is that income distribution is the only contributor to rising crime rates and violent crimes in countries like Pakistan. There is also a need to establish a system by which income inequality and urbanization incidence can be minimized, which will inevitably lead to a reduction in crime rates.

Stationarity property of the data through ADF

Statistical measures and techniques such as Dickey Fuller (DF), Augmented Dickey Fuller (ADF) and Philips Perron unit root tests demonstrating the occurrence of stationarity in any time series data. Nevertheless, this analysis used the ADF unite root test statistical methodology to verify if the data is stationary and whether the variables used in the crime model are implemented in a similar order or elsewhere. The ADF test results for both models are shown in [Table 1](#).

Table 1. Unite root test for crime model

Variables	Level of significance		1st difference		Decision
	Intercept	Trend and intercept	Intercept	Trend and Intercept	
Crime Rate	-1.0265 (0.7354)	-2.8511 (0.1880)	-7.0112 (0.0000)	-6.9045 (0.0000)	I(1)
Income inequalities	-1.7224 (0.4132)	-1.1197 (0.2348)	-6.4937 (0.0000)	-6.4330 (0.0000)	I(1)
Urbanization	-0.7495 (0.8230)	-2.0641 (0.5505)	-3.1811 (0.0282)	-3.0943 (0.1208)	I(1)

Leg length= 1(user specified)

Figures in parentheses are the probabilities of each variable.

The ADF test result ([Table 1](#)) show that the variables say crime rate and urbanization are stationary at the first difference while, income inequality is stationary at the 5% level of significance. The researcher also found that none of the variables is

integrated in order 2, i.e. I (2). The best way to investigate the relationship among dependent and explanatory variables is the ARDL test⁽⁵⁴⁾.

Descriptive analysis

Pakistan’s history shows, in particular, two distinct features of government regimes, i.e. democracy and dictatorship, which have been side-by-side since its inception. Pakistan has been governed by dictatorship for about half the time since Pakistan came into being⁽⁵⁵⁾. Recent research indicates a good association between crime rate and democracy⁽⁵⁶⁾. The decade-wise cautious crime rate shown in Table 2 indicates that the average rate of crime in Pakistan has risen during the time period 1973-2017, with an growing trend over each decade. The statistic also indicates that the crime rate has been consistently high in the last decade during the study period. The figure also depicts that crime rate is significantly high in last decade during the study period. Along with crime rate urbanization is also high during the last decade. That indicates positive association between crime rate and urbanization. Meanwhile, the statistics concerning to GDP growth reflects mixed trend in each decade. It is quite important that GDP growth is high during the 1980s that exhibits good economic health and clear the way for economic development. In contrast, the statistics of income inequality displayed that poor rich gap diminishes in each successive decade. On the other hand the statistics of income-inequality displayed that poor rich gap diminishes in each successive decade.

Table 2. Decade wise specification of income inequality, urbanization and crimes in Pakistan (1973- 2017).

Years	Income Inequality	GDPG	Crime Rate	Urbanization
1970s	35.15	5.74	20.30	26.69
1980s	33.73	6.29	25.21	29.22
1990s	31.41	3.96	28.94	31.70
2000s	30.73	4.22	33.82	30.41
2001-2017	29.79	4.47	34.96	35.72

All values are calculated at simple decade averages.

The era-wise findings reported in Table 3 demonstrate that Pakistan’s average crime rate has risen in both quasi-democracy and dictatorship over time. Yet it is comparatively higher in democracy than in quasi-dictatorship. The cause may be that, during the period of democracy, governments based on the principles of democracy may have failed to control the system of law and order in the country. In addition, there is lake of stable economic and consistent policies in democratic governments that are necessary for running the economy smoothly. While on the other hand non-democratic governments persists with stable and consistent economic policies. That is the reason where dictator ship contributes more to the economy than that of democracy. As well, democratic governments have a lake of stable economic and consistent policies that are important for smooth running of the economy. Whereas non-democratic states on the other hand, continue with stable and consistent economic policies. That is why dictator ships contribute more to the economy than democratic ones.

Table 3. Some conventionalized comparison of income inequality and crimes in democratic and dictatorship eras in Pakistan (1973-2017)

Years	II	GDPG	Crime Rate	Murder	Urbanization
1973-1976	35.53	4.99	18.65	4571.75	17.25
1977-1985	34.45	6.65	22.44	4757	22.98
1986-1998	32.14	4.66	28.56	8272.31	35.46
1999-2006	31.13	4.89	30.13	9641.25	48.99
2007-2017	29.89	3.84	36.18	11757	63.19
Democratic	32.51	4.50	27.80	8200.35	38.63
Dictatorship	32.84	5.76	26.29	7199.13	35.99

Bold figures represents dictatorship period in Pakistan

Similarly, the results in hand presented in Table 3 also show that GDP growth rate is higher throughout the quasi-dictatorship period, with an average of 5.8 per cent compared to 4.5 per cent in the democratic era. Continued and stable economic growth is a key predictor of a healthy and prosperous economic environment. The higher the GDP growth rate, the higher the well-being of the people will be. Thus, by conversely, the lower the GDP growth rate, society’s prosperity will be small, either directly or indirectly.

ARDL test results for crime model

The estimated results of the Crime Model regression are shown in Table 4. The findings in hands give explanation that there is no spurious correlation between democracy, income inequality, urbanization and crime rate. The F-statistics value for bond testing in the given model is 15.07 greater than the upper critical-bond 3.48 at significance level of 5 per cent. Therefore, the null hypothesis of no co-integration is also rejected even at 1 per cent level of significance. These point out that the connection between crime rate and POLREG, II and URBN exists in long-run. The findings also show the statistically positive value of POLREG, II and URBN as in model. Even so, the co-integrating equation in other words CoinEq (-1) has the right negative sign (-0.8203). Whereas, the t-value (-8.56) indicates that there is a short discrepancy between these variables throughout the study period.

Table 4. The estimations from selected ARDL for crime model

Critical bounds (F test)	1% level of significance	2.5% level of significance	5% level of significance
Dependant variable: crime rate			
Lower	3.42	2.87	2.45
Upper	4.84	4.16	3.63
Crime Model			
ARDL Design	1,0,0,0,0		
F- value	17.81		
Significance level	Cointegrated at (5%)		
Test of ARDL specification significance			
Estimation of long run coefficients:			
POLREG	2.8465 (3.2383)		
II	0.4626 (14.5696)		
URBN	0.3091 (12.7474)		
Short run ECM estimates:			
POLREG	2.4116(3.2071)		
II	0.3919 (8.7195)		
URBN	0.2619 (6.5865)		
CointEg(-1)	-0.8472 (-8.9632)		

Bold Figures in parentheses are the t- statistics values

The results of the study also show that the coefficient of POLREG is significant with a positive sign (2.7). The positive and significant evidence of the POLREG confirms that the rate of crime increases in democracy and also confirms the results of the Crime Model (Table 4) and the descriptive analysis presented in Tables 2 and 3. This positive and significant result has shown that people are more probably to have a trend to commit crimes during the democratic period compared to quasi-dictatorship during the study period. These results are consistent with⁽⁵⁷⁾ and⁽⁵⁸⁾ where they have determined that crime rates are higher in democracy than in dictatorship if the law is implemented under the political surveillance system. However, the findings contradict the study analyzed by⁽⁵⁹⁾. The results in hand also explain that the association between income inequality and crime rate is significantly positive and not spurious. These results are consistent with⁽⁶⁰⁾ and⁽⁶¹⁾. They established a positive association between income-inequality and crime. Similarly,⁽⁶²⁾ analyzed that the increase in income-inequality, less female employment and rising inflation rates had a considerable positive impact on crimes in Pakistan. Whereas,⁽⁶³⁾ has explored that inequality has a positive effect on crime.

Granger causality test for crime model

Table 5 demonstrates the Granger-Causality test set. The findings show that the null hypothesis that Income Inequality does not impact the Crime Rate is rejected even at a 5 % significance level as shown by the p-value. Whereas, the null hypothesis, that the rate of crime does not affect income inequality is accepted. It means income disparities Granger-Cause Crime Rate and not the other way round. As a result, income-inequality is likely to affect the rate of crime in Pakistan between 1973 and 2017. Similarly, urbanization causes a crime at 10% level of significance.

Table 5. Pair wise granger-causality tests results

Null-Hypothesis	F-statistics Values	Probability values
Income Inequality doesn't Granger Cause Crime Rate	4.69424	(0.0151)
Crime Rate doesn't Granger Cause Income Inequality	2.85244	(0.0701)
Urbanization doesn't Granger Cause Crime Rate	2.50972	(0.0947)
Crime Rate doesn't Granger Cause Urbanization	1.59696	(0.2158)

Diagnostic test for crime model

The study in hand showed that there is no serial correlation, no hetroskedasticity, and that the model is normally distributed. Various diagnostic tests such as Breusch-Goldfrey Serial Correlation LM test; Ramsey's Reset test; Hetroskedasticity test and Jarque-Bera test (Normality Test) are utilized to fulfill the above assumptions. In this study, various diagnostic tests are employed to check whether the model is appropriate or not. Table 6 provides the sequence for checking the validity and reliability of the crime model following the various results of the diagnostic tests.

Table 6. Diagnostic test results for crime model

Ramsey's Reset test; H0 : Equation is Correctly Specified		
Ramsey-value	p-value	Result of the test;
1.0439	0.3132	The equation is correctly specified
Breusch- Goldfrey serial-correlation LM test; H 0: There is no serial-correlation		
B.G.S LM-value	p-value	Result of the test;
1.7509	0.1370	There is no serial-correlation
Hetroskedasticity test; H0 : There is no Hetroskedasticity		
ARCH-stat	p-value	Result of the test;
0.6535	0.4235	There is no hetroskedasticity in model
Normality Test (Jarque Bera test) H0 : The residual are Normal		
Jarque Bera-value	p-value	Result of the test;
1.2316	0.5402	Residuals are normally distributed

The calculated result of the Ramsey RESET test (Table 6) indicate that the given model has an accurate functional shape since the p-value (0.31) is greater than 0.05. In the interim period, the p-value (0.14) of the Lagrange Multiplier test (LM test) for the residual serial correlation is greater than 0.05. The serial correlation hypothesis is therefore rejected and thus there is no serial correlation between the variables examined in the model. Similarly, in the ARCH test; the p-value (0.42) is also greater than 0.05, which means that there is no hetroskedasticity in the model tested. Jarque Bera (J-B) is used to check the normality of the residues. Here, too, the p-value (0.54) is greater than 0.05, which is consistent with the normal distribution of residuals. The estimated coefficients of all variables are constant over the study period. Because all diagnostic tests confirm the validity of the model, thus, the consistent parameters of the utilized model are correct and are useful to the government for policy action.

5 Summary and Conclusions

In Pakistan, as in other developing countries around the world, the rate of crime has risen over time due to several factors, including economic and socio-economic instability, poor governance and limited enforcement of the law. The present study was accomplished to examine the dynamics of crime incidence, income inequality and urbanization in Pakistan. This research effectively concentrated on the role of variables influencing the rate of crime, both in the short and long run, between 1973 and 2017. The main aim of this research work was to investigate the role and effectiveness of different political regimes and income inequality in Pakistan as a consequence of crime. The research used ARDL Bound Test Methodology utilizing annual time-series data for Pakistan. The model employed in this analysis is subject to design and diagnostic tests that largely supported the model. The findings of the different diagnostic tests were accurate and preferable to the findings of ARDL. The strong and

positive relationship in the crime model shows that the rise in income inequality is projected to improve crime. The urbanization coefficient is strongly positive, which means that the rise in urbanization will increase the rate of crime and supports the argument that urbanization will increase crime. The dummy used for the democratic period is positively significant, as it examined the fact that democracy has had a positive effect on the country’s crime rate over time, especially between 1973 and 2017. Studies in hands often make it clear that the rate of crime in democratic regimes is higher than that of dictatorship. Since, for the most part, weak economic policies are enforced during the democratic era; people live in democracy with more pitiful circumstances than those of dictatorship. However, the study reveals a startling finding that the rate of crime in the democratic system remains significantly higher than during the dictatorship era. The research in hand will open up new ideas for policy-makers.

Based on the findings of the study, there is a need to track the crime rate in the country and all major economic determining factors of crime, such as income inequality, urbanization, etc., need to be addressed effectively by policy-makers. First, drastic steps are needed to eliminate poverty while improving economic growth, along with desirable inflation and unemployment. Second, policymakers should propose measures that could reduce income inequality in a country that could further reduce criminal activity. In order to manage urbanization, it is important for the government to provide the rural community with incentives, such as grants and allowances, better infrastructure and better medical facilities. Likewise, new towns and homes need to be built up where the rural population can adapt without any difficulty. The current situation needs to make the distribution and use of resources more effective, improved planning and the advancement of new technologies.

Appendix- A

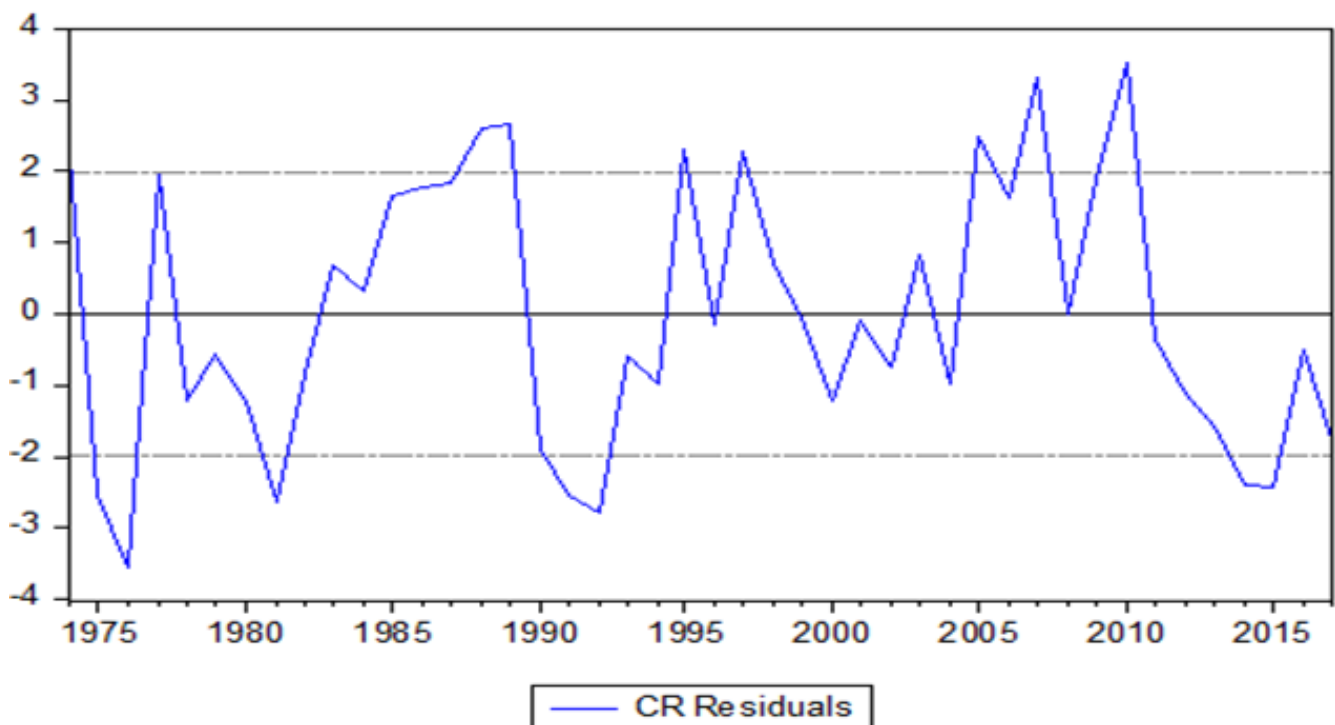


Fig 1. Crime rate residuals

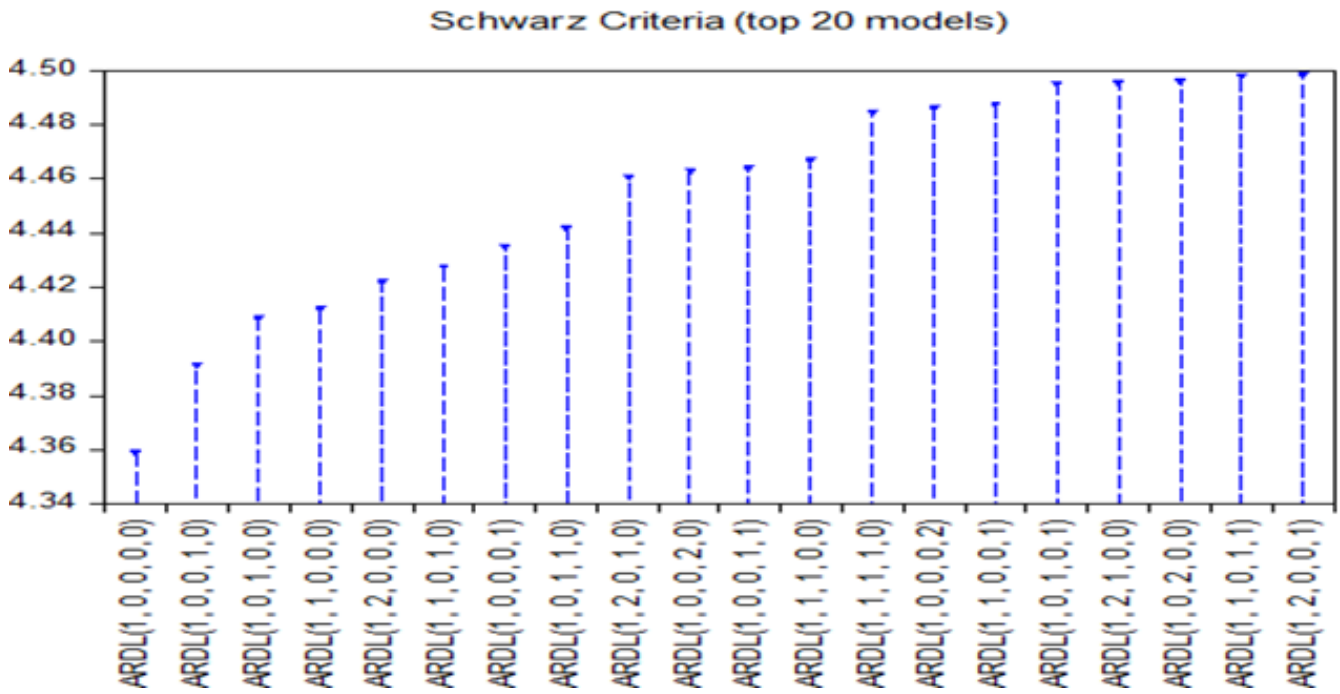


Fig 2. Schwarz criteria for top 20 models

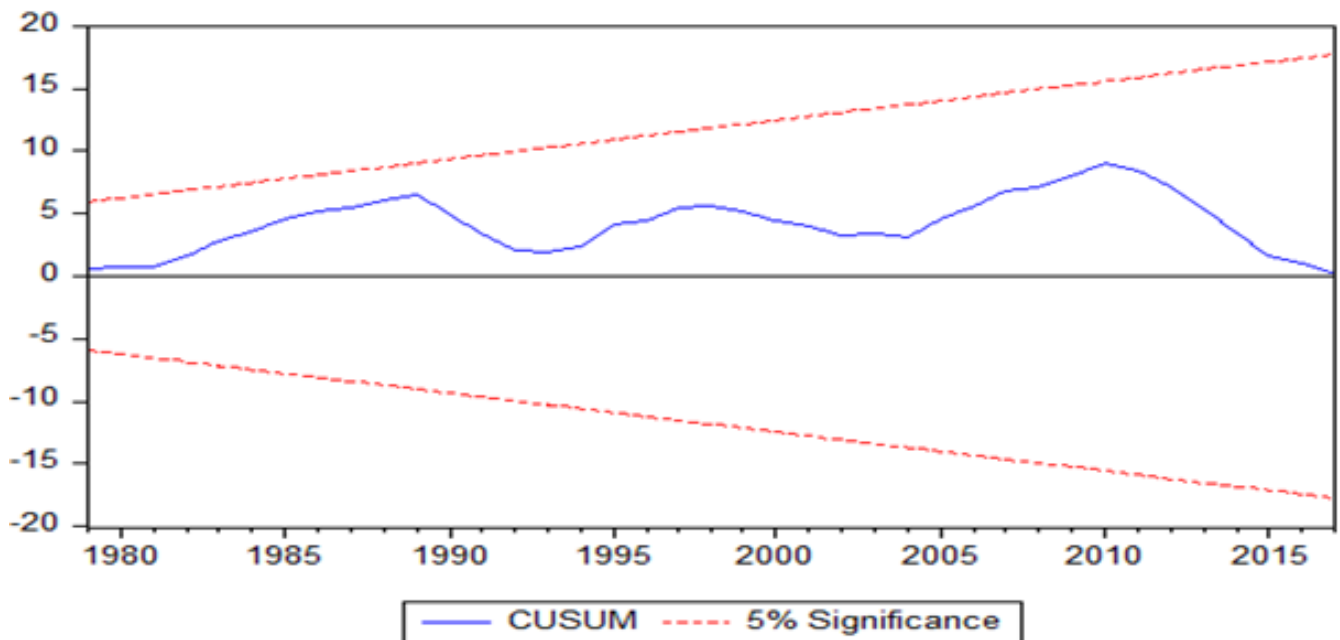


Fig 3. CUSUM at 5% significance level

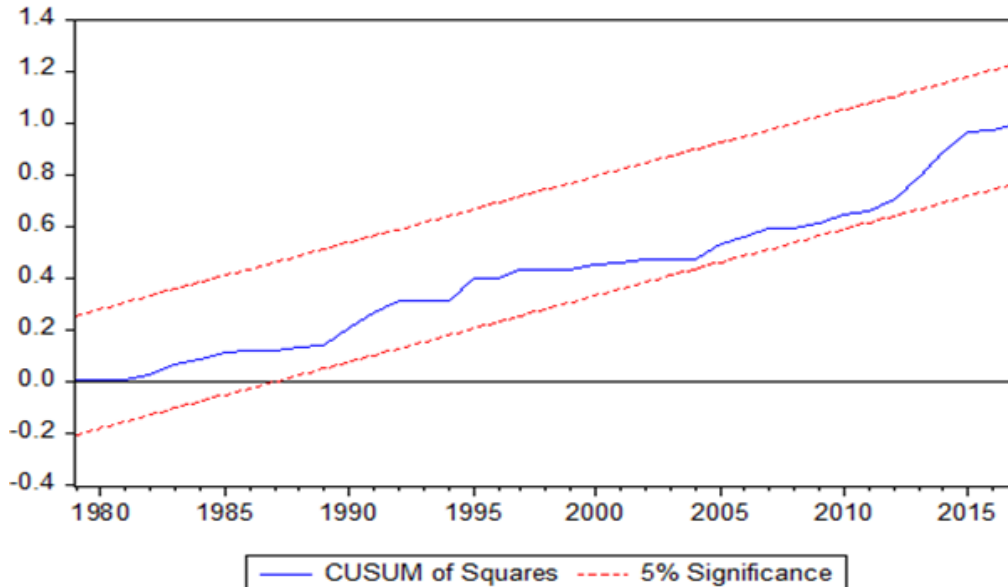


Fig 4. CUSUM of squares at 5% significance level

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