The Role of Human Capital, Corruption and Quality of Life in Determining the Crime Rate: Empirics from Pakistan

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April 2021

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Abstract
Crime is an evil that is increasing day by day in Pakistan. Different factors contribute to the increasing crime trend. This study investigates the impact of human capital, corruption, quality of life, economic misery and rule of law on the crime rate in Pakistan over the period 1985-2019. To find out short-term and long-term dynamics, the Vector Error Correction Model (VECM) is used. For checking casual relationships among variables, the Toda Yamamoto Causality test is used. The results confirm the significant and long-term impact of human capital, corruption, quality of life, economic misery and rule of law on the crime rate in Pakistan. Three channels of bidirectional causality are found with the economic misery index from corruption and human capital, and between the rule of law and corruption. Unidirectional causality runs from human capital, corruption, quality of life and economic misery to crime.

Key words: *Crime Rate, Human Capital, Quality of Life, Economic Misery*
JEL Codes: K1, O15, J17

Introduction

Crime is an act or offense that is prohibited by a state and which is punishable by law. There are many definitions of crime and the most common thing about all definitions is that it is punishable. Auolak (1999) states that "[a] crime is an act or omission of human conduct harmful to others which the state is bound to prevent. It renders the deviant person liable to punishment as a result of proceedings initiated by the state organs assigned to ascertain the nature, the extent and the legal consequences of that person's wrongness"[121-P]. Crime paralyses a peaceful society, as it leaves a sense of nervousness, discomfort and insecurity. Crime also raises feelings of insecurity for those who have been victims of crime, which affects their well-being negatively. A person commits a crime due to many reasons, periodically he/she has committed a crime because of mental illness, and sometimes without any reason, just because of habit. Various economists have studied the economics of crime, and examine its reasons and solutions (Freeman, 1983; Long and Witte, 1981; Nagin, 1978; Taylor, 1978). Merton (1938) points out that many people feel disappointed when they find relatively victorious people. In other words, higher income inequality makes them frustrated and they become involved in crime. According to Shaw and Mckay (1942), societies are not able to regulate their members, which causes crime to appear, and is known as social disorganisation theory. A society bears different economic and social costs like loss due to citizens' inability to attend school, expenditure mental shocks caused by crime, different injuries, victim's family loss and adverse effect on the quality of life. Major resources of developed and developing

countries should be used on law enforcement and its application, and to strengthen the police force (Donohue, 2007). Tella and Schardrodsky (2004) state that direct costs increase with the increase in crimes. Fajnzylber et al., (2002) point out that an increase in indirect cost leads to productivity loss, loss of human and social capital, and reduction in labour market actions.

Crime in Pakistan has increased during the last couple of years, the total crime in absolute number has raised from 247,888 to 395,006 in the year 2002 to 2012 (Punjab Bureau of Statistics, 2012). These statistics indicate that the countrywide reported crime during 2006-07, including 20,082 cases of murder, which rose to 24,036 in 2008 and 2009. Rape cases registered in 2006-07 at 4300, against 5712 in 2008-09. Kidnapping cases numbered 1999 in 2006-07 but this crime increases to 29,602 in 2008-09. There was also an increase in car theft cases from 42,056 in 2006-07 to 61,108 during 2008-09. Burglary, dacoity, robbery and other crimes also increased during the past several years, while cases of cattle theft have decreased from 22,421 to 18,100. The total crime rate in 2010 was 652,338 and in 2011 was 673,750, which decreased to 646,900 in 2012 due to Pakistan army action in the tribal areas of the country. According to the human capital report 2020, Pakistan is ranked 154th out of 189 countries and following the corruption perception index of transparency international (2020), and in the list of most dangerous to live, Pakistan is ranked 124th place out of 189 countries. The main objective of this study is to determine the impact of human capital, corruption and quality of life on the crime rate in Pakistan.

Literature Review

Numerous studies have dealt with crime and factors affecting the crime rate. An overview of the literature is presented below. A huge amount of literature is available on crime and its different factors in countries like the USA, Italy, the UK, Pakistan, Germany, etc. Many studies have determined a negative relationship between crime and wage rate by using cross-sectional and time-series variations in average wages (Viscusi, 1986; Freeman, 1996; Grogger, 1998; Machin and Meghir, 2000). It is stated that the opportunity cost of crime is measured by wages, and this is strong proof in favour of the human capital theory of crime.

Howsen and Jarrell (1987) empirically investigated the determinants of crime, within which economic, sociological, and legal variables were included. Findings indicate that poverty, tourism, police presence and the unemployment rate all affect the crime rate. Witt et al. (1999) find the association between crime and different economic factors with the help of penal data. Unemployment is positively related to crime. In this study, they also find evidence that an increase in the size of the police force decrease crime.

Basu et al. (1992) examine that when there is a link between law enforcing agents and criminals, overcoming corruption becomes hard compared, to the standard Beckerian approach. This paper was extended by Marjit and Shi (1998), who showed that control of crime is difficult, but not impossible in such circumstances, as corrupt officials affect the probability of detection. Gupta et al. (1998) investigate the effect of corruption on inequality with the help of penal data from 37 countries. Results show that a significant and positive relationship between corruption and the Gini co-efficient exists.

Auolak (1999) investigated the impact of unemployment and consumption on the different types of crime like robbery, homicide, and theft in Italy for the period 1951-1994. The results show that unemployment was the main economic factor responsible for different crimes. Michalos and Zumbo (2000) examine the quality of life in British Columbia. Their findings show that victims of crime reported facing a lower level of overall life satisfaction or quality of life, which means high crime rate perception decreases the quality of life of the people. Victims reported larger differences in other satisfaction scores, such as the quality of their neighbourhood. They explain life satisfaction, while 7 percent variations were explained by crime-related variables and 38 percent variations by neighbourhood satisfaction.

Gould et al. (2002) find out the impact of labour market conditions on crime rate by using data from 1979 to 1997 in the USA. Wage rate and unemployment were independent variables while a crime was the dependent variable. The results show that an increment in wages can cause a reduction in the crime rate. Coomer (2003) discovered the effect of macroeconomic variables on crime rate by using the ordinary least square method. The findings show a strong positive relationship between macroeconomic variables and crime rate. When inflation, unemployment and poverty increase, there is also an increase in crime.

Gumus (2004) examines the factors influencing crime in urban areas by using city-level data, in the USA. By using the OLS technique, the study finds that inequality, per capita GDP and percentage of black people are the most significant factor which affect the crime rate in urban regions in the USA. The results show that unemployment and expenditure on police have a significant impact on crime. Tales (2004) investigates the impact of macroeconomic policies on crime rate by using the Bartlett Corrected Trace test technique. The results reveal that monetary and fiscal policies significantly affect the crime rate. Fiscal policy influences crime through public spending, and monetary policy through inflation. Findings reveal that there exists a significant and positive impact of inflation and unemployment on the crime rate.

Lochner (2004) examines the association between human capital and crime rate by employing self-report data from the National Longitudinal Survey of Youth (NLSY) in 1980. The findings show that human capital increases the opportunity cost of crime as older, intelligent and educated people commit fewer crimes. Di Tella et al. (2004) empirically compare life satisfaction in twelve organisations by using the penal data set for the period 1975 to 1997. Edmark (2005) examines the connection between unemployment and crime by using the penal data of Swedish countries for the years 1988-1999. Oskooee and Goswami (2005) explore the impact of corruption on black marketing by using both cross-sectional and pooled data from 60 developing countries over the period 1982-1995. The study found that the black market premium is higher in countries where there is more corruption. Locd and Cohner (2007) empirically explore the association between education and crime in the USA over the period 1960-1990. By using the Ordinary Least Square (OLS) technique, the study concludes that there is a negative association between education and crime, as an increase in education will significantly decrease the crime rate.

Tang and Lean (2007) try to analyse the impact of inflation and unemployment in Malaysia for the period 1970-2006. The results reveal that inflation and unemployment have a significant positive relation with the crime rate in Malaysia. As unemployment and inflation increase, crime rates also increase. Akcomak and Weel (2008) explore the social capital and crime relationship in Netherland, using the data of 142 municipalities with more than 30,000 inhabitants. The study suggests that a higher level of social capital causes a low crime rate.

Buonanno and Montolio (2008) empirically examine the impact of education, per capita GDP and unemployment on the crime rate with the help of penal data over the period 1993 to 1999. Baharom et al. (2008) inspect the effect of economic variables on crime rate with the use of penal data from 1960 to 2001. The considered variables were crime rate, income, unemployment, inflation, political violence and interest rate. After collecting data from 21 countries they apply the Johnson co-integration technique to find out the result. The results of the study show that there is a negative impact of income and political violence on crime, while inflation and unemployment have a strong positive relationship with the crime rate.

Ali and Peek (2009) determine the impact of fiscal, social, political and demographic variables on the crime rate for the period 1970-2000 in Virginia, USA. Population, age, unemployment and poverty are considered independent variables. By using the regression technique, they inspect that social, political and demographic variables significantly affect the crime rate. Dutta and Husain (2009) examine socio-economic factors of the crime rate in the context of India, for the period 1999-2005. The study indicates that socio-economic variables like poverty, education, economic growth, load on the police force and urbanisation have significant impacts on the crime rate in India.

Gillani et al. (2009) find the association of inflation, unemployment and poverty with a crime, with the help of time series data for the period 1975-2007, from Pakistan. Omotor (2009) investigates the crime determinants in Nigeria. Penal data over the period 2002 to 2005 was used. Population and per capita income are used as independent variables, while crime is dependent. The study suggests that creating strict law enforcement agencies and control of the population can reduce crimes.

Kitchen and Williams (2010) investigate the association between crime and quality of life in Saskatoon, Canada. The findings show that social conditions and geography have an impact on the perception of crime. But in the case of fear of crime and quality of life, there is a bivariate relationship that shows perceptions of crime have a significant influence on the quality of life. Borraz and Gonzalez (2010) inspect the impact of social, economic and demographic variables on the crime rate. Penal data was used for the period 1986-2006 in Uruguay. By using the GMM technique, the results show that socio-economic factors like education, unemployment and per capita income do not significantly affect the crime rate, while urbanisation and population have a positive effect on the crime rate.

Machin et al. (2011) check the influence of education on crime in England, for the period 1984-2002. By estimating regression, they concluded that there is a negative relationship between education and crime, as a high literacy rate creates employment opportunities for people, which decreases crime. Hadded et al. (2011) empirically investigate the different determinants of crime with the help of time series data from 1996 to 2005 in Iran. The study reveals that economic factors like unemployment, inequality and income are positively related to crime, while social factors like education are negatively related to crime, and demographic factors were significantly associated with the crime rate. Qadri et al. (2011) empirically find the link of inflation, unemployment, investment, education and health with the crime rate for the period 1980-2007 in Pakistan. Nunley et al. (2011) analyse the relationship of the misery index with crime and stock market growth with a crime over 1948-2009 in the USA. The study concluded that inflation, unemployment and stock market growth are significantly related to crime. Meghir et al. (2011) find the impact of education policy on the crime rate with the use of sample data over the period 1945 to 1955, in Sweden. The study shows the impact of education policies on the individual as well as on their children. They point out that educational reforms decrease the crime rate.

Aurangzeb (2012) investigates the determinants of crime like GDP, education, population and wage rate for the period 1980-2010. The results conclude that there exists a strong positive and significant impact of GDP, population education and wages on the crime rate. The study suggests that the crime reporting system should be improved and to reduce political influence on law-enforcing departments. Jabbar and Mohsin (2013) have empirically determined the impact of education, population, unemployment, police strength and police absconders on the crime rate in Pakistan. They use time-series data from 1978 to 2012 in Punjab. Goulas and Zervoyianni (2013) investigate the effects of crime on economic development by using pooled data for the period 1991-2007. The study shows that crime has an impact on the growth rate at the macroeconomic level. They conclude that there is a negative relationship between GDP and crime.

Dunkel et al. (2013) use life history theory to propose three hypotheses about self-control and criminal intent by using primary data in America. Umaru et al. (2013) investigate the impact of unemployment, poverty, corruption and inflation on the crime rate in Nigeria from 1980-2009. The findings show that causation exists between unemployment and crime level, and no causation exists in the case of poverty and crime level. Khan et al. (2015) empirically determine the social and economic determinants of crime in Pakistan with the help of data from 1972-2011. Crime and higher education have significant negative relation because high education leads to more earnings, which can increase the opportunity cost of crime, whereas GDP per capita positively affects crime in the long run and negatively in the short term. In the case of poverty, a positive association exists between crime and poverty in the long-run, yet this is negative in the short term. This is because poverty may induce a high level of stress and mental illness, which in turn, and over time, causes the individual to adopt criminal behaviour. Asghar et al. (2016) empirically explore the effect of social, economic and political factors on the crime rate in the case of Pakistan for the period 1984-2013. The study suggests that to

reduce crime the policymakers should focus on the political, social and economic factors that are responsible for crime in Pakistan.

The review of the literature highlights factors such as human capital, corruption and quality of life that influence the crime rate. It is important to note that not many studies are available in the literature that have included factors like human capital, corruption and the quality of life responsible for crimes in Pakistan.

The model

Crime is a very complex phenomenon that varies across culture and time, thus there are many theories of crime. Strain theory states that stress or strain causes an increase in the likelihood of crime. Stresses lead to negative emotions like frustration, anger, etcetera, which cause an increase in the crime rate. Conflict theory states that crime in any society occurs because of conflicts among people and the laws which are created by those people who are in power to protect their interests. Rational theory suggests that people commit a crime for own their interests, after checking the maximum risk and reward of it. Social disorganisation theory states that a person's physical surroundings are responsible for increasing crime rate (Shaw & Mckay, 1942). Opportunity theory indicates that a 20 percent rise in the youth will create a 20 percent enhancement of the crime ratio (Cantor and Land, 1985 and Grogger, 1998). Gould et al (2002) find that variations in wages are a big reason for violent and property crimes, accounting for up to 50 percent. Recent research by Raphael and Winter-Ember (2001), Gould et al., (2002), Ali (2015), Ali and Rehman (2015), Haider and Ali (2015), Ali and Bibi (2017), Kassem et al., (2019), Ali and Senturk (2019), Sulehri and Ali (2020), Ali and Bibi (2020), Audi et al., (2021), Ali et al., (2021), Ali et al., (2021), Audi et al., (2021), and Roussel et al., (2021) also documents that unemployment has a strong positive interlinking relation with crimes. Following the previous literature, the model of the study becomes:

Crime = f (hk, cor, qol, mi, rol) (1)

The model can be written in linear form as follows:

$$lncrime = \beta_0 + \beta_1 lnhk + \beta_2 lncor + \beta_3 lnqol + \beta_4 lnmi + \beta_5 lnrol + \mu_t \quad (2)$$

lncrime = log of crime rate
lnhk = log of human capital
lncor =log of corruption
lnqol = log of quality of life
lnrol = log of rule of law
lnmi = log of misery index
u_t = error term
β_1, β_2, β_3, β_4, β_5, β_6 = slopes of regression

In the above model, all variables are represented in log form as (ln=natural log) to remove time and trend in the variables. This study investigates the impact of human capital, corruption, QOL, misery index and rule of law on the crime rate in Pakistan for the period 1985-2019. Data is collected from the Economic Survey of Pakistan, the World Development Indicator

(WDI), the Federal Bureau of Statistics, the International Country Risk Guide (ICRG) and the International Financial Statistics (IFS).

Econometric Methodology

For estimating a model, it is essential to inspect the stationarity of all the variables used in the model, as dealing with a non-stationary series may bring spurious results. Time series shocks in stationary are short-term and their effects are ultimate over time. But in the case of non-stationary, time series shocks are permanent or long-term and their mean and variance depend on time. The unit root test is used for checking the stationarity of the variables by Augmented Dickey-Fuller (ADF) tests. A unit root test checks whether the Autoregressive model is stationary at the level of 1st difference. It was assumed by Dickey and Fuller (1979, 1981) that error terms are likely to be white noise. But later they suggest an augmented version to eliminate the autocorrelation problem by including extra lagged terms of the dependent variable (Dickey and Fuller, 1982). ADF lag length is determined by Akaike Information Criteria (AIC) and Schwartz Bayesian Criteria (SBC). By adding lagged dependent terms in the ADF test we use the LM test to investigate whether errors of ADF regression are autocorrelated or not. For checking the long-run relationship between variables, a co-integration technique is used. Johansen (1988) exhibits this technique to examine the long-run association between variables that are not stationary. In this research, the Johansen co-integration technique has been used.

Engle and Granger (1987) stated, that when two series are integrated of order 1 then we use VECM representation to govern the joint behaviour of the series of a dynamic system. If two or more variables are found co-integrating in a set of variables then VECM will be an appropriate method that adjusts short term and long term variations. It is compulsory for VECM that all variables should have the first order of integration, and a minimum of one co-integration relation should exist among them. If there is no co-integrating relationship among them then we will use the VAR model. Hence it requires a restricted VAR model when variables are co-integrated of order 1 and also have co-integration. Engle and Granger (1987) state that two variables X and Y are co-integrated if they are not stationary, but the linear combination of these variables is stationary. The Standard of Granger-Casual is not reliable because Granger causality has limitations of specification bias that makes estimated regression spurious. According to Toda and Philips (1993), the causality decisions made from the 1st order VAR model are not reliable and provide misleading results. Therefore, Toda and Yamamoto (1995) introduced the Wald test to statistics to avoid these problems based on the VAR model. The Toda Yamamoto test is better than the test of Granger causality because it does not require a test of stationarity and co-integration. The Toda Yamamoto test is better because it is estimated by seemingly unrelated regression (SUR) that estimates causality among variables by Wald test.

Results and Discussion

Empirical results and their interpretations are presented in this part. For checking the properties of variables included in this study descriptive statistics results are displayed in table 1. The

descriptive statistics results show that crime, human capital, QOL, Misery index and Rule of Law are negatively skewed, while corruption is positively skewed. The given results show that all variables included in the model have positive kurtosis. As kurtosis and skewness are different from zero, the hypothesis of no normality is rejected. Jarque-Bera results indicate that the variables included in the model have zero mean and finite co-variance. Thus, the results show that variables are normally distributed.

Table 1: Descriptive statistics

Variables	Lncrime	Lncor	Lnhk	Lnqol	Lnmi	Lnrol
Mean	12.911	0.676	0.989	4.136	2.60	0.969
Median	12.898	0.693	1.029	4.139	2.69	1.098
Maximum	13.420	1.098	1.223	4.193	3.29	1.366
Minimum	12.251	0.405	0.693	4.070	1.80	0.0000
Std. Dev.	0.347	0.159	0.140	0.0369	0.354	0.3541
Skewness	-0.061	0.430	-0.225	-0.137	-0.60	-1.438
Kurtosis	1.89	4.58	2.013	1.877	2.869	4.267
Jarque-Bera	1.60	4.187	1.519	1.724	1.902	12.76
Probability	0.447	0.123	0.467	0.4222	0.386	0.00168
Sum	400.2626	20.96	30.68	128.24	80.65	30.056
Sum Sq. Dev.	3.613	0.764	0.59	0.041	3.773	3.7627
Observations	35	35	35	35	35	35

Now we will check the stationarity of all the variables before estimation. As a traditional theory of econometrics is based on the assumption of zero mean and constant variance, but in the case of long-term time-series data it does not hold, therefore stationary is checked before conducting empirical research work. We use the unit root test for checking stationarity, which is conducted by the ADF test. In table 2 the results are reported with critical values at 1%, 5% and 10% level of significance for rejection of the null hypothesis. The findings of the ADF test show that no variable is stationary at the level and all variables are stationary at the first order of integration. ADF test shows that calculated values in the absolute term are greater than the critical values at first, so we reject the null hypothesis that shows the presence of unit root, and it is concluded that all variables are stationary at 1st difference. In short, results indicate that there may be a long-term relationship among variables as all variables are integrated I (1).

Table 2: ADF test results

Variables	At level	At 1st Difference	Stationary
Lncrime	-1.368	-6.035*	1st Difference
Lnhk	-1.70	-4.17**	1st Difference
Lncor	-1.93	-3.42*	1st Difference
Lnqol	-1.25	-3.26***	1st Difference
Lnmi	-1.74	-2.9**	1st Difference
Lnrol	-2.03	-3.55*	1st Difference

*’ ** and *** shows 1%, 5% and at 10% level variables are stationary at 1st difference.

Unit root results exhibit that all the variables are stationary in the first order, so a long-run association between variables is determined. We use Johansen's and Juselious's co-integration test for checking the long-run association between variables. It is stated that co-integration variables may diverge from their equilibrium path in the short-term but not in the case of the long term, so this test was suggested by Johansen to check the long-run relationship among non-stationary variables. First of all, we determine the optimal lag length of variables by AIC and SBC criteria and results indicate that the optimal lag length of the model is 2, because it minimises SBC and AIC values. Later, the long-run relationship among variables is determined by Johansen co-integration test.

For determining the co-integration relationship among variables, trace and maximal Eign value statics are used. These results are reported in table 3. Findings of trace statics show that five co-integrating vectors exist, while maximal Eigen results also show that there are five co-integrating vectors at a 5% level of significance, as both test statics are greater than their respective values. So, we reject the null hypothesis of no co-integration and find that there exist five co-integrating equations that allot help to long-run equilibrium relationships included in this study.

Table 3: Johansen and Juselious co-integration results

Hypothesised no. of CE(s)	Trace Statistics	Critical value (5%)	Prob.**	Maximum Eigen	Critical value (5%)	Prob.**
None	258.93*	117.70	0.0000	89.77*	44.49	0.0000
At most 1	169.16*	88.80	0.0000	52.033*	38.33	0.0008
At most 2	117.12*	63.87	0.0000	48.88*	32.11	0.0002
At most 3	68.24*	42.91	0.0000	34.68*	25.82	0.0026
At most 4	33.559*	25.87	0.0045	23.04*	19.38	0.0140
At most 5	10.51	12.51	0.1056	10.51	12.51	0.1056

Table 4: Normalised co-integration coefficient

Lncrime	Lnhk	Lncor	Lnqol	Lnmi	Lnrol
1.00	-0.07893	-0.2947	7.03734	-0.073857	0.002730
S.E.	0.03782	0.04756	2.40535	0.00968	0.00948
t-value	2	6	3	7	0.28

Normalised co-integration equation results are presented in table 4, which provides information about the long term relationship among variables. The results are as follows:

$$lncrime = 0.078lnhk + 0.29lncor - 7.03lnqol + 0.07lnmi - 0.002lnrol \quad (3)$$

t-value (2) (6) (3) (7) (0.28)

The results show that the h,uman capital coefficient is 0.078 which positively affects crime rates and is statistically significant. This indicates that a 1 percent rise in human capital increases crime by 0.078 percent in the long run in the case of Pakistan. This means there is a

positive association between human capital and crime, which is against the expectations. These results are consistent with earlier findings where education is positively related to crime, see for example Comer, (2003) and Lochner, (2013), and in Pakistan, Qadri et al. (2011) and Asghar et al. (2016). It does not mean that education increases crime, but it may be the use of human capital in negative activities, as people use improved ways to commit a crime like white-collar crime and misuse human capital. Another reason is unemployment and lack of foreign investment due to which educated people do not find jobs according to their qualifications.

The results show that corruption affects positively and significantly the crime rate, with an elasticity of 0.29. The corruption coefficient shows that a 1 percent increase in corruption, on average,s leads to a 0.29 percent increase in the crime rate. This result is consistent with the findings of Asgher et al. (2016). They found a positive and statistically significant relationship between corruption and crime in the case of Pakistan. The reason for this relationship is that there is less risk of being caught and low chances of punishment if caught. Furthermore, in the case of Pakistan, people escape punishment by resorting to things like bribery if caught. A high level of corruption, money laundering and black marketing in the economy cause crime rates (Dijk, 2007).

The coefficient of QOL is -7.03, which negatively and significantly affects the crime rate. The coefficient shows that a 1 percent increase in QOL, on average, will decrease the crime rate by 7.03 percent. This means better quality of life may reduce the crime rate. QOL is measured by life expectancy which is increasing in Pakistan over time. These findings are consistent with the theory of Dunkel et al. (2013), which states that in the case of short life expectancy, people's self-control decreases and people commit more crime, while in longer life expectancy scenarios people do not lose their self-control and commit less crime. A high level of quality of life leads to a reduction in the crime rate (Michalos and Zumbo, 2000).

The coefficient of misery index is 0.07, which positively and significantly affects the crime rate. The coefficient indicates that a 1 percent rise in the Misery index, causes up to 0.07 percent rise in the crime rate in the long run. This result is the same as the finding of Saboor et al. (2016) and Asgher et al. (2016), who find a positive and significant relationship of misery index with the crime rate. An argument in favour of this relationship is that Pakistan, being a developing country, has low economic growth, which leads to unemployment and inflation. As a result, the crime rate increases.
The coefficient of rule of law is -0.002, which negatively affects the crime rate but, it is statistically insignificant. This implies that a 1 percent increase in rule of law decreases crime by 0.002 percent, on average, in the long run in Pakistan. In Pakistan, terrorism is reducing due to the efforts of the Pakistan army, which means that if there is an improvement in rule of law in Pakistan crime will decrease as people will commit less crime due to the fear of strict punishment. Crime is less in countries where strict rules are followed (Dijk, 2007).

VECM is estimated after finding the co-integration relationship between variables. The results are presented in Table 5. Differences from variables capture the short-term dynamic, and

measure the instant effect of independent variables on the dependent variable. A negative and significant value of lagged error correction model indicates co-integration among variables in the long run. Lag length 2 is used while estimating the VECM, as the value of SBC and AIC is minimum at this lag length. Results of first equation establish short-termrelationship of human capital D (lnhk(-2)), corruption D (lncor(-2)), QOL D (lnqol(-2)), misery index D (lnmi(-2)) and rule of law D (lnrol(-2)) with crime D (lncrime(-2)). Results show that corruption, QOL and rule of law have an insignificant short-term relationship while the human capital and misery index has a significant short-term relationship. The value of ECT is negative and significant at -2.56. This indicates that a long-run association exists between crime and human capital, corruption, QOL, misery index and rule of law. The ECT coefficient is -0.512, which shows the speed of adjustment towards long-run equilibrium and indicates that 51 percent of the disequilibrium, on average, is corrected in the next year. In other equations, no regression establishes short-term and long term relationships as ECT of other equations is significant. The value of R^2 is indicated at 0.52, which means 52 percent of the variation is explained by independent variables over the analysis period 1985-2019.

Table 12: Vector Error Correction Model

Variables	D(lncrime)	D(lnhk)	D(lncor)	D(lnqol)	D(lnmi)	D(lnrol)
EC_{t-1}	-0.512 (-2.56)	-0.345 (-1.09)	1.394 (4.10)	0.002 (1.13)	-0.32 (-0.313)	-0.82 (1.16)
$D(lncrime_{t-2})$	0.402 (2.429)	-0.04 (-0.15)	-0.24 (-0.85)	0.0005 (0.31)	0.914 (1.07)	-0.40 (-0.68)
$D(lnhk_{t-2})$	0.244 (1.96)	-0.017 (-0.08)	0.266 (1.25)	-0.001 (-1.21)	-0.77 (-1.21)	-0.15 (-0.34)
$D(lncor_{t-2})$	0.079 (0.68)	0.103 (0.56)	-0.51 (-2.58)	0.0004 (0.39)	-0.67 (-1.13)	0.293 (0.71)
$D(lnqol_{t-2})$	-1.409 (0.06)	9.79 (0.28)	-87.1 (-2.37)	0.80 (3.5)	39.6 (0.35)	36.09 (0.47)
$D(lnmi_{t-2})$	0.092 (2.06)	0.02 (0.28)	-0.04 (-0.59)	0.0005 (1.18)	0.0414 (0.18)	0.03 (0.21)
$D(lnrol_{t-2})$	0.103 (1.706)	0.053 (0.56)	-0.02 (-0.24)	-0.0006 (-0.9)	-0.019 (-0.06)	-0.02 (-0.105)
Constant	0.021 (0.233)	-0.04 (-0.32)	0.37 (2.40)	0.0005 (0.59)	-0.22 (-0.47)	-0.11 (-0.35)
R^2	0.52	0.08	0.49	0.55	0.21	0.13
F-Statistic	3.19					

The results of Toda Yamamoto Causality are presented in table 6, where statics of Wald test probabilities of (χ^2) are given. VAR is estimated with 2 lags by seemingly unrelated regression

method as k+d(max) = 2. To examine the restriction on the variables the Wald test is applied only on the second k coefficient in the model. Following are the results:

Table 6: Toda Yamamoto causality

Dependent Variable	Sources of Causation					
	Lncrime	Lnhk	Lncor	Lnqol	Lnmi	Lnrol
	Mwald test (χ^2)	Mwald test (χ^2)	Mwald test (χ^2)	Mwald test (χ^2)	Mwald test (χ^2)	Mwald test (χ^2)
Lncrime	---	14.33 (0.0002)*	4.060 (0.0493)**	10.087 (0.0015)*	4.527 (0.0333)**	0.345 (0.5568)
Lnhk	1.495 (0.2213)	---	2.40 (0.9961)	0.6813 (0.4091)	2.831 (0.092)***	0.0017 (0.966)
Lncor	0.03117 (0.859)	2.043 (0.1529)	---	4.669 (0.0307)*	2.830 (0.092)***	3.594 (0.05)**
Lnqol	1.927 (0.1650)	11.033 (0.0009)*	0.118 (0.730)	---	4.76 (0.0291)**	3.900 (0.048)**
Lnmi	0.701 (0.402)	14.89 (0.0001)*	10.053 (0.0015)*	2.26 (0.1324)	---	5.037 (0.024)**
Lnrol	0.441 (0.506)	0.7128 (0.398)	2.72 (0.098)***	1.158 (0.281)	1.55 (0.2130)	---

*'** and*** shows 1%, 5% and 10% level of significance.

In equation 1 four unidirectional causalities are running from human capital, corruption, QOL and misery index towards crime rate. Causality from human capital to crime and QOL to crime is significant at a 1 percent level of significance, while causality from corruption to crime and misery index to crime is significant at a 5 percent level of significance. This means that in Pakistan human capital, corruption, QOL and misery index cause to increase the crime rate. First human capital causes to increase the crime rate. This does not mean that education causes crime, but it may be the use of human capital in negative activities, as people use improved ways to commit a crime like white-collar crime and misuse the human capital (Lochner, 2013). Corruption also causes crime as high levels of corruption, money laundering and black marketing in the economy cause to increase the crime rate (Dijk, 2007). QOL causes crime as when basic facilities of life are not provided people include themselves in committing the crime. Crime is less in the areas where QOL is better (Michalos and Zumbo, 2000). Misery index also causes crime as Pakistan being a developing country has low economic growth, which leads to unemployment and inflation which are known causes of the crime rate (Asghar et al., 2016). In equation 2, there is no unidirectional causality. In equation 3, there is one unidirectional causality running from QOL to corruption, at a 1 percent level of significance,

which means QOL causes corruption in Pakistan. As people improve their QOL, they indulge themselves in bribery, black marketing and a high level of corruption.

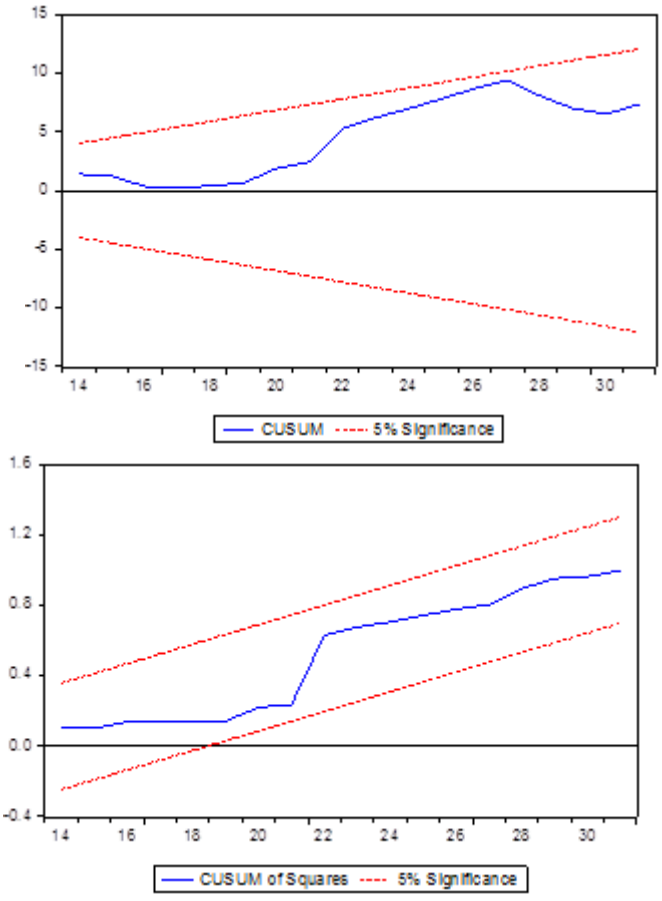
In equation 4 three causalities are running from human capital, misery index and rule of law towards QOL at 1 percent, 2 percent and 2 percent level of significance, respectively. First human capital causes QOL, as when the level of education and health increases QOL becomes better, as health expenditure has been increased by the government. Health facilities are provided by both the private and public sector in Pakistan and cause life expectancy to increase (Shahbaz et al., 2015). Secondly, the misery index causes QOL, which economic misery causes a lower life expectancy rate in Pakistan. Due to the energy crisis in the early 1990s, there has been a reduction in employment opportunities, and in the production process demand and supply have also been affected by the energy crisis, which leads to inflation (Shahbaz et al., 2015). Rule of law also causes QOL. As strict rule of law decreases crime rate and as a result, QOL will increase. In equation 5 there is unidirectional causality running from rule of law towards the misery index at a 5 percent level of significance, which means rule of law causes the misery index. Good governance reduces misery, which means strict rule of law leads to reduced misery index, while worse governance raises misery in the economy (Dadgar and Nazari, 2012). Bidirectional causality exists between human capital and misery index, which means human capital causes misery index, in turn, misery index also causes human capital. Increment in health expenditure and reduction in illiteracy rates causes lower economic misery in Pakistan (Shahbaz et al., 2015). On the other hand, because of the energy crisis in the production process, demand and supply forces are affected and unemployment increases, which in turn causes lower human capital. Second bidirectional causality is found between corruption and misery index. Corruption causes misery index, in turn, misery index also causes corruption. Corruption is effective in causing inflation by a budget deficit in developing countries like Pakistan (Samimi et al., 2012). And because of corruption, job opportunities for eligible people reduces. Yet because of economic misery corruption also increases. A third bidirectional causality exists between corruption and rule of law. This means rule of law causes corruption, in turn, corruption also causes rule of law. A strong rule of law causes lower corruption, as a strict rule of law is a strong instrument for controlling corruption (Mendonca and Fonseca, 2012). Conversely, a weak rule of law causes a higher level of corruption (Huntington, 1968).

Table 7: Diagnostic test results

Ramsay's Reset Test		
Ramsay stat	P-Value	Result
0.208	0.65	Equation is correctly specified.
Serial correlation LM Test		
LM Stat	P-Value	Results
0.69	0.50	No serial correlation problem.
Heteroskedasticity Test		
ARCHA stat	P value	Results
0.288	0.91	No heteroskedasticity problem.
Jarque-Bera Testl		
Jarque-Bera	P-Value	Results
1.867	0.3943	Residuals are normally distributed.

Findings of diagnostic tests are presented in table 7. Ramsay's test is estimated by using the square of fitted values which confirmed that the model has the correct functional form as the p-value is greater than 0.005. Thereby, the null hypothesis is accepted that the equation is incorrect functional form. LM test indicates that there is no serial correlation problem among the variables as the p-value is greater than 0.05. Therefore, the null hypothesis is accepted that there is no serial correlation problem. Findings of the heteroskedasticity test imply that, as the probability value is greater than 0.05, there is no heteroskedasticity problem in the model. Hence, we can accept the null hypothesis that there is no heteroskedasticity problem. Jarque Bera (J–B) normality test has a probability value of 0.3 which is greater than a 5 percent level of significance. This shows that residuals are normally distributed. Thus, findings show that the estimated parameters of the model are correct and useful for the policy measure, as all diagnostic tests affirm the validity of the model. The findings indicate that the Cumulative sum (CUSUM) and Cumulative sum of the square (CUSUMQ) lie within the critical lines. This shows that the model is stable over time or parameters of the estimated model are stable over time.

CUSUM and CUSUM Square plots



Conclusions

This research is an effort to examine the impact of human capital, corruption and QOL on the crime rate in the case of Pakistan. The relationship among variables is checked by different econometric techniques using data over the period 1985-2015. For determining the long-run relationship Johansen co-integration method has been applied, and for the short-term

relationship, Vector Error Correction Model (VECM). The long-run findings indicate that human capital and corruption have a positive and statistically significant effect on the crime rate in Pakistan. Human capital is positively linked with crime because it is used in performing negative activities like white-collar crimes, due to which crime is rising. Another reason is the lack of employment opportunities, as people with higher education do not get jobs according to their qualifications and as a result, human capital is misused. There is also a positive relation of corruption crime in the long run, as in case of corruption there is less risk of being caught and punished. Therefore corruption is increasing in Pakistan and as a result crime increases. On the other hand, QOL is negatively and significantly related to the crime rate in the long run, which means that better quality of life leads to a low crime rate, as QOL is measured by Life expectancy, which is increasing in Pakistan because of improvement in health facilities. Moreover, the misery index is positively related to crime in Pakistan. The misery index is comprised of inflation, unemployment and interest rate, and when inflation, unemployment and interest rates increase, people will commit more crime. Rule of law is negatively related to the crime rate, as strict rules and punishment can reduce crime. To inhibit crime, restrictions should be applied to the misuse of human capital. The government should pay attention to enhancing human capital, and make people aware of how to use human capital in the right way. As a result, people will have better health and education facilities and they will enjoy more earnings as they get more opportunities and will be less likely to become involved in wrongdoings. Employment opportunities should be provided according to the qualification and experience of the individuals. This will cause a reduction in under unemployment. Pakistan is among those countries that have the highest rates of corruption. The government of Pakistan should take effective steps to get rid of this problem, and proper checks and balances should be imposed in the country at every level so that corruption can be identified and tackled properly. Law and order situations should be brought under control to reduce corruption, as a strict rule of law causes to combat the problem of corruption and crime rate. The misery index is another reason for the high crime rate in Pakistan, which can be controlled by overcoming the problem of the energy crisis. In the production process, it positively affects the forces of demand and supply and prices decrease. The purchasing power of the people thus increases and people will be able to meet their basic needs, in this way they will commit less crime. On the other hand, employment opportunities should be created to avoid the problem of unemployment so that people earn their livelihood through legal means.

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