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Urbanisation and Crime: A Case Study of Pakistan

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1. INTRODUCTION

Crime is an activity which is against the law and the fact that the linkage between criminal activities and the socio-economic development of the society is undeniable. Moreover, the relationship between crime and evolution of mankind may also be considered a historical one as Cain (first son of Adam and Eve) committed first crime when he murdered his brother Able because of jealousy. Due to the complex nature of the subject of crime, for example, regarding its causes and consequences, various academic disciplines such as criminology, sociology, geography, psychology and demography study it from their own perspective. A relatively new emerging field, however, is the economics of crime which tries to identify the socio-economic causes and consequences of criminal activities in a society.

Marshall and Clark (1952) wrote: "A crime is any act or omission prohibited by public law for the protection of the public and punishable by state in a judicial proceeding in its own name". Similarly Tappan (1960) defined that "A crime is an instrumental act or omission in violation of criminal law, committed without justification and sanctioned by the state as felony or misdemeanour". Though in case of criminal activity the net social benefits are negative but there are some advantages also like new jobs for crime prevention. Using cost and benefit analysis many theories have explained the trends in criminal activities. For the criminal person the cost is punishment plus time which he has to spend in custody. On the other hand, the cost for the victims may include security expenses and the loss of money etc. In a strictly economic sense, a criminal is taken as a rational person as he compares the costs and benefits of committing a crime [Becker (1968)].

As urbanisation is the process of growth in urban areas. Industrialisation, specialisation, and economic development are related to the theories of urbanisation. A basic feature of urbanisation is the shifting in employment from rural to urban or industrial sector. In other words, urbanisation is an indicator of industrial development in the economy. Labour market pooling, trade of goods and services, knowledge spillover, high level of income and economic relations are the basic pillars of urbanisation. This

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type of development is helpful for employment creation, poverty reduction and planned local business development in the urban regions. Theories suggest that urbanisation is good for promoting growth of industries and development in the economy. The other face of this urbanisation may be the encouragement of crimes as well, since, crimes normally occur in large cities and in urbanised areas [Krivo and Peterson (1996)]. In rural areas, due to lower population density, criminal persons have less chance of hiding themselves because people know each other. The opposite is true for urban areas. The main facts of crimes in urban areas are the fewer chances of arrest and recognition [Glaeser and Sacerdote (1996)]. Therefore, it is argued that as urbanisation increases so does crime [Galvin (2002); Gaviria (2002)]. Hence, one may argue that more urbanisation is an indicator of higher crimes. This is a common observation for many countries in the world. Through out the world the rate of expansion of urban population is on the rise because of substantial industrial development. As Gumus (2004) argued that in 1950, 30 percent of world population was living in urban areas where as, in 2000, this value reached 47 percent. It is estimated that this figure will reach to 60 percent in 2030. In Pakistan there is rapid increase in crimes like the other countries of the world. It may be the effect of urbanisation, and some other economic and socio economic factors.

There has not been undertaken a systematic comprehensive study for Pakistan on the above mentioned issue. Several explanations have been provided on crime in the literature but none of these provide a sound analysis of linkage between urbanisation and crime. Therefore, there is dire need to fill this gap in the literature by conducting an empirical investigation on the relationship between crime and urbanisation. This provides the motivation for the underlying study. More specifically, the objective of this study is to find the relationship between crimes and urbanisation and some other macroeconomic factors such as unemployment, and inflation. The question is what will be the impact on crimes when large numbers of people settle down in a single city? Using time series data for Pakistan the study covers the period of 1963-2008.

Using Johansen cointegration analysis, the results indicate that there is a positive association between urbanisation and crime in Pakistan. Moreover, unemployment, inflation, and income inequality are also important determinants of crimes. Education, on the other hand, is found to have a negative effect on criminal activities. For the purpose of robustness of results, three models are estimated using various variables. This also takes care off for the multicolinearity problem.

Rest of the study proceeds as follows; Section II briefly reviews the related literature on crimes and their determinants. Section III discusses the theoretical model and the econometric methodology used in the study. Detail of variables, results and interpretations are presented in Section IV. Section V concludes the study.

2. LITERATURE REVIEW

The economic foundations of criminal justice was developed by Beccaria (1767) and another source of interest in economics of crimes is emerged from the famous novel "Crime and Punishment" by Dostoevsky (1866).

The role of income on the criminal activities is observed by Fleisher (1966). The author argued that income has two possible effects on criminal behaviour. An expected demand side effect is positive and expected supply side effect is negative. Demand side

effect is that when people have higher incomes then there is decrease in criminal behaviour. The supply side effect is that when there is more income in the economy and people want to get that money through criminal behaviour. He estimated that demand side effect is more than the supply side effect that is if there is 1 percent increase in income then the delinquency decreases by 2.5 percent.

Recent theoretical foundations of crime link back to the work of Becker (1968) and Ehrlich (1973). The main contribution on economics of crime is normally related to the work of Becker (1968). He presented a model and argued that a person will commit crime if the expected utility of crime is more than the utility he could get from consuming his time in some other legal activities. Every criminal faces physical and psychological benefits from crime and also costs in terms of law-enforcement. There are two main determinants of costs. One is probability of being caught and the other is the punishment faced if caught. He worked mostly on shaping policies related to the cost of illegal behaviour. Similarly there are also some other macroeconomic factors which affects crimes. Out of those factors unemployment is at number one. The positive association between crimes and unemployment is observed by Ehrlich (1973). He mentioned that unemployment is an indicator of income opportunities from legal sector. So if there is an increase in unemployment rate then the involvement of persons in legal sector also decreases.

The main difference between above two studies was that Becker considers opportunity costs as well as explicit costs and benefits in a society while Ehrlich investigates employment as an indicator of availability of income in a society. Crime rate is high at younger age. In the age of eighteen almost 35 percent people were arrested in Philadelphia, Wolfgang (1972). Similarly Tillman (1987) reported that one third of all men were arrested in California at least once between the age of 18 and 30. The hypothesis of deterrent measures on criminal activities was tested by Mathur (1978) and Witte (1980). Mathur considered two time periods, 1960 and 1970 and found inverse relationship between the certainty and the severity of punishment with all types of crimes because of rationality of the people. Similarly Witte also found negative relationship but he investigated that the effect of certainty of punishment is more as compare to severity. Myers (1983) took random sample of offenders released by federal prisons in 1972. He studied that punishment is not more effective tool for preventing crime. It is better to create opportunities for employment and this will work for reduction in crime.

Further the empirical investigation between crimes and its determinants in urban areas is done by Gumus (2004). He used two types of crime in large US cities. First he took total numbers of property crimes and second he used serious crimes like murder, forcible rape and robbery as a dependent variable. Using cross sectional data of large US cities he found that urbanisation and income inequality are important factors of urban crime. The main facts of crimes in urban areas are the less possibility of arrest and the less probability of recognition and families are less intact in urban areas [Glaeser and Sacerdote (1996)]. Another effect on crimes is observed by Krivo and Peterson (1996). Considering 177 regions, authors estimated the separate models of property and violent crimes and argued that when the neighbours of urban areas are poors then there is more chance of crimes in urban areas.

In Pakistan urbanisation is a serious matter because in 2030 urban population will rise by 140 percent almost [Haider (2006)]. The author argued that this type of fast growth in urbanisation will create unemployment in youth and change the mind of people towards crimes. Urbanisation is not bad in itself because people have the right to improve their living standard and find suitable jobs which is more in urban areas.

3. THEORETICAL FRAMEWORK AND ECONOMETRIC METHODOLOGY

In economic geography, it is argued that if there are economies of scale then those economic regions with more production become more profitable and attract more production. Concentration of production should be focused in some regions or cities instead of spreading it. This will create high income opportunities in those regions or cities and make them more densely populated. More than hundred years ago Marshall (1920) argued that there are three reasons why a firm, situated in a cluster, is more efficient than a firm situated at a secluded place. These reasons are basically the sources of external economies. First reason is that cluster supports the specialised suppliers. For example, when there is need for specialised equipment in the case of new production, this type of clusters can be very beneficial. Second is that cluster of firms can create pooled market for highly skilled labours. The third one is the knowledge spillover effect. With this effect, knowledge is available for other industries also and those industries can get benefit in production. Some studies identified theoretical models which described the conditions of a person when he will commit crime as his objective is the maximisation of utility). Keeping in mind the aforementioned debate and considering Coomer (2003), Gumus (2004), and Gillani, *et al.* (2009) we build a model in which the following determinants of crimes are taken.

Crime = *f* (Urbanisation, Unemployment, Inflation, inequality, education)

In the above model both pure economic and socioeconomic determinants of crimes are considered. More importantly, this model also considers a demographic variable (urbanisation) which has not been considered for Pakistan in the earlier studies. These variables are justified on basis of theory as well as their extensive use in empirical research in the literature on crimes. Most empirical studies concluded that these variables are important determinants of criminal activities in the respective regions of studies. The first variable is urbanisation. Unplanned urbanisation may contribute to crime, and since urbanisation in Pakistan is unplanned [Arif (2003)]. The second explanatory variable is unemployment and it is observed that if the person is unemployed then he must adopt some other ways to get money. Moreover, for an unemployed person, the opportunity cost of committing a crime is also low, which may force him to be involved in illegal activities. Thus, unemployment may have positive effect on crimes [Ehrlich (1973); Hagan's (1993); Thornberry (1984); and Wong (1995)]. The second economic variable is inflation and it is obtain by taking the growth of CPI. Increase in prices normally decreases the real income of individuals. In the light above justification it may be easily be concluded that inflation is important determinant of crimes and its possible effect is also positive [Coomer (2003); Gillani, *et al.* (2009), and Omotor (2009)]. The next two variables are socio economic. First one is the income inequality and the other one is

education. The income inequality is also an important factor which may affects crimes. Gumus (2004) argued that if inequality is more, then people with low income want to adopt the living standard of high income people. It is impossible for low income group to follow the higher living standard with legal work. The last variable is education. Education can reduce the crimes through wages. Basically education is the source for raising wage of a person. Lochner (2007) argued that education has two possible ways to reduce crimes. First way is that good education increases the opportunity cost of crimes because criminal needs time for committing crime and that time cannot be used in other productive purposes like legal work because high education confirms the better job opportunities in legal sector. Second is the time wastage of criminal for being in custody or in jail. This cost is very high for criminal because he can raise his income by spending his time in other ways.

3.1. Econometric Methodology

The underlying section discusses the econometric methodology used in the study. It is the Johansen Cointegration technique that started by Engel and Granger (1987). It was further advanced by Stock and Watson (1988), Johansen (1988) and Johansen and Juselius (1990). The purpose of using this technique is to find cointegration among stationary time series. All variables are non stationary at level but stationary at first difference. It means that variables can be cointegrated. The stationary linear combination is called the cointegrating equation and interpreted as a long run relationship among the variables. For investigating long run relationship among the variables we apply the most reliable Johansen Maximum Likelihood (ML) approach for the following equation.

$$Crimes = \beta_0 + \beta_1 Urbanization + \beta_2 Unemployment + \beta_3 Inflation + \beta_2 IncomeInequality + \beta_3 Education$$

3.2. Johansen Cointegration Technique

Basically two types of statistics (trace statistics and maximum eigenvalue) are used for checking cointegration. The explanation of these statistics is given below.

Johansen methodology starts from vector autoregression (VAR) and can be writes as

$$\Delta Y_t = A_o + \Pi Y_{t-p} + \sum_{j=1}^{p-1} A_j \Delta Y_{t-1} + \varepsilon_t$$

Let Y_t be vector of variables with sample t where Y_t follow the I(1) procedure. In above equation Y_t and Y_{t-1} are integrated at I(1). The long run stable association between Y_t is determine by the ranks of Π which is r and is zero. In this situation above equation slice to VAR model of pth order. So conclusion is that when variables are stationary at level then there is no cointegrating relation between them. If this the case like $0 < r <$ n then there are nYr matrices of $\delta\omega$ and now we can write

$$\prod = \delta\omega'$$

Where δ and ω normally shows the power cointegration relationship. Further $\omega' Y_t$ is I(0), and Y_t is I (I). In this case, (A0, A1,….., Ap-1, Π) is estimated through ML method

and two steps approach is adopted for the estimation of the parameters. Initially, the process starts to regress ΔY_t on ΔY_{t-1}, ΔY_{t-2},…… ΔY_{t-p+1} and obtain the residuals $\hat{v}_t$. Second step is to regress Y_{t-1} on ΔY_{t-1}, ΔY_{t-2},…… ΔY_{t-p+1} for the residuals $\hat{\varepsilon}_t$. With the help of these residuals variance- covariance matrix is estimated.

$$\sum\nolimits_{vv}^{\wedge} = \left[\frac{1}{T}\right]\sum_{t=1}^{T}\hat{v}_t\hat{v}_t'$$

$$\sum\nolimits_{\varepsilon\varepsilon}^{\wedge} = \left[\frac{1}{T}\right]\sum_{t=1}^{T}\varepsilon_t\hat{\varepsilon}_t'$$

$$\sum\nolimits_{v\varepsilon}^{\wedge} = \left[\frac{1}{T}\right]\sum_{t=1}^{T}v_t\hat{\varepsilon}_t'$$

Now the ML estimator 'ω' can be obtained by solving:

$$\left|\eta\sum\nolimits_{\varepsilon\varepsilon}^{\wedge} - \sum\nolimits_{\varepsilon v}^{\wedge} INV(\sum\nolimits_{vv}^{\wedge})\sum\nolimits_{v\varepsilon}^{\wedge}\right| = 0$$

With the Eigen-values $\hat{\lambda}_1 > \hat{\lambda}_2 > \hat{\lambda}_3 > \ldots\ldots\ldots > \hat{\lambda}n$ the normalised cointegrating vectors are $\hat{\omega} = (\hat{\omega}_1, \hat{\omega}_2, \ldots..\hat{\omega}_n)$, such that $\hat{\omega}'\sum\nolimits_{\varepsilon\varepsilon}^{\wedge}\hat{\omega} = I$. Further one can estimate the null hypothesis that $r = h$, $0 \leq h < n$ adjacent to another one of $r = n$ by obtaining the following statistics as given below:

λ trace = $L_A - L_0$

Where,

$$L_0 = -\left(\frac{T_n}{2}\right)\log(2\prod) - \left|\frac{T_n}{2}\right| - \left(\frac{T}{2}\right)\log\left|\sum\nolimits_{vv}^{\wedge}\right| - \left(\frac{T}{2}\right)\sum_{j=1}^{h}\log(1-\hat{\lambda}_t)$$

And

$$L_A = -\left(\frac{T_n}{2}\right)\log(2\prod) - \left|\frac{T_n}{2}\right| - \left(\frac{T}{2}\right)\log\left|\sum\nolimits_{vv}^{\wedge}\right| - \left(\frac{T}{2}\right)\sum_{j=1}^{n}\log(1-\lambda_t)$$

Hence

$$L_A - L_0 = -\left(\frac{T}{2}\right)\sum_{j=1+h}^{h}\log(1-\hat{\lambda}_t)$$

$$2(L_A - L_0) = -T\sum_{j=r+1}^{h}\log(1-\hat{\lambda}_t)$$

Where $\hat{\lambda}_{t+1}, \ldots..\hat{\lambda}_p$ are the calculated *p-r* smallest Eigen-values. The null hypothesis can be inspected which is that *r* is maximum cointegrating vector between variables. Simply, it is said that it is the number of vectors that is less than or equal to *r*, where *r* is 0, 1, or 2, and onward. Similarly like the upper case the null hypothesis will be examined against the alternative one. So the η max statistics is give below:

$$\lambda_{trace}(r) = -T \sum_{j=r+1}^{h} \log(1-\hat{\lambda}_j)$$

$$\lambda_{\max}(r, r+1) = -T \sum_{j=r+1}^{h} \log(1-\hat{\lambda}_{r+1})$$

The r is null hypothesis while r +1 is an alternative theory of cointegrating vectors. Consequently, hypothesis of $r = 0$ is examined against the alternative supposition of $r = 1$, $r = 1$ against the alternative $r = 2$, and onward. The next step is to decide the lag length so for this objective AIC and SBC are two standard measures for suitable lag length. It depends on minimum value of AIC and SBC for the decision about suitable lag.

4. DETAIL OF VARIABLES AND THEIR SOURCES

The dependent variable set in the study is total numbers of crimes reported in Pakistan from 1964–2008 which is the combination of different crime categories like murders, attempted murder, kidnapping, child lifting, dacoities, robberies, burglaries, cattle theft, and other thefts.

The demographic variable, urbanisation rate (UBZ), is used as independent variable and shows the proportion of total population living in urban areas. Unemployment rate (U) is simply the number of unemployed person out of total labour force. Data on unemployment rate is available for many years in published form. Where ever required, the data gaps are filled by using interpolation through the compound growth rate formula.

Consumer Price Index (CPI) is used for constructing the inflation (π) variable. The year 2000 is used as base year. Taking the growth rate of CPI yields the inflation rate. Income inequality is also a socio economic factor which shows the gap between the incomes of people. Education enables individuals to increase their resources. If a person is more educated, then he has more job opportunities. Hence, education paves the way to earnings through legal activities [Coomer (2003)]. One way to include this variable is to take portion of population who has education of more than 16 years. However, for avoiding the problem of multicolinearity with urbanisation rate the variable set in the study is the ratio of secondary education to higher education enrolments. The construction of this variable is base on the following formula. The ratio of this variable shows the higher education in the economy.

For above mentioned variables published data is used from various surveys, reports and articles. Data on all reported crimes from 1964 to 2008 is taken from various issues of Pakistan Statistical Year Book. These crimes are registered crimes in the sense that the Pakistan Statistical Year Book has obtained this data from Bureau of Police Research and Development, Ministry of Interior. Data on total population and urban population is obtained from various issues of Economic survey of Pakistan. Data on unemployment and labour force is also taken from various issues of Economic Survey of Pakistan for calculation of unemployment rate. Data on consumer price index is also obtained from International Financial Statistics (IFS) for calculating inflation. Data on Gini coefficient is taken from World Institute for Development Economic Research (WIDER).

4.1. Results and Their Interpretation

Table 1 shows the quantitative descriptions of the data. Average value of crimes per 100 persons (Cr) indicates that, in last 45 years, 0.20 crimes are committed per 100 persons. To make it more elaborative, we can say that, on average, 20 crimes are committed in a population of 10,000 persons. Similarly unemployment rate on average is approximately 5 percent. Tend in unemployment rate is moderate but its average value lies towards the upper end of the data. The mean value of unemployment rate demonstrates that the unemployment rate in Pakistan has remained around the natural rate of unemployment. Average values of remaining variables lie almost in the middle of the data which shows that data is almost equally spread to its mean values. The encouraging part of this analysis is the values of standard deviation for these variables, where except for education, the standard deviations in the data for all the variables are less than 1, which is acceptable.

Table 1

Summary Statistics

Variables	Mean	S.D.	Min.	Max.
Crime Per 100 Persons	0.20	0.02	0.01	0.34
Unemployment Rate	5.26	0.37	0.32	8.27
Income Inequality	35.09	0.58	27.52	41.00
Inflation	8.28	0.76	0.17	26.66
Urbanisation Rate	29.46	0.54	22.24	35.84
Education	63.83	1.28	48.68	84.38

Before estimation it is essential to check for the multicolinearity problem in the data by using correlation matrix. In our estimation we drop some variables; namely per capita GDP and Poverty with the help of above correlation matrix. It is evident from Table 2 that these variables have linear relationship with urbanisation variable.

Table 2

Correlation Matrix

Variables	Crimes	U	PCGDP	Gini	Inf	Edu	UBZ	Pov
Crimes	1.000							
U	0.757	1.000						
PCGDP	0.857	0.596	1.000					
Gini	0.223	0.144	–0.082	1.000				
Inf	–0.008	–0.035	–0.045	0.309	1.000			
Edu	0.527	0.374	0.750	–0.519	–0.057	1.000		
UBZ	0.910	0.749	0.971	0.004	-0.004	0.692	1.000	
Pov	–0.875	–0.742	–0.725	–0.375	–0.041	–0.390	–0.770	1.000

4.2. Unit Root Test

The use of time series data for analysis demands the investigation of presence of unit root in the data. For this purpose, Augmented Dickey-Fuller (ADF) test is applied for the inspection of non-stationarity problem in the variables. ADF test is applied here by considering the following two kinds.

(1) With intercept.
(2) With trend and intercept both.

The general form of ADF test can be written as follows:

$$\Delta x_t = \alpha_0 + \gamma x_{t-1} + \sum_{i=1}^{k} \beta_i \Delta x_{t-1} + \varepsilon_t \text{ (When intercept term is included)}$$

$$\Delta x_t = \alpha_0 + \alpha_1 t + \gamma x_{t-1} + \sum_{i-1}^{k} \beta_i \Delta x_{t-1} + \varepsilon_t \text{ (When intercept and trend included)}$$

Where

$\Delta x_t = x_t - x_{t-1}$

k = Number of lags in the variables and ε_t is the stochastic term

ADF has the following hypothesis

Null Hypothesis Ho: $\gamma = 0$; Variable x_t is Non-Stationary
Alternate Hypothesis H1: $\gamma < 0$; Variable x_t is Stationary

If the calculated value is less than the critical value we will reject the null hypothesis of non-stationarity in data in favour of alternate hypothesis of stationarity of data. However, the acceptance of the null hypothesis would mean that the series is non-stationary at level and required to be different to make it stationary. The results of the ADF test are illustrated in Table 3.

Table 3

Results of the Unit Root Test

Variables	Intercept	Trend and Intercept	Conclusion
Crime			
Level	–1.3468 (0.5993)	–2.6140 (0.2760)	I(1)
1st Difference	–7.5804 (0.0000)	–7.5091 (0.0000)	
Urbanisation			
Level	–1.6725 (0.4378)	–2.9728 (0.1512)	I(1)
1st Difference	–5.2233 (0.0001)	–5.2448 (0.0005)	
Unemployment			
Level	–2.2492 (0.1927)	–1.5598 (0.7923)	I(1)
1st Difference	–4.8503 (0 .0003)	–5.1717 (0.0007)	
Inflation			
Level	–1.2651 0.1864	–3.0231 (0.1377)	I(1)
1st Difference	–4.7782 (0.0004)	–4.7326 (0.0026)	
Income Inequality			
Level	–2.4629 (0.1314)	–2.4326 (0.3585)	I(1)
1st Difference	–4.7662 (0.0004)	–4.8335 (0.0018)	
Education			
Level	–1.4869 (0.5306)	–1.8000 (0.6873)	I(1)
1st Difference	–5.6426 (0.0000)	–5.7608 (0.0001)	

The figures of the ADF test shows that all variables are non-stationary at level, supporting the null hypothesis that unit root problem exists in these variables. Consequently, all variables are I (1) which indicates that the data is stationary at first difference. Next step is to select the appropriate econometric technique. The application of either cointegration or Vector Autoregression (VAR) depends on the results of Johansen (1988) cointegration test. If the test shows that there is a unique long run relationship among the variables of analysis, the appropriate technique would be cointegration. On the other hand, the absence of a unique long run relationship among the variables would ask for the application of VAR. Keeping in view the above discussion, we apply the Johansen cointegration test to detect a unique long run relationship among the I (1) variables used in the analysis.

Tables 4 and 5 show the results of Johansen cointegration test. Both the trace statistics and eigenvalue statistics in the two tables show that there is a unique long run relationship among the variables because in both cases the test shows one cointegrating equation at 5 percent level of significance. Thus, the Johansen cointegration test confirms the existence of a unique long run relationship among the variables; namely, crimes, urbanisation, unemployment and inflation. So the hypothesis of zero cointegrating vector is rejected in favour of the alternative hypothesis that there is one cointegrating vector. It suggests that we should apply the cointegration technique and interpret the long run parameters obtained from this estimation. We now turn to the estimation of variables. The results of Johansen estimation are demonstrated in Table 6.

Table 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesised No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.524653	55.45818	47.85613	0.0082
At most 1	0.255807	23.47868	29.79707	0.2234
At most 2	0.214283	10.77410	15.49471	0.2258
At most 3	0.009358	0.404294	3.841466	0.5249

Table 5

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesised No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.524653	31.97950	27.58434	0.0127
At most 1	0.255807	12.70458	21.13162	0.4798
At most 2	0.214283	10.36981	14.26460	0.1888
At most 3	0.009358	0.404294	3.841466	0.5249

Table 6

Cointegrating Coefficients

Variables	Coefficient	Std. Error	t- Statistics
Urbanisation	0.020590	(0.00414)	4.9734
Unemployment	0.012471	(0.00606)	2.0579
Inflation	0.010611	(0.00200)	5.3055

Results of Table 6 confirm that all three variables are the important determinants of crimes in Pakistan. Results suggest that all the variables are significant at conventional levels of significance. These results are logical because urbanisation in Pakistan is a serious matter and motivating people towards crimes. The lack of planning regarding the expansion of urban areas (urbanisation) results in scarcity of resources, which in turn motivate people to involve in criminal activities. People move from rural areas to the cities in search of higher earnings. However, when they do not get jobs, or get jobs with lower earnings, they may turn to criminal activities in order to fulfil the desire of higher earnings. Unfortunately, the records of all these people are not present with the concerned authorities, which may help them to hide themselves easily in the populated urban areas. The lack of record and high population density raises the probability of not being caught after committing a crime. This means that the opportunity cost of involving in criminal activities is low, which is a motivational factor for involvement in crimes.

Second economic determinant is unemployment which has also positive impact on crimes. Our result is consistent with the work of Becker (1968), Ehrlich (1973) and Wong (1995). They concluded that unemployment is an indicator of income opportunities from legal sector. Hence, the increase in unemployment reduces income opportunities from legal sector which thereby raises the possibility of committing crimes. The third economic variable, inflation, also has positive impact on crimes in case of Pakistan. Inflation has an adverse effect on the real income of an individual. Consequently, if that individual desires to keep his utility at the same level, he will have to raise his real income, which may force him to be involved in criminal activities [see, for example, Allen (1996), and Omotor (2009)].

Tables 7 and 8 show again the Johansen cointegration test but this time the variables included along with urbanisation are income inequality and education. In the previous case the two variables with urbanisation were pure economic variables whereas in this case the variables are socioeconomic. The trace statistics and eigenvalue in these two tables show the unique long run relationship among the variables. Thus again the Johansen test confirms the long run relationship among the variables.

Table 7

Unrestricted Cointegration Rank Test (Trace)

Hypothesised No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.545250	33.88429	28.58808	0.0095
At most 1	0.342494	18.02995	22.29962	0.1777
At most 2	0.168445	7.931664	15.89210	0.5559
At most 3	0.108707	4.948524	9.164546	0.2891

Table 8

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesised No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.545250	33.88429	28.58808	0.0095
At most 1	0.342494	18.02995	22.29962	0.1777
At most 2	0.168445	7.931664	15.89210	0.5559
At most 3	0.108707	4.948524	9.164546	0.2891

The cointegrating coefficients are presented in Table 9. Once again the results confirm that urbanisation has significant positive effect on crimes in Pakistan. The results also confirm the fact that income inequality is an important determinant of crimes in this country. Nonetheless, this result is contradictory to Fleisher (1966) and indicates that demand side effect is weaker in Pakistan which implies that if there is more income in the economy or people have more income then they will not commit crimes. In other words, they will not adopt the illegal way of earning money because they already have the money from some other legal sources. However, in Pakistan, the supply side effect is stronger which implies that when the gap between "haves" and "have not" is widened, then the "have not" will adopt illegal ways to earn money the rich ones. Thus, we can conclude that income inequality has long term positive relationship with crimes in Pakistan.

Table 9

Cointegrating Coefficients

Variables	Coefficient	Std. Error	*t*-Statistics
Urbanisation	0.026001	(0.01124)	2.6684*
I. Inequality	0.056076	(0.01159)	3.2311*
Education	0.011953	(0.00581)	2.0573*

The second socioeconomic variable, education, is also indicating long run positive relationship with crimes. We are linking crimes here with the higher education. The reason of positive relation is the unavailability of jobs to those who hold higher degrees. After completion of education, when these young degree holders do not find jobs, may be due to corruption or limited number of vacancies. The increase in unemployment variable is also showing the involvement of educated persons in illegal activities. Table 9 is showing t-values which are significant at 5 percent level of significance.

For determining the true sign of education we run the third model on which explanatory variables are urbanisation, unemployment and education. Still the long run and unique relationship exist and by including unemployment with education results are significant and give us the negative sign of education variable. So now we can conclude that higher education has negative relation with crimes in Pakistan.[1]

[1]We have also run the regression using the interaction term of education and unemployment and found the sign positive. This means that the presence of educated unemployed persons has positive effect on crimes.

4.3. Robustness of Results

One of the purposes of estimating three models was to check the robustness of results. Table 10 is constructed to summarise the results of the three models. This also make is effortless to check the robustness of parameters values. It can easily be viewed from the table that the coefficient of urbanisation is very robust both in terms of value and sign. The significance of the variable is not affected either in three models. Hence, we can easily conclude that urbanisation is a robust determinant of crimes in Pakistan.

Table 10

Cointegrating Coefficients

Variables	Model 1	Model 2	Model 3
Urbanisation	0.020590	0.026001	0.012046
	(4.9734*)	(2.6684*)	(3.1700*)
Unemployment	0.012471		0.031316
	(2.0579*)		(4.1922*)
Inflation	0.010611		
	(5.3055*)		
I. Inequality		0.056076	
		(3.2311*)	
Education		0.011953	-0.004424
		(2.0573*)	(2.6975*)

5. CONCLUSION

The first and the main conclusion is that there is positive association of urbanisation with crimes in Pakistan. With the help of three models we conclude that urbanisation is very important determinant of crimes in case of Pakistan. Because in all models we include different variables with urbanisation but there is no big change occur in value of the coefficient of urbanisation. This robust analysis shows the very strong positive relation of urbanisation with crimes in Pakistan.

The other outcome is that in Pakistan inflation, unemployment and income inequality also the main determinants of crimes. Education also shows positive relation with crimes but this is not the right sign because we estimate model with urbanisation, unemployment and with education then its sign become negative. It means that unemployment captures the sign of education so its right sign is negative. If there is more high education in Pakistan then this will reduce the crimes also.

The next important outcome is the cause of this relation which is the lack of planning of urbanisation. As hundred years ago Marshall (1920) identified the benefits of urbanisation like knowledge spillover because of cluster of highly skilled workers. Similarly labour market pooling and specialised suppliers. These are all the benefits of urbanisation. But in case of Pakistan urbanisation causes more crimes. So the reason behind is the unplanned urbanisation in Pakistan. Because of this lack of planning resources become scarce, land shortage problem and environmental degradation occur which motivate people towards crimes.

This study brings the important policy implications. The policy makers should make some planned districts for adjusting the urbanisation into those districts. These

districts should have more chance of employment and more capacity to absorb the rapid urbanisation. After getting good education people do not have suitable job. Then those persons can adopt illegal ways to earn more money. But the special focus should be on infrastructure development because since 1964 urbanisation increases.

Second important implication is that government should create job opportunities in rural areas as well. This process will reduce the burden of unemployed persons in urban areas and finally reduce crimes. Moreover, the policy makers should try to keep inflation within acceptable limits so that the real income of consumers does not lose its purchasing power.

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