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Unemployment and Property Crimes in Pakistan

Abstract

The study examines the relationship between unemployment and property crimes for Pakistan covering the period of 1975 to 2008. The Johansen cointegratiom methodology along with Granger causality through VEC is applied to the annual time series data. The results of the cointegration analysis provide evidence of a valid long-run relationship between unemployment and different kinds of property crimes. The results provide evidence of unidirectional causality running from unemployed to different kinds of property crimes. The causality results explain that unemployment Granger cause theft, dacoity, robbery and cattle theft while it does not cause burglary.

Introduction

The prevalence of unemployment in an economy provides the unemployed persons an impetus to commit crime for monetary gains. The crime rate is affected with labor market conditions. For example, if unemployment rate increases, the opportunities for legal earnings declined and crime score tend to jump up because real costs associated with crime for unemployed labor force go down. A number of studies supported the notion that worsened conditions in the labor market are associated with higher property crime rates (see for instance, Levitt 1996; Doyle, et. al. 1999; Raphael and Winter-Ebmer 2001; Gould, et. al. 2002). For a country where majority of the young is jobless crime may become a sport activity. According to the theory of economics of crime, unemployment has a cost, i.e. it increases property crime. In addition high unemployment is costly as it keeps parts of the labor force out of production and, if persistent is likely to decrease the skills and know-how of the labor force.

Crime is an ailment to society which affects and attacks the rights of individuals. It is like a cancer metastatic to society. It impacts the economic, social, and cultural development, both nationally and internationally---a hard fact that we can no longer afford to ignore. The incidence of crime has become an extremely important social and economic issue in Pakistan. The crimes impose enormous costs on victims, families of offenders and society as a whole. It inflicts psychological and monetary damage to the society.

The theory of economics of crime, fundamentally based on Becker's (1968) theory considers crime as a type of work, as it takes time (along with cost of probability of lowering wages in future employment, imprisonment, fine, physical torture and psychological guilt of crime) and yields economic benefits (along with psychological gains). The theoretical model is thus applicable on property crimes. An individual makes choice between employment and crime as source of income during one period. Employment and crimes are regarded as alternative activities that cannot be combined. The model describes the supply of crimes (see also Ehrlich 1973; Freeman 1999). Dynamic models as well as models allowing the combination of employment and crime have also

been developed and used in economics of crime (see for instance, Wittee and Touchen 1994).

Freeman (1999) pointed out that an estimated positive relation between unemployment and crime need not necessarily imply that unemployment causes crime, but may merely reflect that both are affected by factors that have generally been omitted from the analysis. So in the literature, in addition to factors motivated by theory of crimes, a number of control variables are generally included in models on unemployment and crimes (see for instance, Doyle, et. al. 1999; Paphael and Winter-Ebmer 2001; Gould, et. al. 2002)

A number of studies in the area of sociology, criminology, psychology, have attempted to identify and trace out the socioeconomic determinants of crime. The prevalent determinants identified are unemployment, family and cultural background, education, urbanization (Gillani, et. al. 2009), poverty, income inequality, age, gender etc. All these determinants have effect on crime but unemployment is regarded the most powerful determinant instigating individuals to commit crime. Raphael, et. al. (2001) in their instrumental variable analysis have given support for a causal direction from unemployment to crime.

Conceptualizing property crime as a form of employment requires time and generates income (Wittee and Touchen 1994). A rational offender compares returns to time use in crime and employment and makes decision accordingly. Cateris peribus, the decrease in income and potential earnings associated with involuntary unemployment increases the relative returns to crime. Moreover, the individuals that experience chronic joblessness have less to lose in the event of an arrest and incarceration. This economic reasoning suggests that unemployment is an important factor of property crimes in an economy.

In the literature, there is discussion on possible effects of crime on unemployment. Raphael, et. al. (2001) explained that high and increasing crime in a community has a deterrent effect on the setting up of new industries or even scare existing companies away that naturally restrains employment in that area. Nagin and Waldfogel (1995) narrated that individuals with a criminal record (with conviction and incarceration) have fewer opportunities to find work, which may lead to lower employment. In areas with many ex-criminals thus would have a lower employment opportunities. Gould, et. al. (1998) further added that companies in areas with high criminality are disadvantaged through having to pay higher wages in order to compensate their employees for bad areas. Hence there are good reasons to believe that there exists a causal relationship between unemployment and crime.

Despite the appeal of causal relationship argument, empirical research has been unable to document a strong causal effect on crime. Schuller (1986 for Sweden) found a positive relation between unemployment and crimes. Rafael and Winter-Ebmer (2001) originated a sizable positive effect of unemployment on rates of specific violent as well as property crimes (see also Gould, et. al. 2002 for USA; Charmicheal and Ward 2001 for United Kingdom; Daniel and Holoviak 2002 for Australia, Japan and South Korea). Scoreu and Cellini (1998 for Italy) concluded that unemployment is a significant variable for theft. Bushway and Engberg (1994) found two-way Ganger causality for unemployment and crimes. However, Papps and Winkelmann (1998) and Entorf and Spengler (2000 for West Germany) have shown weaker effect of unemployment on crimes. These insignificant results may be due to insufficient variations in the unemployment rates. Entorf and Spengler (2000) even have reported negative estimates for some theft crimes. Corman, et. al. (1987) have found no Granger causaliy in both directions for unemployment and crimes.

Studies of aggregate crime rates generally find small and statistically weak unemployment effect, with stronger effects for property crime than for violent crime. Moreover, the crime-unemployment relationship is considerably weaker in time series than in cross-sectional comparisons (Freeman 1995). The empirical evidence is thus ambiguous.

The unemployment effect on violent and property crimes differs considerably (Chiricos 1987). It is stronger for property crimes (Levitt 1997; Raphael and Winter-Ebmer 2001) signifying the unemployment property crimes analysis. The property crimes are composed of several different crimes, namely burglary, robbery, theft/pilfering from shops, car and bike theft and fraud. It is possible that the effect of unemployment differs between these crimes. For example, the possibilities to commit fraud may be better for those who hold certain types of jobs, which implies that unemployment could be negatively correlated with this specific crime. It can also be the case that increased unemployment implies less people in movement and less money in circulation, which decreases the supply of crimes that demand a personal meeting. Hence it is motivated to conduct an analysis on the specific property crimes (see also Entrof and Spengler 2000). The objective of this paper is to trace out the empirical relationship between unemployment and specific kinds of property crimes in Pakistan.

An Overview of Crimes in Pakistan

Crime Statistics of Pakistan reports that there is a rapid increase in the number of crimes just like other countries of the world. It may be associated to both economic and non-economic factors but economic factors are considered to be more important than other ones.

The rise in crimes is not only concerned with illiterate and poor class of society but a pool of rich, educated and influential people is also involved in crimes. They are in the marathon of accumulating wealth through illegitimate means. The available crime statistics reveals that the overall economic, social, cultural, technological, environmental, moral and spiritual health of Pakistan is sub optimal.

The crime statistics show that in 1947, 73105 cases were registered and the number reached to 129,679 in 1971, i.e. almost doubled. During the period from1980 to 1990 the crimes were again doubled, from 152,782 to 403,078. The number of crime reached to 616,227 in 2009. The statistics show only the reported crimes. No authentic numbers can be given about the unreported crime in Pakistan. However, about 30-50% crimes are generally considered unreported in the country. The propensity to report a crime may be different for various crimes. For example, it would be high when a report is necessary for insurance purpose, for example car theft, while it is generally lower for violent crimes. Table-1 shows total number of crimes, their growth rates and crime committed per hundred thousand population for selected years from 1951 to 2009.

The figures in table-1 shows that the number of crime per 100,000 populations has gone up from 226 to 376 during the period of 1971-2009. In 1971, the reported crime per hundred thousand populations was estimated at 206 that rose to 323 in 1998. It shows an increase of 82.53 percent in crime in seventeen years. In the next eleven years it raised from 323 to 376, showing the increase of 17.33 percent.

In Table-2, property crimes by type have been reported for the years 1975 to 2008. The total number of reported crime has gone up by about 360 percent during the period 1975-2008. The highest growth is recorded in dacoity and then robbery (robbery is here part of the property crimes even though it is a crime that may lead to violence, since the main reason behind a robbery may be assumed economics benefits, otherwise the individual could just as well commit violent crime such as assault or damage) and the lowest growth is in cattle theft. The nature of crime committed indicates that the increase in crime committed was financially motivated. The figures in table-3 explain a linear increase in unemployment as well as crimes.

Review of Literature

A number of studies have attempted to see the relationship between unemployment and crime.

Antonello and Cellini (1998) investigated the economic determinants of crime rates in Italy. They used cointegration and Granger causality test for the time series data of 1951-1994. Consumption was found to be explaining the pattern of homicides and robberies while unemployment was found better in explaining the theft pattern.

The relationship between unemployment and series of crimes for Asia-Pacific countries, i.e. Australia, Japan and South Korea have been analyzed by Daniel and Holoviak (2002). They employed Johansen maximum likelihood cointegration along with Granger causality tests to find the long-run equilibrium and a causal link between unemployment and crime variables. The results provided a valid long-run equilibrium relationship between youth unemployment and various crime series for three Asia-Pacific countries.

Baron (2006) produced the strain theory by examining what kind of role the unemployment plays in criminal behavior. He used the sample of 400 homeless street youth. The results revealed that the effect of unemployment on crime is mediated and moderated primarily by other variables. The study further revealed that anguish behavior towards unemployment also instigate youth to commit crimes. The lack of sufficient money and limited employment opportunities directly affect the unemployment which ultimately promote crimes. Criminal involvement is accelerated with the support of peers along with lack of panic of punishment.

Armengol, et. al. (2007) analyzed the connection between social structure and information exchange in two competing activities, crime and labor. They took a dynamic model where individuals belong to mutually exclusive two-person groups, referred to as dyads are included. They found multiple equilibriums, i.e. If the legal labor market is not paying them handsome wages so earnings from criminal activities would be profitable as the unemployment allowance does not provide them a guarantee of leading a better life. Whereas if they are having well-paid jobs /or criminal activities do not pay well so they want to remain unemployed and enjoy the unemployment allowances and keep them away from indulging in deviant behavior of

committing crime. The study found that deterrence policy of either punishment or arrest may bring fruitful results because of the close ties between the blue blooded class and the criminals.

Engelhardt, et. al. (2008) investigated the nexus between crime policies and different labor market both quantitatively and analytically. They extended the Pissarides model (Pissarides2000) of labor market to include in it crime and punishment (similar to Becker 1968). They applied the model to United States data. The study explained that all workers, regardless of their position in the labor force, can participate in criminal activities while the employment contract is determined optimally. The study observed that a public spirited unemployment insurance system decreases the crime scores of those who are out of work. At the same time it also affects crime statistics of those who are in work while it depends upon the timings of job, i.e. job duration and jail sentence. The overall result was that the policies brought the crime rate down although the reduction was quantitatively small. The study further found that the subsidies in the wage, though small, reduce the unemployment and crime numbers of those who are in work and of unemployed workers thereby raise the society's welfare. Crime policies have affected the crime scores in a significant manner but they have limited effects on the labor market.

Gillani et al (2009) investigated the nexus between crime, unemployment, poverty and inflation in Pakistan by covering the data for the years 1975-2007. The study used the Johansen Maximum Likelihood Cointegration and Granger Causality tests. The findings revealed the existence of long-run cointegration relationship among crime, unemployment, poverty and inflation. The Granger causality has been tested through Toda-Yamamoto and explained that crime is Granger caused by unemployment, poverty and inflation in Pakistan.

Economic theory proposes a negative correlation between police and crime. However, it is not easy to depict this correlation relationship empirically because the localities with greater numbers of crime need more police personnel. By using a Two-stage least square (2SLS). Lin (2009) found that the elasticity of police availability with respect to crime is about -1.1 (for violent crime) and 0.9 (for property crime). The obtained estimates remained significant thereby suggesting that police reduces crime meaning that there is a negative correlation between police and crime.

We are concerned with the causality analysis of unemployment and property crimes in Pakistan. The novelity of our study is that we have taken the property crimes (see also Chiricos 1987; Levitt 1997; Papps and Winkelmann 1998; Raphael and Winter-Ebmer 2001 for separate analysis of property crimes) instead of all crimes (as used by Gillani, et. al. 2009). The logic behind is that property crimes are peculiarly concerned with lack of income that is ultimately connected with unemployment rate in an economy. Moreover, we have taken different kinds of property crimes instead of making an index or addition of different kinds of crimes. It is to make clear that what kind of crime is more concerned with unemployment.

Data and Model Specifications

The major objective of the study is to explore the link between unemployment and property crimes. Property crimes are defined as the crimes proposed on economic benefits. It varies for economies and different studies have used various crimes as property crimes. For example, Raphael and Winter-Ebmer (2001), Gould, et. al. (1996) and Levitt (1996) have taken burglary, theft/pilfering and motor vehicle theft as property crimes. We used the annual time series data for the years 1975-2010. The data has been taken from Pakistan Economic Survey by Federal Bureau of Statistics (FBS), Handbook of Statistics on Pakistan Economy 2010 by State Bank of Pakistan (SBP) and Bureau of Police Research and Development, (BPRD) Islamabad[1].

Most of the economic variables exhibit a non stationary trend. We checked the stationarity of data, otherwise ordinary least square may generate spurious results. We used the Augmented Dickey-Fuller (ADF) test developed by Dickey and Fuller (1981) to find the unit root problem in data, which is indication for non-stationarity of data. ADF test is based on the following equation:

$$(1\text{-}L)Y_{t=\alpha} + \mu Y_{t\text{-}1} + \sum_{i=1}^{k} \beta_i (1\text{-}L)\, Y_{t\text{-}i} + ut \ldots\ldots (i)$$

Where, L is a lag operator, t denotes time trend, and u_t is a white noise error term. Y_t denotes the variables for which study is testing unit root problem. $Y_{t\text{-}i}$ are the lagged values of variables of our study. β_i are the coefficients of lagged values of $Y_{t\text{-}i}$ to capture the optimum lag length (k), k ensures that there is no correlation between error term and regressors of this equation. Lag length is selected by AIC criterion. The equation is only

[1] Although the common omission from time series regression of variables that exert pro-cyclical pressure on crime rates may lead to downwardly biased estimates of the partial effect of employment on crime.

with constant α and includes also time trend γt afterward along with constant. ADF test checks the statistical significance of μ, if μ has statistically zero value then Y_t has unit root problem and is non-stationary. If μ is not statistically zero then there is not a problem of unit root and Y_t is stationary.

We have also applied Phillips-Perron test that has an extra advantage over the ADF test, i.e. it has been adjusted to take into account of serial correlation and equally applicable for small size or big data.

To see the relationship between unemployment and property crimes, we have used the following variables. Unemployment Rate (UNR = Unemployment rate in Pakistan), Burglary (BUR = Annual number of registered burglary cases), Robbery (ROB = Annual number of registered robbery cases), Theft (THF = Annual number of theft cases), Dacoity (DAC = Annual number of dacoity cases), and Cattle theft (CTHF = Annual number of cattle theft cases).

Cointegration, a multivariate technique, occurs between two or more time series variables, if one or more linear combinations of different nonstationary time series produce stationary time series (Engle and Granger, 1987). The linear combination produces the long run relationship between different time series because it is a description of the lasting effects shared by the different time series (Johansen, 1995). The long run relationship, as a statistical point of view, means the variables move together over time so that short term disturbances from the long term trend will be corrected. A lack of cointegration suggests that such variable have no long run equilibrium relationship and in principle, they can wander arbitrarily far away from each other (Dickey, et al. 1991).

The Johansen (1991) maximum likelihood test is used to test the cointegration between URN, BUR, ROB, THF, DAC, CTHF. That means it examines, whether the series are driven by common trends (Stock and Watson, 1988) or, equivalently, whether they are cointegrated (Engle and Granger, 1987). The test statistic is used as follows;

$$X_t = \delta_1 X_{t-1} + \delta_2 X_{t-2} + \ldots + \delta_k X_{t-k} + \zeta_t \quad \text{..(ii)}$$

Where X_t is the vector of non-stationary I (1) variables; $\delta_1, \delta_2, .. \delta_k$ are the parameters; ζ_t is the vector of random errors which is distributed with zero mean and Ω variance matrix.
The model can be further rewrites as:

$$\Delta X_t = \theta X_{t-1} + \sum_{i=1}^{p-1} \lambda_i \Delta X_{t-i} + \varepsilon_t \text{ .. (iii)}$$

Where $\theta = \sum_{i=1}^{p} \lambda_i \partial_i - I_i$ ..... (iv)

and $\lambda_i = -\sum_{j=1}^{p} \lambda_i \partial_j$ .... (v)

The Granger representation theorem asserts that if the coefficient matrix θ has reduced rank r < x, there exists x X r matrix ω and Ω each with rank r such that $\theta = \omega\Omega'$ and $\Omega' X_t$ is stationary. R is the number of cointegrating relations (the cointegration rank) and each column of Ω is the cointegrating vector. The elements of ω are known as the adjustment parameters in the vector error correction model. Johansen's method is to estimate θ matrix is an unrestricted form, the test whether we can reject the restrictions implied by the reduced rank of θ.

We use Granger Causality Test to analyze the causality between variables for each model. If both variables are integrated of order one, 1(1), and there is cointegration between them. Granger causality test is a technique for determining whether one time series is useful in forecasting other one.

The general form of the vector error correction model is as follows:

$$\Delta y_t = \alpha_\circ + \alpha_1 t - \prod z_{t-1} + \sum_{i=1}^{p-1} \Gamma_i' \Delta z_{t-1} + \psi w_t + \mu_t \text{ . (vi)}$$

where

$z_t = (y_t', x_t') \ldots y_t$ is an $m_{yX} 1$ vector of endogenous *I(1)*

var x_t is an $m_{xX} 1$ vector of exogenous of exogenous *I(1)* variables.

$\Delta x_t = \alpha_\circ + \sum_{i=1}^{p-1} \Gamma'_i \Delta z_{t-1} + \Psi w_t + \mu_t \ldots . w_t$ is a q*1vector of exogenous /deterministic variables I(0).
In model, the disturbance vector of e_t and w_t satisfy the assumptions:

(a) $\mu_t = (e_t w_t) iid(0, \sum)$

Σ = a symmetric positive-definite matrix

(b) μ_t = (the disturbance term in the combined model) are distributed independently of w_t i.e. $E(\mu_{t/} w_t) = 0$ $\alpha \circ and \alpha_1$ …intercept and trend coefficients respectively.

$\prod$ = long run multiplier matrix i.e. $\prod_y$ multiplier matrix of order $(m_y + m)$
Where m = $(mx + my)$

$\Gamma'_{1y} - \Gamma'_{p-1,y}$ = Coefficient matrices capture the short dynamic effects and are of order m_y*m
Ψ_y= the m_y*m matrix of coefficients on the I(0) exogenous variables.

Empirical Findings

Stationary Test
In the first step, we checked the stationary property of the data. We have employed both Augmented Dickey Fuller (ADF) test (Dickey and Fuller 1981) and Phillips Perron (PP) test (Phillips and Perron 1988). The results given in table-4 show that all the variables under investigation have unit root at level and they become stationary at first difference.

Johansen Cointegration Test Results
We have used Johansen Cointegration procedure to trace out the multiple cointegrating vectors. The results reported in table-6 show that null hypothesis of no cointegration (r=0) is rejected both under λ-max and Trace test.

Causality Test
The relationship between variables obtained through regression analysis does not imply causation. The difference between correlation and causation is tricky but it is not wise to equate correlation with causation. The presence of long run relationship implies that there should be at least one direction of causality among variables.

The causality is tested through VEC/Block Exogeneity Wald Test. The results provide evidence of unidirectional causality running from unemployment to cattle theft, dacoity, robbery and theft whereas no sign of causality from unemployment to burglary emerged. One possible explanation for no causality to burglary may be the lack of sufficient variation in data of burglary cases.

Conclusion and Recommendations

The major objective of the study was to find the empirical relationship between unemployment and property crimes in Pakistan. The analysis covered the period from 1975 to 2008. The results revealed that unemployment has long-run relationship with property crimes. This implies that property crime in Pakistan are attributed to unemployment suggesting that policies aimed at improving the employment prospects of workers facing the greatest obstacle can be effective tools for combating crimes. The employment schemes and internship programs for unemployed persons may be a beneficial tool for decreasing the property crimes. As the property crimes are assumed to be based on economic reasons, the unemployment allowances and collateral free loaning for employment may contribute to slide down the crimes.

The estimates explain that unemployment in Pakistan Granger causes dacoity, robbery, theft and cattle theft in Pakistan. The finding of the study supports the hypothesis that due to wide spread unemployment in the country there is promotion of property crimes. The results of causality support that unemployment promotes property crimes.

It should be noted that the unemployment rate is not the only possible measure of the situation of labor market. Doyle, et. al. (1999) used a broader definition of labor market situation when measuring its effects on crimes, which in addition to unemployment rate includes wage levels and unemployment benefits (the schemes for unemployed are now existed in Pakistan). It is possible that such a measure is more appropriate to use in economics of crime. An interesting task for future studies could be to develop a method to measure the overall labor market situation in Pakistan and its effects on crime.

References

Antonello, S. E. and R. Cellini (1998) "Economic Activity and Crime in the Long-run: An Empirical Investigation on Aggregate Data from Italy, 1951-1994" International Review of Law and Economics Vol.18,pp.279-292.

Armengol, C. A., T. Verdier and Y. Zenou (2007) "Strong and weak ties in employment and crime" Journal of Public Economics, Vol.91, No.1-2, pp.203-233.

Baron, W. S. (2006) "Street Youth, Strain Theory and Crime" Journal of Criminal Justice, Vol.34,pp.209-223

Becker, G. S. (1968) "Crime and Punishment: An Economic Approach" Journal of Political Economy, Vol.76,pp.169-217.

BPRD (various years) Report: Bureau of Police Research and Development. National Police Foundation, Islamabad.

Bushway, S, and J. Engberg (1994) Panel Data VAR Analysis of the Relationship between Crime and Unemployment, mimeo, Carnegie Mellon University.

Carmichael, F. and R. Ward (2001) "Male Unemployment and Crime in England and Wales" Economic Letters, Vol.73,pp.111-115.

Chiricos, T. (1987) "Rates of Crime and Unemployment: An Analysis of Aggregate Research Evidence", Social Problems, Vol.34, No.2, pp.187-211.

Corman, H., J. Theodor and N. Lovitch (1987) "Crime, Deterrence and the Business Cycle in New York City: A VAR Approach" Review of Economics and Statistics, Vol.69,pp.695-700.

Doyle, J. M., E. Ahmed and R. N. Horn (1999) "The Effects of Labor Markets and Income Inequality on Crime: Evidence from Panel Data". Southern Economic Journal, Vol.65, pp.717-738.

Ehrlich, I. (1973) "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation" Journal of Political Economy, Vol.81,pp.521-565.

Engelhardt, B., G. Rocheteau and P. Rupert (2008) "Crime and the Labor Market: A Search Model with Optimal Contracts" Journal of Public Economics, Vol. 92, pp.1876-1891.

Entorf, H. and H. Spengler (2000) "Socioeconomic and Economic Factors of Crime in Germany: Evidence from Panel Data of the German States" International Review of Law and Economics, Vol.20, pp.75-106.

FBS (various years) Pakistan Economic Survey. Federal Bureau of Statistics (FBS), Statistics Division, Government of Pakistan, Islamabad.

FBS (various years) Statistical Yearbook. Federal Bureau of Statistics (FBS), Government of Pakistan, Islamabad.

Freeman, R. B. (1995) The Labor Market, in James Q. Wilson and Joan Petersilia (eds.) Crime, ICS Press, San Francisco, pp. 171-191.

Freeman, R. B. (1999) The Economics of Crime. Handbook of Labor Economics, 3:3529-3571.

Gillani, S. Y. M., H. Rehman and A. R. Gill (2009) "Unemployment, Poverty, Inflation and Crime Nexus: Cointegration and Causality Analysis of Pakistan" Pakistan Economic and Social Review, Vol.47, pp.79-98

Gould, E. D., B. A. Weinberg and D. Mustard (2002) "Crime Rates and Local Labor Opportunities in the United States: 1979-1995", Review of Economics and Statistics, Vol.84,No.1, pp.45-61.

Government of Pakistan (various years) Pakistan Economic Survey. Finance Division, Government of Pakistan, Islamabad.

Lee, D. Y., and S. J. Holoviak (2006) "Unemployment and crime: an empirical investigation'",Applied Economics Letters, Vol.13, No.12, pp.805-810.

Levitt, S. D. (1997) "Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime", American Economic Review, Vol.87, No.3,pp.270-290.

Levitt, Steven D. (1996) "The Effect of Prison Population Size on Crime Rates: Evidence from Prison Overcrowding Litigation", The Quarterly Journal of Economics, Vol.111,pp.319-352.

Lin, J. M. (2009) "More Police, Less Crime: Evidence from US State data" International Review of Law and Economics, Vol29, pp.73-80.

Nadeem, A. H. (2002) Pakistan: The Political Economy of Lawlessness. Oxford University Press. Karachi.

Nagin, D. and J. Waldfogel (1995) "The Effects of Criminality and Conviction on the Labor Market Status of Young British Offenders" International Review of Law and Economics, Vol.15, pp.109-126.27

Papps, K. and R. Winkelmann (1998) Unemployment and Crime: New Answers to an Old Question. IZA. Bonn.

Pissarides, C. A. (2000) Equilibrium Unemployment Theory. Cambridge Press, MIT.

Raphael, S. and R. Winter-Ebmer (2001) "Identifying the Effect of Unemployment on Crime" Journal of Law and Economics, Vol.44, pp.259-283.

Ruhm, C. J. (1995) "Economic Conditions and Alcohol Problems" Journal of Health Economics, Vol.14, pp.583-603.

SBP (2010) The Handbook of Statistics on Pakistan Economy 2010. State Bank of Pakistan (SBP), Islamabad.

Schuller, B.-J. (1986) Ekonomi och Kriminalitet. En Empirisk Undersökning av Brottsligheten i

Sverige (Economics and Crime. Emperical Research in Sweden), Economic Studies, Vol.17.

Scorcu, A. E. and R. Cellini (1998) "Economic Activity and Crime in the Long Run: An Empirical Investigation on Aggregate Data from Italy, 1951-1994" International Review of Law and Economics, Vol.18, pp.279-292.

Witte, A. D. and H. Tauchen (1994) Work and Crime: An Exploration Using Paneldata. National Bureau of Economic Research. Cambridge, MA.

Appendix

Table-1. Crime Growth in Pakistan

Year	Total No. of Crimes Reported	Crime Growth Rate (Percentage)	Crime (per hundred thousand of Population)
1951	76519	-	226
1958	81124	6.02	212
1961	79900	–1.51	185
1966	93633	17.19	180
1971	129679	38.50	206
1976	167032	28.80	228
1981	152782	–8.53	215
1986	220035	44.02	248
1991	403078	83.19	257
1998	431854	7.14	323
2000	388909	–9.94	278
2003	400680	3.03	267
2005	453264	13.12	294
2007	538048	18.71	340
2009	616227	14.53	376

Sources: FBS (various years) Pakistan Economic Survey, BPRD (various years) Reports: Bureau of Police Research and Development (BPRD) and Nadeem (2002)

Table-2. Property Crimes Reported by Type

Year	Dacoity (Nos.)	Robbery (Nos.)	Burglary (Nos.)	Cattle Theft (Nos.)	Theft (Nos.)	Total Crime (Nos.)
1975	99	497	10285	9232	19134	164419
1980	70	530	8677	5094	15864	152782
1985	248	910	8916	4597	16404	220035
1990	506	1915	8639	7767	29937	403078
1995	1274	6468	12039	7590	27997	334143
2000	1402	7991	14440	6675	23322	388909
2005	2395	12199	11676	11615	39382	453264
2006	2895	14630	13218	13206	49330	537866
2007	3260	16639	11718	9355	51475	538048
2008	4512	19793	14621	8829	64224	592503

Sources: FBS (various years) Pakistan Statistical Yearbook. Gillani, et. al. (2009).

Table-3. Crimes and Unemployment in Pakistan

Year	Total Crime (Nos.)	Unemployed Labor Force (In Millions)	Unemployment Rate (Percentage)
1975	164419	0.34	1.79
1980	152782	0.92	3.55
1985	220035	1.04	3.83
1990	403078	0.98	3.14
1995	334143	1.83	4.84
2000	388909	3.17	7.82
2005	453264	3.6	7.69
2006	537866	3.13	6.2
2007	538048	2.73	5.2
2008	592503	2.98	5.46
2009	616227	3.04	5.5

Sources: FBS (various years) Pakistan Economic Survey, BPRD (various years) Reports: Bureau of Police Research and Development (BPRD) and FBS (various years) Pakistan Statistical Yearbook

Table-4. Results of ADF Unit Root Test

Variables	Intercept		Trend and Incept	
	Level	1st Difference	Level	1st Difference
UNR	-1.707354	-5.279903	-1.840389	-5.364238
Burglary	-1.119985	-7.652727	-3.205748	-7.614321
Robbery	2.137095	-2.735904	-1.763888	-4.034456
Theft	2.555993	-1.728131	0.496089	-2.351580
Dacoity	4.106632	-0.043346	2.167554	-3.441610
Cattle Theft	-1.959037	-8.436976	-3.604021	-8.310252

Table-5. Results of PP Unit Root Test

Variables	Intercept		Trend and Intercept	
	Level	1st Difference	Level	1st Difference
Unemployment (UNR)	-1.707354	-5.279903	-2.025896	-5.364238
Burglary (BOR)	-0.810508	-7.878564	-3.205748	-7.841249
Robbery (ROB)	2.989364	-3.031887	0.275072	-4.397842
Theft (THF)	2.930654	-4.932328	0.420956	-5.820967
Dacoity (DAC)	4.333945	-2.234179	2.167554	-3.697477
Cattle Theft (CTHF)	-2.205244	-6.076061	-3.190944	-7.127867

Table-6. Johansen Cointegration Test Results

Number of cointegrating vectors	Trace			λ-max		
	Statistic	C (5%)	Prob.**	Statistic	C (5%)	Prob.**
$r = 0$	192.3721	95.75366	0.0000	100.6274	40.07757	0.0000
$r \leq 1$	91.74469	69.81889	0.0004	37.94400	33.87687	0.0154
$r \leq 2$	53.80069	47.85613	0.0125	24.05725	27.58434	0.1327
$r \leq 3$	29.74344	29.79707	0.0507	16.59000	21.13162	0.1923
$r \leq 4$	13.15343	15.49471	0.1093	7.330810	14.26460	0.4508
$r \leq 5$	5.822625	3.841466	0.0158	5.822625	3.841466	0.0158

*denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug – Micheilis (1999) p-values

Table-7. VEC Granger Causality /Block Exogeneity Wald Test

Dependent Variable D (UNR)			(eq.1)
Excluded	**Chi-sq**	**Df**	**Prob.**
D(BUR)	0.433856	2	0.8050
D(CTHF)	3.854720	2	0.1455
D(DAC)	1.921871	2	0.3825
D(ROB)	0.325150	2	0.8500
D(THF)	1.412126	2	0.4936
All	11.07447	10	0.3517
Dependent Variable D(B)			**(eq.2)**
D(UNR)	0.838393	2	0.6576
D(CTHF)	5.739306	2	0.0567
D(DAC)	0.525725	2	0.7688
D(ROB)	4.280153	2	0.1176
D(THF)	3.154782	2	0.2065
All	24.90638	10	0.0055
Dependent Variable D(CT)			**(eq.3)**
D(UNR)	5.135121	2	0.0767
D(BUR)	4.278145	2	0.1178
D(DAC)	5.328222	2	0.0697
D(ROB)	1.520879	2	0.4675
D(THF)	2.312894	2	0.3146
All	9.808961	10	0.4574
Dependent Variable D(DC)			**(eq.4)**
D(UNR)	12.90932	2	0.0016
D(BUR)	14.51948	2	0.0007
D(CTHF)	31.14833	2	0.0000
D(ROB)	0.334521	2	0.8460
D(THF)	2.077441	2	0.3539
All	70.25306	10	0.0000
Dependent Variable D(R)			**(eq.5)**
D(UNR)	9.223858	2	0.0099
D(BUR)	22.94313	2	0.0000
D(CTHF)	39.57722	2	0.0000
D(DAC)	14.61129	2	0.0007
D(THF)	2.414105	2	0.2991
All	64.86919	10	0.0000
Dependent Variable D(T)			**(eq.6)**
D(UNR)	5.520532	2	0.0633
D(BUR)	8.372848	2	0.0152
D(CTHF)	19.20867	2	0.0001
D(DAC)	14.14572	2	0.0008
D(ROB)	6.929223	2	0.0313
All	39.72566	10	0.0000