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Original Paper

Relationship between Crime and Economic Conditions in Sindh: A Time Series Approach from 1984-2015

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Abstract

Using the time series data from 1984 to 2015, this study attempts to explore Sindh economic situation and the relationship between criminal activities. Three Variables are used for economic conditions, such as crime rate, dropout ratio and unemployment. We check their relationship with the reported crime. Enhanced Dicky Fuller test for unit root process indicates that all variables are stationary at the first level. For long-term relationships, Johanson-Cointegration technology has been applied. The results of the statistical process show that dropout ratio and unemployment are closely related to crime.

VCM has been applied to check the short-run relationship between the variables. VCM results suggested that the model we estimate is divergent. Divergent model mean that there is no adjustment from long-run to short-run between variables as they are going away, if we increase the lag length, the model can become divergent but due to crime data unavailability it was difficult to increase the observations and the lags as well. Study gives evidence that economic conditions have significant impact on crimes and increasing dropout which is Positive related with crime in Sindh. It is also shown that the crime is influenced by economic condition. Government is capable to reduce that threat through effective target policies and legislation. The empirical results of this study will enhance understanding of the role of public sector policy formation in promoting national productive capacity by uplifting the positive effect of the Sindh economy.

Keywords

crime rate, drop out, unemployment

1. Introduction

Crime is the mirror of society. For a long time, Theological studies show that crime is the most common in society to allow the material differences of the standard of living of its citizens (Hsieh & Pugh, 1993; Kawachi et al., 1994). The present study elaborates the understanding of the social environment in producing educated and employed society using crime. In society, crime is a sensitive indicator of social relation. According to Sol Levine, crime is important aspect of quality of life of society. The crime is well concerned given its evil effect on economy and more generally on quality of the life of a society as a whole. Several studies have done in social and economic areas to discover the reasons of crime. Crime and economic condition are inter link. Machin (1998) reported negative relation between economic incentives and criminal activities.

Becker (1968) contribution is the major in the economics of the crime. He explored that person will commit crime if he gets higher expected return from crime than illegal activity. Physical and psychological benefits and cost faced by every criminal, two main determinants of cost. Probability of arrested and penalty faced if arrested. Similar to that other economic variable also affect crime and unemployment is one of them. Crime and labor market are linked together. The incentive for the criminal activities increases with the unemployment, zero income and low income makes the cost benefit analysis easy for the individual (Fleisher, 1963). Positive relation is observed between crime and unemployment and highlighted that unemployment is a sign of income opportunities from legitimate sector then if unemployment increases then engaging of a person in legal sector also decrease (Ehrlich, 1973)

Various reasons supports that education reduce the criminal activities, first schooling increases the return to legitimate work and raising opportunity cost of illegal behavior (Freeman, 1996) furthermore, punishment for the criminal behavior often entails incarceration. If higher wage offer then opportunity cost of schooling becomes higher. Second, schooling may direct effect on financial reward itself. Finally, schooling may affect the change preferences indirect ways, which may affect decision to involve in crime. For example education leads to more one's patience (Becker & Milligan, 1997)

Crime and unemployment have a significant impact on the economic development of any country. Crime on the one hand affects investment, thereby reducing economic growth. On the other hand unemployment, through the aggregate demand channel affects economic growth. Sindh's systematic and scientific investigations are vital to the economy's left and development and have an advantage over the other provinces of Pakistan. Sindh contributes in National GDP about 32 percent and population share is 24 percent. Per capita income of Sindh according to rough estimation 2012-2013 is PRs. 166,000 and its 26 percent higher than the national average. Most industrialized province of Pakistan is Sindh and in the provincial economy shore of industrial sector is much higher than the national average. About 1.6 million people are unemployed and net enrolment ratio is stagnant (Husain, 2014).

Over all scenario of crime is fluctuate indifferent region like United States, Germany and United Kingdom are the top three countries in absolute numbers. Pakistan's rank is 23rd amongst other countries whereas India is 10th. Daily average of crime in Pakistan is 1144 as against 64870 in USA, 17164 in Germany, 14166 in UK and 4834 in India.

Table 1. Total Crime by Country

Rank	Country	Total Crime	Rank	Country	Total Crime
1	United State	2367780	10	India	1764630
2	German	626472	19	Finland	530270
3	United Kingdom	5170830	20	Denmark	504240
4	France	3771850	22	New Zealand	427230
5	South Africa	3422740	23	Pakistan	417846
6	Russia	2952370	37	Greece	102783
7	Canada	2476520	40	Ireland	81274
8	Japan	2443470	50	Moldova	38267
9	Italy	2205780			

Source: Seventh United Nations Survey of Crime Trends and Operations of Criminal Justice Systems (United Nations Office on Drugs and Crime, Centre for International Crime Prevention), Bureau of Police Research and Development, Ministry of Interior, Islamabad.

In the below Figure show the overall reported crime, unemployment and dropout in Sindh.

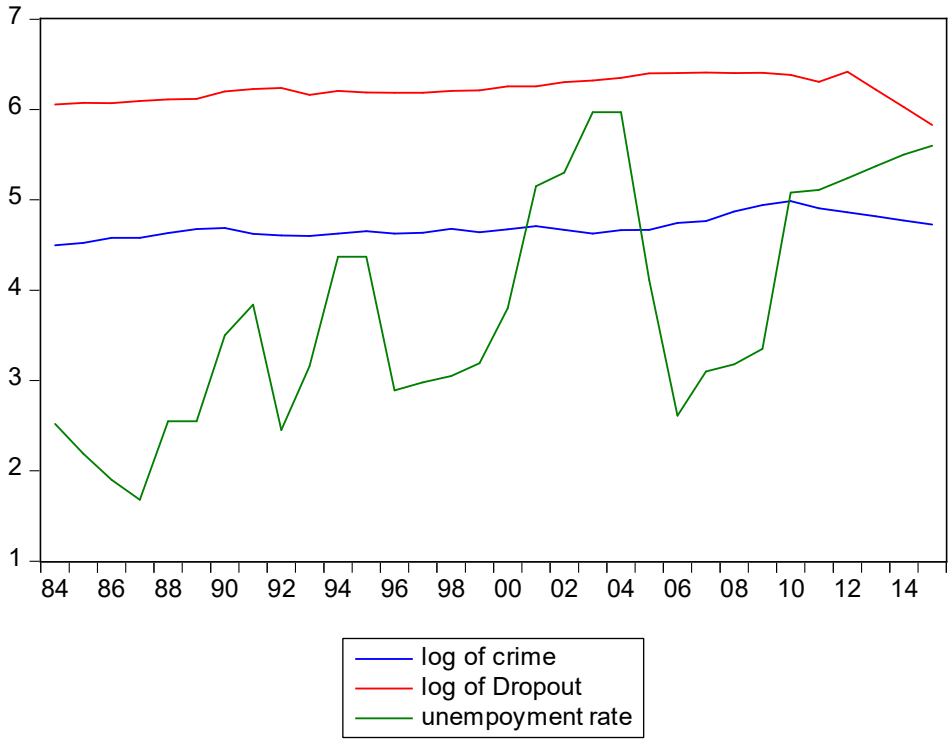

Figure 1. Combine Garph

There is a lot of research on the relationship between crime and unemployment in Pakistan but none of these explore the link between crime and drop out even in aggregate level (Pakistan), therefore, there is dire need to fill this research gap in the literature. Up to my best knowledge provincial wisdom of crime research does not occur in the previous literature of Pakistan.

1.1 Implications of the Study

This study will help for understanding relationship among crime and unemployment and drop out and helpful for decreasing crime rates to increase education enrolment which leads to decrease the dropout in Sindh province.

Today, without a high school diploma, an individual's chances of carving out a good future both socially and economically are slim. Young people with too little education, lack of experience and job skills are highly likely to become socially dependent or marginal. Below-par school attendance also has other negative consequences:

- Generally poor state of health;
- Higher mortality rate;
- Increased social dependence;
- Some inability to cope with technology change;

Dropping out often leads to exclusion. This can take different forms: homelessness, drug addiction, prostitution, psychosocial problems, delinquency and crime. Exclusion engendered by dropping out of school may lead to social dropping out and result in young people not exercising to the fullest their

rights or role as a citizen. It can also be an obstacle to integration into the workforce. The consequences of dropping out are felt as much socially as on the individual level. This makes not only a personal problem for many young people, but also an issue with repercussions for society as a whole.

1.2 Theoretical Implications

It usually measures changes in operating income, operating profit, personal wages and work. The analyzed economic events may include the implementation of new policies or projects, or may simply be the presence of an enterprise or organization. When the public is concerned about the potential impact of a proposed project or policy, an economic impact analysis is usually conducted. Its sociality organizes society in a better way. Theoretically, unemployment reduces the economic crime rate, is conducive to social improvement, increase the skills and educated labor force, improve the productivity of enterprises directly to increase economic GDP to have a positive impact. A better education system, active low dropout rates help to discourage the activities of crime, which overall increases the level of economic activities.

1.3 Practical Implications

The ability to lower crime rates nationwide will bring about many benefits such as increased domestic and foreign investment, better overall quality of education and housing, as well as a reduction in inequality. It helpful in following different ways.

- increase tax revenues;
- delinquency and increased costs of crime prevention and punishment;
- increased employment and social security benefits, increased health care benefit;
- Easiness in recruiting skilled workers and filling specific job vacancies, such as those in the knowledge economy.

This paper examines the impact of economic condition on crime in the long run as well as in short run. In this paper economic condition is measured by drop outand unemployment. The paper is organized by following folds, Second section present hypothesis and objective of this study, Third section show brief review of literature about crime with different economic variables, Third section describes the model of crime with economic variable and methodology of this model, final section analyze of the results and conclusion of this study.

1.4 Objective

Long term and short run relationship present between crimes and different economic variables in the Sindh

1.5 Hypothesis

Ho: No long term and short run relationship between crime and different economic variables.

H1: There is long term and short relationship between crime and different economic variables.

1.6 Review of Literature

Economic and criminal relations were first formulated by Becker in 1968. Becker's paper, from the 1980s, opened the door to a new field of empirical research aimed at validating and studying the

economic variables that determine individual criminal choice and behavior. According to Becker's criminal behavior is based on cost-benefit analysis of rational decision-making

Kennedy, Kawachi et al. (1998) showed that poverty and income were potent predictors of homicide and violence crime. They concluded that the effect of the growing gap between the rich and the poor is mediated. By undermining social cohesion or social capital, the reduction of social capital in resulted. They would link to increased malaria killings and violent crime.

Wilkinson (1999) narrated that crime is rarely considered to be the result of public health research. Over the past 50 years, the development of criminology has shown that the same social and environmental factors are responsible. He concludes that some geographical variation in predicted crime rates may also be relevant to explaining community change in health and well-being. Understand the causes of crime disparities in countries and regions. The state helps us to solve a lasting puzzle in public health, namely.

Norman at al. (1999) used panel data for intentional homicide and robbery as a sample. Data from 1970-1994 for Developed and developing countries from United Nations World Crime Survey. He explained the types of Transnational and inter-temporal crime rate for different countries. He use simple model of motivation and criminal behavior that explain a clear consideration of the possible causes of crime rate in countries.

Kelly (2000) explained that robbery, assault and generalized violent crime have seriously deteriorated due to income Gap in country. Fajnzylber et al. (2002) has found the same results robbery and murder. A recent study of Nilsson (2004) also found Solid crime, robbery and income inequality.

Neumayer (2005) concluded that week relationship between income inequality and robbery/theft. Given the results of these contradictions, this study investigated income inequality and the relationship between crime incomes. He uses panel data from 50 states and the District of Columbia 1995 to 2004. They observed that there is positive relationship between income inequality and robbery.

Brush (2007) estimated the impact of income inequality on crime rate. He used using the cross-section crime rate data from US. OLS technique has been use in that study. Result showed that Income inequality was positively related to the crime rate on the cross but negatively correlated with crime rate in time series analysis. Studies in criminology and economics have shown that inequitable resource allocation can incite criminal activities. For example, people may be driven to crime by lacking the resources they need. For survival or relative to defects in their communities "considered normal".

Choe (2008) has a lot of research into the relationship between income inequality and crime. Many of these studies have found relative income inequality can seriously affect crime (Messner & Tardiff, 1986) contrast, the use of Canadian studies. They conclude that there was a strong positive correlation between relative income inequality and crime rates among provinces (Patterson, 1991). A study conducted in the Manhattan neighborhood found a strong relationship among income inequality, poverty on the crime.

Gillani, Rehman et al. (2009) they explained crime is the main source of insecurity and discomfort in every society. Criminal behavior leads to insecurity and fear those who have not yet become victims. This sense of panic victountry's parliament or land. There is no universal and permanent definition of crime. It's different in different periods and regions. Moreover, investigated the long run relationship between crime and several economic variables such as poverty, unemployment and inflation in Pakistan for the period 1975-2007. Johansen co-integration has been used to investigate the long run relationship between crime and economic condition and found statistical significant results. Toda-Yamamoto technique has been used to test the causality between crime and economic variables and their results have provided evidence that causality between crime and economic variables is present.

Jalil and Iqbal (2010) explained crime is a violation of the law, the criminal activity and the social and economic development of the link between is undeniable. In addition, the relationship between crime and human evolution can also be considered a historical relationship, because Kain (Adam and Eve's first son) committed the first crime, when he murdered his brother Abel because of jealousy. Due to the complexity of the subject of the crime, for example, its causes and consequences, various disciplines such as criminology, sociology, geography, psychology and demography study it from their own perspective.

Raja and Ullah (2013) described the long run and short run relationship between the crime and economic condition of Pakistan by using time series data from 1990-2011. They used female employment and consumer price index as a proxy of income inequality and inflation. Their results have evidence that economic condition is statistical significant impact on crime. The employed Dicky Fuller test was used for the unit root process, which indicates that all variables were fixed at the first level. For long-term relationships, Johansen co-integration technology has been applied. The statistical process results showed that female employment, inflation and Gini coefficient were closely related to crime. The Gini index coefficient was high, which means that inequality in long-term income affects crime more than the other two, since income inequality is a long-term phenomenon, so it affects large-scale criminal activity. The Vector Correction Model (VCM) has been applied to examine short-run relationships between variables. They conclude that economic conditions have a significant impact on crime and increased female employment, which was considered to be a positive correlation between labor market improvement and crime in Pakistan.

1.7 Data Source

Present study is conducted for the Sindh province of Pakistan by using the secondary data comprises on 30 years' time series data for the period 1984-2013. Aggregate data on unemployment and dropout will be collected for the maximum of period available. Drop out and number of crime data are taken from various development statistics of Sindh and data of unemployment rate are taken from the different labor force survey of Pakistan

2. Method

This study deals with time series data, so it is likely that there is evidence of unit roots in the data. If the unit root exists in the data, the ordinary least squares estimation coefficients cannot be used. This is one of the reasons that common-based modeling techniques have been used to report more efficient and consistent estimates.

$$crime = \beta 1 + \beta 2 dropout + \beta 3 unemployment + ui$$

In the above model crime use as dependent variable, unemployment and dropout use as independent variables. β's shows coefficients and u_i is error term

The co-integration test is performed in two steps: first, a single series is tested to achieve a common integration sequence. If the series is the same order, which would mean synergistic integration. Using the Augmented Dickey Fuller (ADF) test, stationary series for testing. The ADF test is a standard unit root test; it analyzes the order in which the data sequences are integrated. These statistics are calculated using a constant and a constant plus time trend, these tests have a null-suppose that the non-stationary is an alternative to stationarity. The ADF test used to check the stationarity series is based on the equation the form is as follows:

$$\Delta Yt = \beta 1 + \beta 2t + \delta Yt - 1 + \alpha i \sum^{m} t \Delta Yt - 1 + \epsilon t$$

Where t is a pure white noise error term and

$$\Delta Yt - 1 = (Yt - 1 - Yt - 2), \Delta Yt - 2 = (Yt - 2 - Yt - 3), etc$$

These tests determine whether the estimate is equal to zero. Fuller (1976) provides a cumulative distribution of ADF statistics. Have determine all these variables to be I (d), and then conduct the study determines the sequence of integration for long-term analysis. CRIME, UNEMPLOYMEN, and DROPOUT. Number of crime and unemployment rate show a positive relationship, according to theory and the relationship between dropout and crime is also a linear theoretical concern. For check the purpose of the long-term relationship between variables. They must be co integrated. If the linear combination of two or more variables is integrated into any order less than, then they are co-integrated.

Co-integration testing provides the basis for long-term tracking relationship. The two tests in common integration have been given Literature (Engle and Granger (1987) and Johansen and Juselius (1990)). In the multivariable case, the Engle-Granger procedure is not applicable, if the I (1) variable is linked by more than one co-integration vector. Therefore, this studies use Johansen co-integration to identify the number of co-integration vectors. The Johansen and Juselius methods have been developed in part by literature and descending order regression available in the art. The co-integration vector 'r' is defined by Johansen as the maximum Eigenvalue and trajectory test or static. There are two important problems. First, the optimum lag length is critical in the estimated vector autoregressive (VAR) model given in Equations (1) to (4), which can be determined using the Akaike Information Criterion (AIC). Second, if the variables are unsteady and co-integrated, the equations (1) to (4) can be modified to

incorporate the vector error correction mechanism defined by Johansen (1988) and Johansen et al., (1990).

The dynamic impact of dropping out and unemployment on crime rates has been estimated using the Johansen (1988) and Johansen et al. (1990) common integration approach. The multivariate co-integration method of Johansen (1988) and Johansen et al. (1990) is based on the following steps. First, an estimate of the unrestricted Vector-Autoregressive Model (VAR) as explained by Halda et al. (2010) is required, as shown below,

$$y_t = \sum_{i=1}^{p} \Pi_i y_{t-i} + \varepsilon_t \quad (1)$$

The equation (1) is the unrestricted VAR model, where, "$\mathbf{Y_t}$" represents all "N" variables of the model which is three in the present case, that is, crime, dropout and unemployment. ∏ is the N*N matrix of coefficients and "ϵt" is a vector of random shocks to the system. It is assumed that "εt" is normally distributed with zero mean and constant variance. The VAR model (1) can be written in its Error Correction Form (ECM) as given in equation (2)

$$y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Pi_i \Delta y_{t-i} + \varepsilon_t \quad (2)$$

Where $\prod = -(I - \sum_{i=1}^{p} A_i)$ and $\prod_i = -\sum_{j=i+1}^{p} A_j$ and "I" is an identity matrix.

If all variables are first-order integrals, i.e., stationary for non-identical orders, Δyt is fixed. If the assumptions common to the variables are not violated, then the estimated coefficients of Eq. (6) are consistent and are also stable or zero-order integrals.

For example, if Π = 0, the matrix is empty or there is no co-integration vector at all, and equation (2) is contracted to the usual first differential VAR model. If Π = 1, it means that there is a co-integration vector and is an error correction term that indicates how the system reverts to its long-run equilibrium in response to any shocks in the short term. For multiple co-integrating vectors, the rank of Π can be in the range 0 <π <n, and there is a representation of Π such that Π = α. B. Where α and β are the (n.r) dimensions, and "r" is the rank of Π. B denotes the matrix of co-integrating vectors, and α denotes the speed of long-term equalization adjusted to the whole system.

Basically two tests for the tracking statistic (λ trace) and the maximum Eigen value statistic (λ max), which can be used to derive the number of co-integrating vectors in the whole system. Once the long-term relationship is identified, the next step is to estimate the representative vector error correction model of the crime rate as the dependent variable. This can be done by following the general-to-specific method of the VECM, i.e., the general VECM can be estimated in the first step. In the second step, the general VECM model can be sought to match the standard theory. However, if there are some variables that do not matter or have a theoretically incorrect sign, they can be discarded

and another version of the VECM model can be obtained. According to this general-to-specific approach, researchers can obtain models that are more compatible with standard economic theory.

3. Result

Table 1. Summary of Result of and Test

Variables	At level (t statistics)	At level (probability)	At 1st difference (t statistics)	At 1st difference(probability)
Crime	-1.992005	0.6885	-3.622763	0.0112
Drop out	-0.263270	0.9195	-9.658780	0.0000
Unemployment	-2.278064	0.1851	4.567225	0.0000

Source: Author's Calculation using Eviews 8.0 Portable Software.

The Table above summarizes the results of the ADF tests at the level and first differences of all variables, including all possible options, i.e., constants. One of the purposes of Table 1 is to use more robust estimation techniques to confirm the results of symmetric analysis. The effectiveness of the ADF test depends on the appropriate hysteresis length selection and the appropriate options, none, constant and both. All variables in the first order of the fixed and non - isotopic levels discussed above. The ADF tests crime, dropouts and unemployment variables to test their smoothness. Based on the empirical results in Table 1, all variables are not stable, so Ordinary Least Square (OLS) cannot be used to obtain unbiased, consistent and valid estimates for the developed models. There is a straightforward way of using co-integration techniques. It is possible that time series may have a balanced long-term relationship between them, and OLS cannot capture in its estimation.

Several steps to implement the Johansen co-integration integration technique. These steps include estimating the appropriate vector autoregressive (VAR) model for the appropriate lag length, and using the Trace statistic and the maximum Eigen value test to test the existence of the co-integration relationship between variable. Finally, an appropriate version of the estimated Vector Error Correction Model (VECM) model and Granger causality test is part of the Johansen co-integration technique. However, we used VECM in our study.

Table 2. Trace and Maximum Eigen Value Test

Unrestricted Co-integration Rank Test (Trace Test)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 percent Critical Value	Prob.**
None	0.462581	29.48817	29.79707	0.0342

At most 1	0.282297	10.85884	15.49471	0.2203
At most 2	0.029809	0.907877	3.841466	0.3407

Unrestricted Co-integration Rank Test (Maximum Eigen value Test)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 percent Critical Value	Prob.**
None	0.462581	18.62933	21.13162	0.1081
At most 1	0.282297	9.950965	14.26460	0.2152
At most 2	0.029809	0.907877	3.841466	0.3407

Source: Author's Calculation using Eview 8 software.

The Table above shows the Vector Error Correction Model (VECM). It contains the short-term impact of different variables on crime rates. If the VECM term is negative, it means that there is a short-term imbalance in the model that reverts to the equilibrium level in the model. In the case of a crime rate in the model, the "VECM" term is negative. This suggests that if there is any short-term imbalance in the model, 65% will return to equilibrium in the current year. All variables of crime, dropout and unemployment have the right theoretical mark, except for a few. From a year and two years, the crime rate of the current crime rate of lag effect is negative. This means that if the crime rate increases this year, it will fall in the next year. This type of relationship can describe our social behavior. This is a common phenomenon, if there is crime this year, the future crime may be lower.

Economic theory holds that there is a positive correlation between criminality and dropping out of school. The negative VECM term in Appendix II is theoretically valid. It is significant at the 5% level of probability. The one-year lag effect of the crime rate on the current crime is negative, at a significant 5% level. This is based on theory. The impact of dropout and unemployment is also positive, but the signs of dropping out are positive, which is different from the theory. R squared and adjusted R-squared values were 72% and 62%, respectively, the overall model meaning is good. There are no major flaws in the model.

4. Conclusion

The present study improve the literature of controlling the crime and contribute economic and social benefits both. The study has found significance relationship between crime and economic condition. According to results, decreasing the number of dropout are associated with significance decrease in number of crime in the Sindh and the effect of increasing enrollment appears to be dependent on economic context. Furthermore, another economic factor that is unemployment which also effect on crime.

The analysis of crime trends in Sindh shows that all these definitions of crime fluctuate to a considerable degree. It has also been concluded that, according to trend analysis, unemployment is the main driver of overall accountability for crime in Sindh. There are several reasons why this can be explained by the dismal performance of the Sindh crime rate. However, the trend analysis shows that political instability, institutional corruption, unemployment, education and employment policies are the main factors of high crime rates in Sindh province. According to the trend analysis, dropout and unemployment are considered to be the main variables that may affect the crime rate situation in Sindh province. Based on primary expectations and theoretical evidence, it is assumed that dropouts and unemployment have a positive impact on them. These assumptions have been analyzed empirically using annual data for the period from 1984 to 2015. The use of pre-measured economic techniques to quantify the impact of these variables on crime rates. Granger - causality test has been used to identify the causal relationship between variables. The Johansen co-integration technique is used to test whether there are any long-run equilibrium relationships between variables. A 30-year quantitative analysis of past data suggests that there is strong evidence that these variables are co-integrated. They contain long-term equilibrium relationships. The error correction component shows that there may be an imbalance in the short term, however, there is a significant error correction component that restores the system to equilibrium. It is also shown that the crime is influenced by economic condition. Government is capable to reduce that threat through effective target policies and legislation. The empirical results of this study will enhance understanding of the role of public sector policy formation in promoting national productive capacity by uplifting the positive effect of the Sindh economy.

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