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RESEARCH PAPER

Socio-Economic and Demographic Determinants of Property Crimes in Pakistan: A Case Study of the Punjab

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PAPER INFO	ABSTRACT
	This study is an empirical attempt to explore the effects of various socio-economic, demographic and law enforcement variables on the property crimes of Punjab, Pakistan. In this regard a panel data set from the year 2010 to 2014 of 34 districts of Punjab has been used to investigate the relationship between Dependent and Independent Variables. Haussmann's test suggested that Fixed Effect Model is more appropriate to be used in empirical procedure. Empirical findings have explored a positive and significant relationship of population growth, economic activity, untraced property crime rate, police strength and proclaimed offenders while the influence of literacy rate indicate a negative and significant association with property crime rate of the Punjab province of Pakistan. Findings of the study are way forward for policy makers and to bring reforms i.e. controlling population, enhancing literacy rate, making reforms in law enforcement institutions and providing more security into the area where there is more economic prosperity.

Introduction

History of crime is in fact the history of mankind and it remained a subject of interest in every society. However, various societies differ in their magnitude of crime rate because each society has its own causes and effects of crime. A single universal definition

and even determinants of crime is hard to find due to the socio economic, religious, cultural and psychological disparities but in a broader sense crimes are all those actions that intentionally and deliberately threatens, attempts or that actually causes physical harm, property harm, freedom harm, or harm the prevailing public order of some state or country. . Moreover, all those offences, that intentionally and deliberately threatens, attempts or that actually causes physical harm, are known as crime related to persons or property crimes and all those offences that intentionally and deliberately threatens, attempts or that actually causes property harm are known as crime related to property [Buonnano and Montolio (2008), Annual crime analysis report of AIG Crime Punjab for the year 2011].

Pakistan is an emerging economy where crime rate is increasing over time and it needs a considerable attention of the economists to contribute in the discipline of economics and crime in order to suggest some preventive measures to control high crime rate in society. However, some of the economists of country have contributed in this discipline to highlight the potential socio-economic and demographic determinants of crime [Jalil et al (2010), Gillani et al (2009; 2011) and Syed (2008)].

Study has concentrated on property crime[1] as it is quite intuitive and logical to suppose that property crime rate comprises of those types of crime which are more responsive to socio-economic conditions of a country. Property crime rate consists of Robbery, Dacoity, Burglary, Motor Vehicle Theft, Auto Theft, Cattle Theft, Kidnapping for Ransom and Crime of Snatching. Nature of these types of crime reveals that it requires proper planning and particular energy level for committing such types of crime and it seems more suitable to estimate an economic model of crime by using different characteristics of socio-economic and demographic variables (Becsi (2002); (Jabar and Mohsin (2013).

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[1] Other well known categories of crime are Total Crime, Violent Crime, Heinous Crime and Crimes under Local and Special Law which has been discussed as a proxy of illicit behavior in an immense literature of Crime and Economics, Law and Economics and Cultural Criminology.

Literature Review

Chiricos (1987) tried to bring a strong picture of the relationship between crime rate and unemployment. Now, it has become a debatable issue because many studies like Coack and Wilson (1985) explored that there exists a weak association between crime rate and unemployment.

Levitt (2002) tried to explore the impact of police on crime rate. If the numbers of police are increased it would affect the crime rate or not. The study tried to answer the new evidences. [ibid] first discussed the two approaches on it then included some variables in the study and presented the results. As no one study to date presented the identified results, so by using firefighters as instrumental variable. Four different approaches were applied. There exists resemblance in the results of all four studies which is more remarkable addition to the previous literature that consistently failed to explore any evidence that police reduce crime.

Paolo Buonanno et al(2008) studied the socio-economic and demographic factors of crime in Spain. The lagged value of crime rate was used as dependent variable. The study used urbanization rate, clearance rate, fraction of foreigners, and education and unemployment rate as an independent variable. It is important that the study disintegrated dependent variable in two groups' violent crime and property crime. The study checked the discrete impact of independent variables on violent crime rate and property crime rate. Panel data set was used from 1993 to 1999 of Spanish provinces. GMM system estimator was applied to get result.

Gilbert and Sookram (2009) made a study on the socio and economic determinants of crime in Jamaica. The main objective of the study that what are those factors that contributes to the rate of violent crime in Jamaica. (VAR) model is applied to establish the relationship among socio-economic variables. Police force size has greater impact in reduction of violent crime. Improvement in accountability left the positive impact on society. Whereas the impact of social spending is not as much as it was expected previously, its impact is significant and should be taken very seriously.

Omotor (2009) focused on the consequence of various socioeconomic variables mainly the effect of inflation, income, literacy rate and unemployment to examine the crime relationship in Nigeria. By employing the different form of econometric methods ECM and Johansen Cointegration technique, the results of the study showed that in case of Nigeria unemployment and crime rate have strong and positive relation with the crime rate while the high population and low literacy rate in Nigeria were not found the main roots of pretending the crime rate.

Jabbar and Mohsin (2013) tried to classify the effect of demographic, socioeconomic and deterrent variables on property crime rate on the province of Pakistan Punjab. The study used a set of time series data from the year 1978 to 2012. Johansen cointegration approach was used to check the long run relationship among the variables Finding of the study suggest that population density is the main factor which lead to enhances the crime rate in Punjab. Empirical study also proved that the relation of the population density with crime rate has a positive and significant impact but negative association between unemployment and crime rate. Past experience also enhances the property of the crime rate while education has a significant but negative impact on the crime rate in Punjab province

Jabar et al (2015) tried to find the influence of law enforcement and socio-economic variables on crime rate. The study used the cross-section data by taking 35 districts of Punjab to investigate the effect on crime rates by using fixed effect model. An increase in untraced crime cases and population growth has positive impact on crimes while education level and economic activity has negative impact on crime rate. The Study also indicated the positive impact of police strength on crime in Lahore division and this is due to inefficient allocation of police department. The study is important in perspective of policy making as it gives strong idea about the provision and performance of police in various divisions of Punjab.

Warraich and Farooq (2015) tried to focus on those determinants which cause and induce the females to commit crime. Primary data was used and it was collected from Punjab through a scheduled interview. Data was selected of 291 respondents through systematic random sampling. The statistical results of the study showed that the most important and effective factors which induce

women for criminal behavior, are social disputes, social deprivation, revenge, peer group and family culture. Family and peer influence are most important factors of criminality. Social and cultural effects of these two significant pillars of society led females towards the criminal behavior in Pakistan, particularly in Punjab.

Data and Methodology

Theoretical Framework and Empirical Procedure

In social sciences criminal behavior can be discussed by a numerous ways as social scientists have developed different theories for this purpose. Being a social scientist an economist has his own ideas to examine the criminal behavior and in most of their empirical studies they focus on rational economic theory to explain the criminal behavior of the natives of a society. Rational economic theory compels economists to believe that a criminal is an economic agent because he commits crime to enhance his expected utility (Mathur, 1977). David Friedman (1996) stated this fact in these words; a burglar has same reasons of his burglary that a teacher has for his teaching profession because both want to maximize their utility. Thus, it can be identified that choice between committing and not committing a criminal activity depends upon the net payoff (φ_i) of some criminal activity. Choice of involvement in an illicit activity denote the mathematical term (P_i) that show the decreasing function of its expected cost (C_i) and increasing function of expected gain (G_i) of that activity i.e.

$$Pi = f(Ci, Gi)$$

Whenever;

$$Ci = f(ci, wli, pi, fi)$$

Where the term C_i, is total cost that show the relation between other factors which are related to the illicit activity and faced by criminal while committing a crime, and c_i, direct cost that a criminal pays in term of effort he made in acquiring gains from criminal activity. These can the efforts of self-defense to avoid penalties or to avoid arrest / imprisonments etc. wl_i, indicates the foregone of legitimate labor market wages in case of arrest or conviction, p_i,

stands for probability of arrest or conviction, f_i represents the fines or other penalties in term of imprisonment etc.

Moreover, gain of some criminal activity can be shown by following function.

$$G_i = f(L_i)$$

In the above identified function the notion G_i shows that the relationship between L_i is positive and L_i is something gained as a result of some criminal activity.

Finally the difference of gross gain and total cost can be defined in term of φ_i which explain the net pay off.

Or $\qquad \varphi_i = L_i - c_i - wl_i - p_i f_i$

The net pay-off (φ_i) can also be stated as expected utility of committing a crime and someone may be able to claim that a criminal activity takes place if and only if;

$$\varphi_i > 0$$

Or $\qquad E[G_c] > E[C_c]$

The description of expected gains $E[G_c]$ is considered as economic incentives; however, these incentives can be psychological in most of the illicit activities. While on the opposite direction in case of arrest or imprisonment the expected cost of crime consist of, fine, penalties ,wastage of time or foregone wages from the legitimate labor market activities and from the above debate it is cleared that expected gains and expected cost of some criminal activity permits only those who want to maximize their expected utility participate in the criminal sector (Becker (1968); Ehlrich (1973); Witt (1984) and Becsi (1999)). Moreover, this discussion is the core of economic model of crime that study will use in its empirical procedure. It will be helpful in identifying the role of various socio-economic, demographic and deterrent factors that can affect the property crime rate in province of Punjab (Pakistan). After considering Buonnano et al (2008); Friedman (1996); Cherry et al (2002); Becsi (1999); Allison

(1972) and Jalil et al (2010) study has narrated the following function of crime;

Property crime = f (untraced property crime, proclaim offenders, Police strength, factory per thousand, population growth, literacy rate)

$$PC_{it} = x_{it}\beta + c_i + u_{it}$$ (1)

Where PC_{it} is the property crime rate in District i in time t. PC_{it} is showing the function of some Socio-Economic ,Deterrent, Demographic and Economic variables.

Our model　　　(2)

$$PC_{it} = c_i + \alpha_1 UPC_{it} + \alpha_2 PCO_{it} + \alpha_3 PS_{it} + \alpha_4 FPTn_{it} + \alpha_5 PG_{it} + \alpha_6 LR_{it} + u_{it}$$

t= 2010…………2014 ;　　　I= 1, 2 ……………..170

Where $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6$　　are　the　parameters. $UPC_{it}, PCO_{it}, PS_{it}, FPT_{it}, PG_{it}, LR_{it}$ are the explanatory variables and they can change their values both at across districts i and across time t. The c_i is unobserved effect which is called individual effect or individual heterogeneity when i is indexed as individuals. The u_{it} change both across t and i and it is called idiosyncratic error/ or idiosyncratic disturbances. These idiosyncratic disturbances are independent and identically distributed. Now, the question is how to treat with c_i? If we treat c_i as fixed (it varies across group or time periods) then the model will be called Fixed Effect Model and if c_i is treated as random then the above model will be called Random Effect Model. If model contains no individual effect then Ordinary Least Squares (OLS) parameters are efficient and consistent and OLS's five assumptions are; Linearity, exogeneity, homoscedasticity, no autocorrelation, observations on the independent variable is fixed in repeated sampling and full rank (Greene, 2003). In our study 'N' (no. of cross sections) is large and 't' (no. of time period) is small estimators obtained by the two method can differ significantly . Our individual units in sample are not drawn randomly so, Fixed Effect Model is appropriate. (Gujrati,5th edition)

In fixed effect approach, individual effect can either be captured by dummy variable model or within transformation method but least square dummy variable model faces incidental parameter

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problem when there are too many groups in the panel (Baltagi 2001) and within group effect model removes incidental parameter problem as it does not require dummy variables. So, we are using the following model to compute our parameters.

$$TC_{it} - TC_{i\blacksquare} = \alpha(X_{it} - X_{i\blacksquare}) + (u_{it} - u_{i\blacksquare})$$

$TC_{i\blacksquare}$, is total mean of district i $X_{i\blacksquare}$ is mean of explanatory variables of district i. Another method used to remove the individual is first differencing method but the difference lies between two estimates when time period is greater than 2. If there are only two time periods then two estimators are same (Wooldridge, 2002).

Descriptive Statistics

Descriptive statistics for the variables used in this study are given below in table 1. For quantitative description of the data mean and standard deviation have used as measure of central tendency and as measure of dispersion respectively. Moreover, maximum and minimum value of the data has been taken to find the range of the data. Results of the table show that average value of Property Crime (PC), Untraced Property Crime (UPC) and Police Proclaimed Offender is 3.10, 4.06, and 0.21 respectively. More explicitly it can be narrated that on average there are 3.10 property registered crimes per thousand people in each district of Punjab with standard deviation of 1.1 There are 4.06 untraced criminal cases per thousand people in each districts of Punjab with a standard deviation of 2.5.results of the descriptive statistic also specifies that almost all variables are indicating a low standard deviation which shows less variability of data set.

Table 1: Descriptive Statistics

Variables	bs.	Mean	Std. Dev.	Min	Max
PC	170	3.10512	1.110924	1.21949	8.471411
UPC	170	4.061714	2.75649	.2	14.3
PCO	170	0.21132	0.23201	0.022140	0.88013
PS	170	.0074842	.0017841	.0032554	.0144049
FPT	170	.0900348	.0689168	.0114329	.3248555
PG	170	1.58516	.2834145	1.09569	2.222765
LR	170	56.85143	11.67819	27	80

Estimation Method

There are different methods to estimate the panel data but Hausman test suggested that for estimation of the model of current study Fixed Effect model is appropriate. The regression model is estimated by using within effect model, time effect model, between effect and two ways within effect model but estimation results of only within effect model are shown because these are more accurate and significant as compare to the rest of methodologies.

Table 2: Empirical Estimations by Fixed Effect Model

	(1) PC (000)	(2) Log PC	(3) PC (LSDV)	PC (Less Dens Districts)	PC (High Dens Districts
Untracedproperty Crime	0.0100***	0.0059***	0.0831*	0.1630***	0.1536***
	(0.0024)	(0.0016)	(0.0349)	(0.0470)	(0.0488)
Proc_offender000	0.0544	0.0294	0.0875	0.0652	0.0432
	(0.0400)	(0.0266)	(0.0341)	(0.0032)	(0.0025)
Police000	29.1939	27.2683*	31.3132*	121.0303**	76.1853
	(17.0440)	(11.3365)	(13.8039)	(10.31571)	(.3509)
FactperThousand	1.0103*	0.2304	0.7453**	7.1156**	4.2981*
	(0.3966)	(0.2638)	(0.2682)	(2.1486)	(2.3361)
Pop_growth	0.6495**	0.5556***	0.1782***	4.7532***	4.7698***
	(0.2130)	(0.1416)	(0.1362)	(1.6161)	(1.7398)
Literacy_rate	-0.0052	-0.0033	-0.0372	-0.0134	-0.0167
	(0.0034)	(0.0023)	(0.0152)	(0.0315)	(0.0231)
_cons	-0.5939	-1.2730***	-2.1392		
	(0.4069)	(0.2706)	(0.1432)		
N	170	170	170	80	80
R^2	0.934	0.916	0.913	0.8922	0.871

Standard errors in parentheses $*p < 0.05$, $**p < 0.01$, $***p < 0.001$

Results and Discussion

Our foremost empirical finding is related to the deterrent effect of various independent variables on the property crime rate of the Punjab province of Pakistan. Simple linear regression model is estimated in Column (1) and on the other hand to check the robustness of the results of the simple linear regression model log-linear model is estimate in column (2) and in column (3) estimate results are on the base of another method of Least Square Dummy Variable which also depicts the same results of the of the relationship between property crime and other regressors.

Coefficient of the estimated result of untraced property crime (0.0100) in simple linear regression model shows that one unit change in untraced property crime results suggested that on the average property crime rate increased by 0.0100 unit. On the other hand log linear model empirical findings (0.0059) showed that one unit increase in untraced property crime will result in 0.0059 percent increase in property crime rate of the Punjab. So, empirical results of the study indicate that there is a positive and significant impact of untraced property crime on property crime of the Punjab (Pakistan). In tracing criminal cases it can be stated as inefficiency of police department. The failure of this institutional leads to higher property crime rate. This will intensively lead to have a lower expected cost of committing crime that absolutely will be reason a high crime rate if police department has poor ability for the detection of crime and proportion of register crime remained untraced.

Empirical findings of coefficient police proclaimed offenders (0.0544) means one unit change in police proclaimed offenders result will lead on the average 0.0544 unit increases in property crime rate in Punjab. Further, the results of police proclaimed offenders on log linear model (0.0294) also depicts the positive and significant sign mean that if one unit increase in untraced property crime will result in 0.0294 percent increase in property crime rate. So the relationship between police proclaimed offenders with property crime rate is positive and significant. It will support to recognize that in committing property crime past criminal experience has impact on current crime rate along with the information that proclaimed offenders are consider most interested. In simple linear regression model estimated findings of police strength (29.1939) indicate that one

unit change in police strength leads to 29.1939 unit increases in property crime rate of the Punjab province (Pakistan) and it showed the positive and significant impact on property crime rate.

And Empirical result of police strength (27.2683) depicts one unit increase in police strength results on average 27.2683 percent increase in property crime rate of the Punjab. By checking robustness direction of the relationship between dependent and independent variables remained the same as in simple linear regression model.

Results of the study indicate that in allocation of police strength not only the preferences but the allocation of police employees in Punjab can also be stated as a positive factor. When government detect a high crime rate in society they announce job vacancies and after this recruitment a key proportion of these newly recruited police employees deputed to serve and protect only the political and influential personalities in Punjab. A positive and significant relationship between property crime and police strength is similar to the results of Becsi (1999), Allison (1972), Gumus (2004), and Buonnano et al (2008). These investigators explain their results by saying that when a high crime rate is observed in a society government should take interest in order to announce new vacancies in police department which causes a positive and significant relationship between these two variables.

Factory per thousand which is taken as the proxy variable of the economic activity of the Punjab. Factory per thousand has a positive and significant relationship between independent variable and property crime rate. In simple regression model result of factory per thousand (1.0103) means one unit increase in factory per thousand results on average 1.0103 unit increase in property crime rate. In the log linear regression model estimated findings (0.2304) means one unit increase in factory per thousand results in 0.2304 percent increase in property crime rate of the Punjab. As factory per thousand increases in a particular area its population also increases. Crime is usually considered as urban phenomenon. As a result crime rate is higher. As population increases crime target also increases and probability of arresting a criminal get lower and cost of crime is lower so crime rate will be higher.

Relationship between population growth and property crime observe positive and significant in case of the Punjab province and empirical results (0.6495) in simple linear regression model indicate that one unit increase in population growth rate will result on average 0.6495 unit increase in property crime rate of the Punjab. By checking robustness through log linear regression model findings of the above said variable (0.5556) means one unit increase in population growth rate will leads to 0.5556 percent increase in property crime rate in Punjab. Increase in population growth rate has significant positive effect on property crime rate. It is quite rational and comparable with the empirical findings of Jabbar and Mohsin(2013-14) Regoeczi(2003) Keth Harries (2006) Bunnano et al (2008) and Erdel Gumus (2008) it seems reasonable to discuss that in more populated area may lead to lower probability of arrest and shrink the cost of crime. As a result the crime rate will be increased.

Education has a negative and significant impact on the property crime rate. Results of the study indicate that variable literacy rate in simple linear regression model (-0.0052) showed that one unit increase in literacy rate will leads on average -0.0052 unit decrease in property crime rate of Punjab. In log-linear model result of literacy rate (-0.0033) means one unit increase in literacy rate will result in -0.0033 percent decrease in property crime rate of the Punjab. The effect of literacy rate on property crime of Punjab is negative and significant, huge national and international literature supports these empirical results i.e. Paolo Buonanno (2003), concluded that education have negative and significant association with all type of crime that support the current findings of the study. Furthermore, Lance Lochner (2007; 2001), Usher (1997),) and Jalil et al (2010) also found that impact of education is negative and significant with criminal opportunities.

Before committing some criminal activity with respect to property crime lies in the line of cost and benefit analysis that a criminal makes because immense of national and international literature proved that the impact of literacy rate have negative and significant relationship with all type of crime. Attaining education needs some monetary and time investment which can enhance the probability of real earnings. So, for a well-educated person the expected cost of crime in term of time, imprisonment or punishments becomes higher and he avoids to participate in all types illicit activity Lochner (2004), Jalil et al (2010) , (Becsi (1999),and Usher (1997).

So, the factor of Education not only increase the opportunity cost of criminal behavior but it also stimulates hard-working, honesty, norms and the morals of society along with promoting culture of serving the societies. Additionally, attaining education demonstrate the individuals to be more patience and forward-looking and it becomes a significant source of negative associations of education and criminal behavior (Becsi (1999), (Usher (1997), Lochner (2007), Buonnano et al (2008). Finally, one of the main consequences of education is that it improves the individual's preference towards risk. So, due to this factor educated individuals become more risk averse and they try to avoid any kind of illegal activities.

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