Poverty, Inequality, Political Instability and Property Crimes in Pakistan
A Time Series Analysis

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ABSTRACT

In a formal econometric analysis of crime statistics in Pakistan, this paper estimates five systems of equations determining crime rates against property, conviction rates and police and justice input using time series annual data. The study finds substantial empirical support for the model of crime, punishment and deterrence based on economic theory. The main conclusion of the study is that in the fight against crime Pakistan needs to divert resources from provision of legal justice through various deterrence measures, like large police force, conviction and punishment, towards the provision of social justice in the form of fight against poverty, inequality and unemployment and maintenance of political stability, especially by controlling sect and ethnic based terrorists activities. Resources also need to be diverted from punishments to apprehension of criminals.

Keywords: crime deterrence, inequality, Pakistan, political instability, poverty.

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1. INTRODUCTION

Crime is a complex socio-economic phenomenon, which needs to be addressed by social scientists as well as policy makers at the regional and global levels. The extensive research on the causes of crime has resulted in rich theoretical foundations. In the first formal treatment of economics of crime, Becker (1968) emphasized that criminals act as rational maximizing agents while making choices, keeping in view the expected benefits and costs of committing crime. On the other hand, through the criminal justice system society also maximizes utility by weighing the costs of operating the system against the benefits of avoiding crimes. The implication is that both the criminals and the criminal justice system respond to changes in each other’s behavior. As a result crime rates, conviction rates, and expenditures on criminal justice system tend to become mutually inter-dependent and, hence, jointly determined.

Becker’s (1968) model has served as ‘micro foundations’ to empirical analysis of crime and deterrence at the aggregate level. In the first serious work in this direction, Ehrlich (1973) translates Becker’s theory into a three-equation empirical model determining crime rate, conviction rate and police and justice expenditure. This model with minor changes has been used extensively in various empirical contexts, mostly in the western world, especially the USA.¹ The empirical work for the developing countries has been grossly lacking, needless to say that not a single study on economics of crime exists in case of Pakistan. It is in this background that the present study is undertaken.

Crime rate in Pakistan has increased sharply during the past few decades.² This is a serious challenge for the criminal justice system, which is known to be chocked by unsolved criminal cases.³ The question that needs to be addressed is to what extent the rising trend in crime rate can be attributed to some of the factors well documented in literature on economics of crime.⁴ These

² According to statistics taken from various issues of Pakistan Statistical Year Book of Federal Bureau of Statistics, in terms of the number of crimes per one hundred thousand of population, the decade-wise aggregate crime rate comes out to be 102, 134, 133, 170 and 275 during the 1960s, 1970s, 1980s, 1990s and 2000s respectively.
³ For example, the crime-wise annual data taken from Annual Police Reports of all the four provinces and capital territory of Pakistan show that during the decade of 1980s the number of cases of the 11 major crimes against persons and property pending in all courts had been 93.9 thousand. This number almost doubled to 181.5 thousand during the decade of 1990s.
factors can be quantified in terms of various proxies that indicate benefits and costs of doing crime such as the rates of punishment and the probabilities of conviction along with economy-wide conditioning variables like per capita income, income inequality, poverty and unemployment. A cursory look at data in Pakistan shows indications of increase in returns from crime in terms of substantial increase in per capita income with income inequality remaining persistent. On the other hand, the opportunity cost of committing crime has declined mainly due to declining conviction rates and the rising number of poor households.

Another factor that can potentially be attributed to rising crime rate in Pakistan is the extraordinary burden on criminal justice system to tackle the consequences of political instability. During the periods of political instability police force is heavily occupied with protocol duties, especially in protecting VIPs. Thus political instability can influence crime rate through its adverse effects on the output of criminal justice system.

Whether data formally support the above perceptions is an empirical question, which this paper aims to answer. In particular, the paper addresses the following research problems.

- Compilation and construction of time series data on major property crime in Pakistan.
- Specification of a model of crime and deterrence based on theoretical foundation and the peculiar situation in Pakistan.

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5 Per capita income has increased by 82% during the 25 years period 1980-2005, while Gini index of inequality has remained almost stable, 0.33 in the 1980 and 0.30 in the 2005. See Pakistan Economic Survey, Ministry of Finance.

6 The crime-wise annual data reported in Annual Police Reports of the four provinces and capital territory of Pakistan show that conviction rate for the 11 major crimes declined sharply from 62% during the 1960s to 28% during the 1990s, though it again increased to 35% during the 2000s.

7 Pakistan has the unique experience of observing significant increase in the number of poor households during the past one-decade or so despite moderate increase in per capita income. The data in Pakistan Economic Survey show that the number of poor population has more than doubled from 23.5 million in 1980 to 47.8 million in 2000, though it declined to 36.3 million in 2005, the last figure instigating much controversy between government advisors and independent economists.

8 Data on the allocation of police force to various activities are classified (confidential). However, there are indirect indications that political instability in Pakistan has resulted in the neglect of conventional crimes. The perception that police force is heavily burdened by maintenance of law and order duty can be assessed by the fact that in Karachi, the largest city of Pakistan, the presence of army rangers has become a permanent feature. Similar situation has developed in most parts of North West Frontier Province (NWFP). Several political leaders, including the twice-elected ex-prime minister, Ms. Benazir Bhutto, have been assassinated and several VIPs, including the president of Pakistan have survived murder attempts. In 2011, the Governor of the largest province, Salman Taseer was murdered by his own police security guard for his comments against blasphemy. Similarly, the minister of religious affairs escaped from attempted murder. Another indicator of the diversion of police force from its traditional duty is political riots. The political riots in Karachi on May 12, 2007 resulted in death of about 45 citizens on one day. Likewise, two separate incidents of terrorist attacks during the public meetings of heads of two major political parties on December 27, 2007 caused the death of more than 40 citizens.
• Econometric analysis of the factors entering into the supply of crime function, production function of law enforcement and the demand function for law enforcement.

The study is based on the well-developed empirical model of Ehrlich (1973), which consists of three equations for each crime. The first equation is the supply of crime equation with crime rate as the dependent variable and conviction rate, severity of punishment, government expenditure on police and justice and a number of conditioning variables consisting of Gini index of income inequality, per capita income, headcount index of poverty, unemployment rate and the proportion of young male population as independent variables. The second equation represents the production function of law enforcement and it determines one of the deterrence variables namely the probability of conviction as a function of government expenditure on police and justice (considered as an input), crime rate, severity of punishment and an index of political instability. The third equation represents the demand function for law enforcement input as a function of crime rate under consideration and the overall crime rate.

The model is estimated for the five categories of property crime, namely dacoity, robbery, burglary, cattle theft and theft. The empirical analysis is based on annual time series data for the period 1965 to 2005 and the econometric equations are then estimated on the basis of Generalized Method of Moments (GMM).

The paper is planned as follows. Section 2 presents an empirical model consisting of three equations for each of the five crime categories. Data and variables construction are described in section 3 and results of econometric analysis are presented and analyzed in section 4. Finally, section 5 concludes the paper.

2. METHODOLOGY

The economic theory of crime emphasizes on two-way interaction between criminals and the criminal justice system. A criminal is not the only expected utility maximizing agent. The criminal justice system as the agent of society also maximizes utility by weighing the costs of operating the system against the costs to the society of criminal behavior. The implication is that the criminal justice system responds to changes in criminal behavior by adjusting expenditures on police, courts, prisons, etc. As a result the actions of criminals – the crimes committed - and actions of criminal justice system - arrests, convictions and punishment - tend to be mutually interdependent. This formulation, on one hand, provides better insights into the economic
analysis of crime and justice and, on the other hand, handles the econometric problem of endogeneity in estimation. The econometric model used in this study consists of three equations. These are supply of crime function, production function for law enforcement and the demand function for law enforcement. Various variables used in the model are defined below.

\( E/N \): Per capita government expenditure on police and justice

\( F_i \): Fine for the crime \( i \) measured as the average years of imprisonment per crime

\( Gini \): Gini index of income inequality

\( N_{my}/N \): The proportion of male and young (15 to 24 years of age) population out of the total population

\( O_i/N \): Crime rate of type \( i \), which is the number of crimes of type \( i \) registered with police as a ratio to size of population, the latter measured in hundred thousands

\( O/N \): The aggregate crime rate, which is the number of all crimes registered with police as a ratio to size of population

\( P_i \): The probability of conviction (apprehension and punishment) in crime type \( i \) measured as the number of persons convicted in courts as a ratio to the number of cases registered with police

\( Pol \): The index of political instability

\( Poverty \): Poverty as measured by head count index

\( U \): Unemployment rate measured as the percentage of labor force unemployed

\( Y \): Per capita income measured on the basis of GDP at constant prices of 1980.

### 2.1. The Supply of Offenses Equation

The supply of offense function, often referred to as Becker-Ehrlich model, is based the model presented in Ehrlich (1973), which relies on Becker’s (1968). Ehrlich (1973) considers an individual who maximizes expected utility of returns generated from time allocated to various economic activities. Utility is a function of wealth, measured as a composite good including the monetary equivalent of non-pecuniary returns from all legal and illegal activities and the time allocated to non-market activities. The model postulates that the net marginal expected return from illegitimate activity must exceed the one from legitimate activity in order to lure individual
towards illegitimate activity. For risk-averse individuals this is a necessary but not the sufficient condition for entry into illegal activity. For risk-neutral individuals this is a necessary as well as sufficient condition, while for risk-lovers it is a sufficient, though not the necessary condition (Becker, 1968 and Ehrlich, 1973). It follows that an increase in the rate of return from crime or decrease in the rate of return from legal means of earnings will attract more individuals to crime and raises the overall crime rate. Furthermore, as the probability of conviction or the rate of fine/punishment on a particular crime increases, the expected gain from the crime declines. As a result fewer individuals are attracted to crime. It is obvious that the supply of crime depends on all such factors that can affect the expected return from crime and the expected return from legitimate activity, the latter also interpretable as the cost of committing (producing) crime.

Two prime variables that influence the net expected return from crime are the probability of conviction and fine. The probability of conviction has alternatively been defined as arrest rate and conviction rate (Lewis 1986, Trumbull 1989). The arrest rate is the number of persons arrested as a ratio to the number of cases registered with police. The conviction rate is the number of persons convicted in courts as a ratio of the number of cases registered with police. For the obvious reason, conviction rate is by far the most popular definition used in the empirical studies (Ehrlich 1973, Mathur 1978, Entorf and Spengler 2000) and we also follow this convention. The variable fine can be defined as the sum of all type of penalties and punishments denominated in a common unit such as money or time. Since in our data imprisonment dominates all other types of penalties, the measurement errors in the fine can be minimized if all other forms of penalties are converted into the equivalent years of imprisonment.

Because of inadequate data it is almost impossible to measure the potential criminals’ subjective valuations of returns from crime. Ehrlich (1973) uses median family income of the country as a proxy on the ground that the higher the income, the more there is likely to be worth stealing. However, since only legal incomes are reported in the observed data, the median or mean income would better serve as an indicator of returns from legitimate activities rather than crime. Another proxy is the percentage of families lying below a benchmark level such as poverty line or half the median income (Ehrlich 1973), the reason being that if this figure is higher, the number of persons who have little to lose but much to gain through illegal activities will also be higher. Since the gain from crimes is expected to be higher in less egalitarian societies, an even better proxy is the extent of income inequality. Empirical support to the proposition that
inequality of incomes causes crime is fairly strong. For example, Imrohoroglu and Rupert (2000) find that increase in inequality has prevented a large decline in crime in the US. Machin and Meghir (2000) find strong association between wages of less skilled workers in UK and property crime. Bourguignon (2001) find that criminals in Columbia are to be found among people living in households with per capita income below 80 percent of the overall per capita income. On the other hand, the contrary evidence (e.g., Mathur 1978, Stack 1984, Luiz 2001) is rather limited. In our analysis we shall use both the income inequality and poverty to indicate potential returns from crime.

The cost of committing crime has two components. The opportunity cost and the direct cost. For the opportunity cost - the rate of return from legitimate activities - wage rate and per capita income are used as proxies in literature (Ehrlich 1973, Mathur 1978, Trumbull 1989). Due to inadequacy of wage data in Pakistan, we rely on per capita income as the proxy. Since increase in unemployment reduces the probability of securing legal means of earning, we also use unemployment rate as an indicator of the expected rate of return from legitimate activity. It may be noted, however, that given per capita income and poverty, unemployment better indicates lack of legitimate activity than the lack of income. Unemployment is often also used as an indicator of inequality. Ehrlich (1973) and Freeman (1999) provide theoretical basis to predict that unemployment causes increase in crime rate. However, statistical evidence in this regard is largely inconclusive. Citing a review of 63 aggregate studies by Chiricos (1987) containing 288 estimates, Eide (2000) observes that in 67% cases the relationship remains insignificant. Freeman (1995) also concludes the same in a survey study. Levitt (2001) finds no significant effect of unemployment on violent crime except robbery in the USA. Similar conclusions are drawn by Elliot and Ellingworth (1996) and Carmichael and Ward (2001) for England and Wales respectively. Entrof and Spengler (2000) even report a negative association between unemployment and violent crimes of rape and murder for Germany. Greenberg (2001) and Raphael and Winter-Ember (2001) also report similar results for the US national and state data. Carr-Hill and Stern (1973) support negative relationship suggesting that unemployed fathers stay at home and keep an eye on their children.

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9. Allen (1996) reports on several largely inconclusive studies of the aggregate crime rate in the USA. Freeman (1996) mentions that no significant effect is found in a cross-section of time series for various metropolitan areas in the US when controlling for fixed effects, but pure cross-country data reveal positive and significant relationship between crime rates and various inequality measures. Fajnzylber et al. (2002) find that the direction of relationship between income inequality and crime rate is not robust with respect to competing estimation techniques.
It is also noteworthy that income inequality is a long run phenomenon in comparison to unemployment and crime rate is expected to be more responsive to long-run economic factors. It is, therefore, not surprising that the empirical literature is quite consistent in verifying the positive effect of income inequality on crime, while it is relatively ambiguous in observing the negative effect of unemployment on crime.

The direct cost of committing crime is the cost of time and money that is put to use to produce crime. The time cost depends on the efforts to deceive law enforcement agents like security personnel and devices, while the monetary cost depends on the cost of acquiring weapon, mostly in the form of black market premium, and aligning local police agency. A good proxy for this cost is the per capita government expenditure on police and justices.

Another variable that we include in the analysis is the proportion of male adults aged 15-24 in the population who are expected to be relatively more active in criminal activities. Finally, to allow sluggishness or persistence in criminal behavior in the society, we also include one year lagged crime rate in the supply of crime equation.

In most studies the supply of crime equation is meant to measure crime in relation to population size (Ehrlich 1973, Mathur 1978, Entorf and Spengler 2000). Thus econometric specifications typically replace the absolute size of crimes by crime rate. Following Ehrlich (1973), we consider the following Cobb-Douglas specification for the supply of offence function.\(^{10}\)

\[
\frac{O_i}{N} = A \left( P_i \right)^{\alpha_2} \left( F_i \right)^{\alpha_3} \left( E_i / N \right)^{\alpha_4} \left( Gini \right)^{\alpha_5} \left( Y_i \right)^{\alpha_6} \left( Poverty \right)^{\alpha_7} \\
\left( U \right)^{\alpha_8} \left( N_{my} / N \right)^{\alpha_9} \left( O_{i-lag} / N \right)^{\alpha_{10}} \exp(\epsilon_i)
\]

This supply function assumes that the elasticities of supply with respect to various arguments \(\alpha_i\) remain constant. It follows from the above discussions that the parameters \(\alpha_2, \alpha_3\) and \(\alpha_4\) are expected to be negative, while \(\alpha_5, \alpha_7, \alpha_8, \alpha_9\) and \(\alpha_{10}\) are expected to be positive. The parameter \(\alpha_6\) could be positive, negative or zero because with the increase in per capita incomes the opportunity cost of doing crime increases but at the same time the potential criminals expect

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\(^{10}\) Apart from the variables included in equation (1), we also considered in our preliminary analysis a number of other variables like inflation rate, estimates of the size of black economy, literacy rate, secondary school enrollment rate, population density and the proportion of urban population in the total population. All these variables formed insignificant relationship with the crime rates.
greater gains from undertaking criminal activities.

2.2. Production Function of Law Enforcement

Since the probability of conviction \( P_i \) is most likely to be endogenous, we need at least one more equation to complete the model. The endogeneity problem arises because any increase in crime rate is likely to force the law enforcement agencies to adopt appropriate countering measures and convict most of the criminals in courts of law. The equation determining the probability of conviction is referred to as the productions function of law enforcement because it determines the output of the law enforcement system as a function of various inputs and conditioning variables (see, for example, Ehrlich 1973). To be consistent with the crime equation, we make standard assumption that production function for law enforcement is of Cobb-Douglas form:

\[
P_i = B_1 \left( \frac{E}{N} \right)^{\beta_1} \left( \frac{O}{N} \right)^{\beta_2} \left( F \right)^{\beta_3} \left( Pol \right)^{\beta_4} \left( P \right)_{\text{log}}^{\beta_5} \exp(\eta_i) \tag{2}
\]

An increase in police and justice expenditure, the main input in the production function, is expected to result in a greater proportion of offenders apprehended and convicted of crime. Thus the parameter \( \beta_2 \) is expected to be positive. On the other hand, an increase in crime rate places more burden on the given resources spent on police and justice and hence for the given output of law enforcement system the conviction rate declines. Thus we expect \( \beta_3 \) to be negative. This also implies that when the crime rate is higher, the productivity of resources allocated to police and justice would be lower because more offenders would then have to be apprehended, charged, and tried in court in order to achieve a given level of conviction rate.

The probability of conviction can increase, decrease or remain unchanged in response to increase in the rate of fine depending on whether the police and justice system considers conviction as complements, substitutes or independent of fine in combating crime. Therefore the sign and magnitude of the parameter \( \beta_4 \) can not be determined on a priori basis.

Ehrlich (1973) has suggested that “in a riot, the probability of apprehension for individual rioters, as well as for offenders committing other crimes, falls considerably below its normal level due to excessive load on local police units.” This means that the frequency of riots is another potential variable affecting crime rates. This proposition cannot be directly verified in
case of Pakistan because data on allocation of police force to various duties are classified (confidential) and the data on the number of riots are available for limited period of 20 years only. However, a good proxy for the number of riots is the political instability index for which consistent time series data are available.\textsuperscript{11} This index includes several components such as wars, mass political movements and ethnic and sectarian conflicts that Pakistan has experienced over long periods of time. Thus political instability is another factor that can potentially undermine the performance of police force in convicting criminals. In order to test this possibility, we have included in the above equation an index of political instability. We expect the parameter $\beta_5$ to be negative. Finally, $\beta_6$ is expected to be positive due to the expected persistence in the productivity of the police and justice system.

\subsection*{2.3. Demand Function for Law Enforcement}

The above formulation is still incomplete as the expenditure on police and justice is not exogenous and is likely to depend on aggregate crime rate. Thus we need to estimate an equation for police and justice expenditure, referred to as the demand function for law enforcement (Ehrlich 1973, Mathur 1978). The demand for law-enforcement activity may be viewed to be essentially a negative demand for crime or, conversely, a positive demand for defense against crime. Naturally, potential victim would like to have self-protection both privately and collectively. In the present context our concern is confined to collective self-protection actions by law enforcement agencies while ignoring private self-protection because data deficiency rule out the comprehensive analysis of social defense against crime. We specify the following demand function for law enforcement.

$$
\frac{E}{N} = C_1 \left( \frac{O}{N} \right)^{\gamma_1} \left( \frac{O_i}{N} \right)^{\gamma_2} \left( \frac{E}{N} \right)_{\text{lag}}^{\gamma_3} \exp(\mu)
$$

(3)

The common practice in literature is to make expenditure on police and justice a function of crime rate of the particular type under consideration, whereas in the above specification expenditure on police and justice also dependents on the overall crime rate. The presumption is that it is the overall crime situation that will compel the police and justice system to respond. The regression coefficient of the aggregate crime rate, which is expected to be positive, indicates the

\textsuperscript{11} Limited data on the number of riots available from \textit{Annual Police Reports} of provinces and capital territory show that the correlation coefficient between the index of political instability and the number of riots over the period 1980 to 2000 is 0.68, which is highly significant with t-statistic equal to 17.5.
response of the police and justice system to changes in the overall crime rate. The regression coefficient of the specific crime rate of type i can be of any sign and magnitude depending on the perception of police and justice system about relative importance of the crime. A positive coefficient indicates that police and justice expenditure increases in response to increase in the specific crime rate when overall crime rate remains constant, that is the other types of crimes decrease on average. Thus a positive value of the $\gamma_3$ will indicate that the police and justice system considers the crime of type i more serious than the other crimes. Likewise negative value of $\gamma_3$ will indicate that the police and justice system consider the crime of type i relatively less serious. Finally, it is expected that police and justice expenditure is positively related to its one year lagged value, which captures stickiness in the government budget allocation.

3. Data

Data on crime rate cannot be compiled accurately because of numerous reasons. Since many crimes remain undiscovered, unreported and officially unrecorded, any record of crimes is at best an index of the total number of crimes committed, which may not maintain a constant ratio with the true crime rate. However, research has to be continued with the given data until more reliable data become available. Dilulio (1996) suggests that even though more than half of the violent crimes and two third of all crimes remain unreported, it is often possible to utilize the given data in ways that lead to meaningful interpretations. The official crime statistics in Pakistan do not speak the whole truth either and are subject to at least the following limitations.

- The victims who face petty crime do not report it to police due to cumbersome procedures and further psychological and monetary costs.
- Victims often do not receive any restitution under Anglo-Saxon laws especially designed during the colonial times. These laws primarily aim at maintaining law and order rather than providing justice.
- The poor and weak citizens are afraid of retaliation from the criminals.
- Reported crimes only depict the number of cases registered by police, irrespective of the number of victims, properties and offenders involved in each case.
- Given the lack of trust and confidence, an easy way for police to show better efficiency both in terms of crimes committed and actions taken in terms of arrest and investigation
is to avoid registration of the First Information Report (FIR). On the other hand, police stations seeking higher budgets may reveal crime statistics that distress policy makers.

The Criminal Branch Offices of the four provinces and the federal capital of Pakistan compile and maintain all data on crime. These data are classified and are meant for internal use of the police administration only. In 1981 the Bureau of Police Research and Development, Ministry of Interior, published a report named *Crime in Pakistan (1947-1980)*. This report provides detailed data since independence (1947). Unfortunately, there is no such consolidated information in the form of a report or the like on crime statistics for the period beyond 1981. For this period crime data are taken from the Criminal Branch Office of each province and the federal capital. Data have been recapitulated and recalculated to keep consistency. Specifically data on certain crimes are aggregated to make them comparable across all the years. The provincial and federal level data are then aggregated to arrive at the national level crime data.

There is no published source of information on punishments for various categories of crime and all the data have to be collected from the primary source that is the records of the jails. Due to the time and financial constraints and the bureaucratic hurdles, it was decided to visit only the largest jail of Pakistan, the Central Jail Lahore. Experts in criminology agree that the pattern of punishments in Pakistan is uniform because cases are registered and punishments awarded (by local or provincial courts) under the same law that is Pakistan Penal Code.

The Central Jail Lahore keeps registered record in chronological order of all prisoners since the year 1950. Data were recorded by writing in column the ages of criminals, types of crimes committed and punishments awarded in the form of death sentence, life sentence, years of imprisonment, number of lashes, property confiscated or amount of fine. Data collection was made possible with cooperation and help from lower staff of the jail.

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12 The authors are thankful to Nazir ul Hassan, Statistical Officer for his invaluable cooperation in providing the data and the information essential for understanding and interpretation of data.

13 The original plan was to visit the three largest jails in Pakistan namely Central Jail Lahore, Central Jail Sahiwal and Central Jail Karachi. The officials in the three jails were requested to provide the information or to grant permission to examine the jail records. The whole procedure starting from the grant of permission from the highest concerned office to entry in the record room was lengthy and it took six months’ efforts to obtain permission for examining the jail records in just one jail. Thus it was decided to exclude the Central Jail Karachi from the sample. The Home Department of the Government of Punjab (where the other two sampled jails are located) granted the permission for examining jail records to one person and from 9.00 am to 3.00 pm for 15 days. There was no facility (such as photocopying) provided and all data records have to be recorded manually. Within the given time span (including the extended hours allowed), only the records in the Central Jail, Lahore could be examined.

14 The authors are especially thankful to Dr. Abdul Majeed Aoulakh, Principal Jail Training Institute, Lahore and M. Masood Khan, Vice Principal Jail Training Institute, Lahore for their advice.

Five major crimes against property analyzed in this paper are dacoity, robbery, burglary, cattle theft and theft. The variables used in the study are constructed as follows.

**Crime Rate**

Following the standard practice (e.g. Ehrlich 1973, Mathur 1978), crime rate for each category is calculated as the number of cases registered per 100,000 of population.

**Probability of Conviction**

The literature uses probabilities of arrest, trial and conviction as the three alternative deterrence variables. However, the probability of conviction is by far the most representative and, hence, the most popular indicator of deterrence and we shall follow the convention. Unfortunately there is no unique way to find the probability of conviction. One possibility is to divide the number of cases in which persons are convicted by total number of cases registered. This procedure can lead to inappropriate estimates because quite often offenders are convicted of multiple crimes in a single case registered. Another possibility is to divide the number of persons convicted by the number of persons against whom cases are registered. This possibility is ruled out in the present case due to lack of the required data. Besides, there are also conceptual problems with this procedure. In many cases, especially arising from long standing animosity, the aggrieved parties tend to register a case against most of the members of a family in order to inflict maximum loss to the rivals. Yet another procedure is to divide the number of persons convicted by the number of cases registered. Although this procedure is not perfect, it is the only procedure used in empirical literature due to the limitations of the other procedures as mentioned.

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\(^{15}\) The authors are thankful to Ansar Hussain Shamsi, Advisor to Finance Minister, Ministry of Finance, Islamabad, Qaisar Saleem Deputy Secretary, Government of Punjab, Dr. Naushin Mahmood, Joint Director, Pakistan Institute of Development Economics, Islamabad and Dr. Azhar Hassan Nadeem, DIG Punjab Police, for providing guidance and channels to obtaining various forms of data.
above and we also follow this practice.\textsuperscript{16}

**Severity of Punishment**

The construction of this variable is the most difficult task. Punishment even in one crime category can be in many forms such as imprisonment and fine. Converting all punishments into a common unit of measurement would require normative judgments. In this paper we use the number of years of imprisonment as the unit of measurement because this is the most common punishment and in many instances it is also the only form of punishment awarded. The other forms of punishment are converted into years of imprisonment on the basis of the estimated conversion factors that can be derived from the given data. The details are as follows.

Most court judgments indicate the additional years of imprisonment to be imposed in case the offender does not deposit a fine. To estimate the conversion factor for a particular crime category in a year, sum of the numbers of years of imprisonment that are imposed in lieu of fine across the sample is divided by the sum of rupees of fines across the same sample. The amount of fine (in rupees) actually imposed in each case is then multiplied by the conversion factor so obtained to arrive at the number of years of imprisonment equivalent of fine. In certain court judgments on robbery and dacoity cases property of offenders is confiscated along with imprisonment. No data on the money value of the property confiscated are available. We assume that the loss of property has the same impact of deterrence whether the property owned by the offender has high or low value. Thus the sample average of the difference between the number of years of imprisonment in the court judgments in which only imprisonment is awarded and the court judgments in which both imprisonment and confiscation of property are awarded is taken as the number of years of imprisonment equivalent to confiscation of property.

**Socio-Economic and Demographic Variables**

Per capita income is estimated as per capita GDP at constant prices of 1980 using GDP deflator. Per capita police and justice expenditure is estimated by dividing the total expenditure on police and justice by the federal and four provincial governments at constant prices of 1980 by population size. We use the data on unemployment rate as reported in *Pakistan Economic*

\textsuperscript{16} The probability of conviction estimated from this procedure may exceed one. In practice this problem is tackled by using truncated estimation by which the estimated probability exceeding 0.99 is set equal to 0.99 (e.g. Mathur 1978). In our data the number never came even close to this limit.
Survey (various years), the Ministry of Finance. Income inequality and poverty are estimated by Gini index and head count index respectively. The two indices for Pakistan have been estimated only for those years in which household surveys were conducted. The estimates are reported in various issues of Pakistan Economic Survey, the Ministry of Finance. Assuming that income inequality and poverty statistics follow smooth time series with no sudden jumps, the missing values are interpolated using exponential trend, which appears to fit better than the linear trend.

The variable measuring the proportion of young (15 to 24 years of age) male population out of total population is constructed using the data on the age and sex composition of population given in Pakistan Economic Survey, the Ministry of Finance and 50 Years of Statistics in Pakistan, Federal Bureau of Statistics. Finally, the index of political instability is taken from Nadeem (2002). The index is developed on the basis of two categories of indicators of law and order and political instability namely ‘autonomous’ political developments and ‘organic’ events. The first category includes major political events of non-recurring nature such as of wars or mass political unrests/movements affecting large segment of population and economy. The second category includes events of recurring nature that are micro-level developments such as strikes, ethnic and sectarian conflicts/murders and other forms of crimes indicating the general state of lawlessness. Missing values of the index for the latest years are extrapolated.

4. RESULTS AND INTERPRETATION

Since for any crime the supply function for offence, the production function of law enforcement and the demand function for law enforcement are mutually interdependent, the three equations are subject to endogeneity problem. This is tackled by applying GMM. The instruments used, besides a constant are the variables of the system that do not depend on any of the three left-side variables plus lags of the potential endogenous variables, that is,

\[ Gini, \, Y, \, Poverty, \, U, \, N_{my}/N, \, Pol, \, (O_{i}/N)_{lag}, \, (O/N)_{lag}, \, (P_{i})_{lag}, \, (E/N)_{lag}, \, (F_{i})_{lag} \]

Five systems of three equations are estimated for the five crime categories. The regression results presented in Table 1 to Table 4 show that the overall quality of estimates is up to the mark. All the DW and Durbin-h statistics fall in the non-rejection range, indicating absence of significant autocorrelation. In 10 of the 15 equations the value of \( R^2 \) remains above 0.85. Only in one case the value falls below 0.6. The good explanatory power of the systems of equations is also supported by significance of t-statistics associated with most of the parameter estimates. We
now analyze the results in detail.

4.1. The Supply of Offenses Equation

The estimated supply functions for the individual crimes show that increase in the probability of conviction has significant negative effects on crime rate of all but one crime category. Only in case of burglary the negative effect of the probability of conviction is statistically insignificant. On the other hand, increase in the severity of punishment has mixed effects on various crimes. This result confirms that it is the certainty of punishment, rather than severity of punishment that matters in controlling crime. Only in case of relatively less serious crimes namely cattle theft and theft, which are expected to yield low return, fine has significant deterrence effect. Since the severity of punishment does not rise proportionately with the expected return from the crimes like dacoity, robbery and burglary, mostly committed by professional criminals, fine loses its effectiveness as a deterrence factor. A possible explanation of the positive correlation between crime rate and fine is that as long as the probability of conviction remains low, increase in fine can push professional criminals to increase the intensity of crime in order to counter-balance the increased expected cost of committing crime. This perception can develop when the amount of fine does not increase in proportion to the number of times a crime is committed. According to our results this perception is checked if the probability of conviction increases.

In any case it appears from the results that increasing the certainty of punishment in more effective than increasing the level of punishment in controlling crimes in Pakistan. Past trends, on the other hand, show that over the period of analysis, 1965 to 2005, while the average rate of punishment in terms of equivalent years of imprisonment has increased by 52%, the average conviction rate has declined by 37%. Thus our empirical results call for a shift of resources from maintaining jails to development of efficient justice system through courts and police.

Turning to the third main variable, we find fairly strong evidence of the direct deterrence effect of police and justice input on crime. The regression coefficients of per capita government expenditure on police and justice are mostly negative and statistically significant. In the crime equation for dacoity the coefficient is negative but insignificant, while in the crime equation for cattle theft it is positive and significant. It may be noted that the crime of cattle theft is confined to rural areas and it is often committed as a coercive act rather than a means to yield direct economic return. Improvement in law enforcement as measured by government expenditure on
police and justice system is unlikely to pose deterrence against this crime. On the whole our results indicate that the presence of criminal justice system in itself poses threat against crime.

Empirical support of the hypothesis that inequality of incomes causes crime is strong. An increase in income inequality is found to result in significant increase in crime rates. In case of cattle theft the regression coefficient is relatively less significant, the reason being that quite often the crime of cattle theft is committed for non-economic reasons.

In four of the five equations crime rate is positively related with per capita income. On theoretical basis the relationship between income and the crime rates remain ambiguous because the increase in income shows increase in illegal as well as legal opportunities. If the increase in income makes the potential target more profitable but the expected increase in opportunity cost of committing crime does not increase much then the crime rate will tend to rise. In our case this pattern holds for most of the crime categories, especially theft, but the increase in per capita income results in a significant reduction in the crime rate of robbery. According to the definition, robbery is an act of extortion under duress, it often also involves physical attack on victims and no more than four persons are involved in one incidence. Thus robbery is known to be more risky than the other forms of crimes against property since these crimes either involve stealing (burglary, theft or cattle theft) or extortion by gangs of more than four persons (dacoity). Thus one possible interpretation of our result is that as the income levels rise, the potential criminals tend to opt for less risky crimes, thereby making the risky crime of robbery subject to negative income effect. Another factor that matters in this context is that with increase in per capita incomes, private security measures improve, thereby leading to reduction in crimes. This effect may even offset the positive effect of income on the rates of certain crimes like robbery.

The results show that increase in poverty results in the increase in crimes against property and this result is most prominent and robust across crime categories with the regression coefficient in all the five equations statistically significant. This result supports our contention that the increase in crimes against property is relatively more prevalent among poor and it is primarily meant for income generation. This is also an expected result because increase in poverty not only reduces the opportunity cost of crimes, but also increases the demand for crime (along with legal activities) on account of positive income effect on labor supply.

The regression coefficient of unemployment rate is negative and statistically significant. This is quite a common observation in the studies based on time series data and literature provides
various possible arguments to explain the behavior. First note that, while estimating the effect of unemployment on crime rates, other indicators of economic activity, especially poverty, income inequality and per capita income are held constant. Therefore the partial effect of unemployment is to be interpreted as the effect of some labor force being idle with no change in the average economic well-being, income distribution and poverty. In this context one argument for the inverse relationship between unemployment and crime is that unemployed people stay at home and therefore to some extent they are able to avoid being victims by increasing the cost of crime for potential criminals. Another argument is that the unemployed fathers stay at home and keep an eye on their delinquent sons. See Carr-Hill and Stern (1973), Chiricos (1987), Freeman (1999), Sutherland and Cressey (1966). Yet another explanation that appears plausible for Pakistan is that just like all economic activities the intensity of crimes committed by professional criminals also moves pro-cyclically with the state of economy. During periods of low economic activity expected returns on criminal activities is low, thereby making such activities less attractive. Finally, this result is not surprising if one recognizes that in Pakistan the problems of disguised unemployment and under-employment are more important than open unemployment.

The results on the effect of changes in the proportion of young males in the population are quite informative. Specifically we observe that the crimes rates of dacoity and robbery are positively related to this variable, though the relationship is significant in the second category only. In Pakistani society these crime are considered the most dare devil acts because these are risky and carry heavy punishments. It is, therefore, not surprising, though it remains astonishing, to find that these crimes are more prevalent among the very young segment of population.

On the other hand, less serious crimes namely burglary, cattle theft and theft are found to be less prevalent among this age group with two of the three regression coefficients statistically significant. Although there is no specific theory to suggest that crimes are more common among the young male adults, almost all the studies conducted for developed countries have found positive association of the proportion of young with crime rate. The general argument provided is that in this age group people become independent in decision-making but their socialization skills are still poor. In this context a strong argument in support of the opposite results found in the present study is that joint family systems is quite common in Pakistan and unlike developed countries, young adults often remain dependent and almost always integral part of the family. Therefore their socialization remains under the umbrella of parental protection. In Pakistan the
average age of independence is generally believed to be higher than the age of adulthood.

Finally, significant coefficients of the lag crime rate indicate persistence in the aggregate criminal tendencies as with most socio-economic variables.

4.2. Production Functions of Law Enforcement

The regression results for the production function of law enforcement shown in Table 2 indicate that, as expected, the conviction rates decline when crime rates are higher in case of the relatively less serious crimes (theft and cattle theft) only. The relationship is, however, positive for the relatively more serious crimes, namely dacoity, robbery and burglary. It appears therefore that the response of criminal justice system to rising crime rate depends on the severity of crime. The system responds proactively when crimes of more serious nature are on the rise, while its productivity declines when it has to cope with rising petty crimes. Thus in the wake of rising crimes against property in Pakistan the system has diverted its efforts to more serious crimes.\(^\text{17}\)

The relationship between probability of conviction and the per capita government expenditure on police and justice is found to be negative and significant in all but one equation. This is the most eye opening and perhaps the most difficult result to explain. The result is robust with respect to the crime category, definition of police and justice input, estimation technique and the period of analysis.\(^\text{18}\) Since the result is contrary not only to our hypothesis but also to common sense, there has to be strong arguments in its support and we explore a number of them.

Ehrlich (1973) argues that during periods of riots the probability of apprehension of individual rioters and offenders committing other crimes decreases considerably due to excessive load on the local police units, thereby reversing the relationship between conviction rates and police and justice input. However, this distortion is captured in our results to the extent that the index of political instability and intensity of riots move pro cyclically (see footnote 11). Another argument is that the increase in police expenditure means a larger police department that is prone

\(^\text{17}\) This argument can be explored further by considering a more general model in which the utility function of the representative potential offender includes all the crimes.

\(^\text{18}\) Various experiments (note reproduced here) indicate that the result does not change across various estimation techniques and across alternative options within the GMM technique. Furthermore the direction of relationship remains stubbornly fixed with the change of instruments, period of analysis and other proxies for the police and justice input, e.g. the size of police force. Finally the direction of relationship does not change even in response to change of specification such as the inclusion of other control variables, for example dummy variables for wars, political regimes, economic shocks, etc.
to diseconomies of scale. However, this argument can weaken the relationship, but not reverse its direction.

Yet another possibility is that the lack of efficiency in criminal justice system is not due to lack of funding, it may be a result of poor governance or changing priorities in the fight against crime. The inverse relationship could mean that the police and justice departments devote most of the additional budget allocations to desk jobs or establishment (salaries and other benefits), rather than solving crimes. One of the reasons for poor performance of police and justice system often advanced by officials is that police departments in Pakistan are occupied with intense political and protocol duties, especially due to rising incidence of terrorism and attacks on political figures and other VIPs. If despite additional funding police cannot control this new wave of crimes, which catches the attention of global as well as local media, it may even resort to diverting its resources from its traditional responsibilities of solving the conventional crimes. Thus it is possible that conviction rates decline despite increase in per capita government expenditure on police and justice.

In a nutshell, our study reveals that expenditure on police represents deterrence to various crimes but it does not enhance the certainty of punishment. That is, the police and justice system has remained unproductive in fulfilling its traditional duty of apprehending criminals, though its direct deterrence effect on the crime itself, as estimated in the crime equations in Table 1, has been in the desired direction. To take the argument further, we have computed the indirect effect of police and justice input on crime rate through its effect on certainty of punishment and thereby deducting the overall net effect of police input on the crime rate. Table 3 presents the picture. The results show that on net basis the increase in per capita government expenditure on police and justice results in decrease in crime rates for 3 cases. On the other hand, the police input has negative net productivity in case of dacoity and cattle theft.

Quite interestingly on a net basis the police and justice input turns out to be somewhat productive in combating crime. However, the system’s productivity comes from its ability in creating an image of law enforcing agent rather than its ability in enforcing the law.

Consider now the relationship of the probability of conviction to the rate of fine. For the major crimes, dacoity and robbery, the certainty of punishment is considered as a complement of severity of punishment, while for the relatively minor crime of theft the certainty of punishment is considered as substitutes for the severity of punishment. For the remaining two crimes
(burglary and cattle theft) the certainty of punishment is found to be independent of the severity of punishment. Thus for the major crimes the police and justice system seems to adopt two-pronged policy focusing both on severity and certainty of punishment. The minor crime of theft is by nature more frequent than the major crimes. Therefore the police and justice system tends to rely more on punishment than conviction in order to save the high costs of convicting large number of small offenders.

According to the regression results the proposition that political instability adversely affects productivity of the police and justices system as measured by conviction rates is strongly supported by data. The regression coefficients of the political instability variable are negative and highly significant in all the five equations. A possible interpretation of this result, though without direct support from data, is that political instability diverts attention of police force from its traditional duty of convicting criminals to the additional duties of maintaining law and order (see section 2.2 for further clarification).

It is important to note that in case of Pakistan the major components of the index have been wars, political unrest/movements, ethnic conflicts and sectarian conflicts. Pakistan experienced major wars with India in 1965 and 1971, the latter resulting in separation of the former East Pakistan as Bangladesh, besides proxy war with former Soviet Union in Afghanistan during 1980s and frequent but small-scaled conflicts in Kashmir. Pakistan also experienced prolonged spells of political movements against governments during 1969-70, 1976-77, 1983-85. These wars and political movements were predominantly concentrated in the first half of our period of analysis when the crime rates remained relatively low (see footnote 2). The second half of the period of analysis, when the crime rates have been much higher, was dominated by sectarian and ethnic conflicts in the forms of terrorists’ attacks in mosques of rival sects and in the localities of rival ethnic populations. The sectarian conflicts continued to erupt throughout the 1980s and 1990s mainly in Punjab and Sindh, the two larger provinces accounting for almost 80% of the country’s population. Ethnic conflicts have been a relatively new phenomenon observed during the late 1980s, 1990s and 2000s. These conflicts mostly originate in Karachi but often instigate reaction by political parties in other parts of the country as well. These observations indicate that the rise in crime rates can more probably be attributed to ethnic and sectarian conflicts rather than to wars and political movements.

19 The components of political instability index are explained in some detail in the last paragraph of section 3.
Before closing this section, note that, as expected, the conviction rates are also observed to follow significant inertia.

4.3. Demand Functions of Law Enforcement

The estimated demand functions for law enforcement are presented in Table 3. According to all the estimated equations the increase in aggregate crime rate results in increase in the per capita government expenditure on police and justice. On the other hand, the effects of increases the individual crime rates on police and justice expenditures are negative. Since these responses are measured while controlling for the aggregate crime rate, a simple interpretation of our results is that the police and justice expenditure increases in response to changes in the composition of crimes. A shift in crimes from those against property to those against persons is considered as undesirable and therefore the size of police and justice input is increased. On the other hand, any shift in crimes from those against persons to those against property is regarded relatively less undesirable and therefore the size of police and justice input is reduced. Finally our results show strong inertia in the per capita government expenditure allocated to police and justice.

5. CONCLUSION

The model of crime, punishment and deterrence based on economic theory finds substantial support from Pakistani data. The model explains significant proportions of changes over time in the supply of crime, the production of law enforcement and the demand for law enforcement. Thus the empirical strength of the framework for economic analysis of criminal justice system in Pakistan holds promise for more precise analysis based on less aggregate data.

The paper finds limited evidence in support of the deterrence hypothesis whereby crime rate can be reduced through deterrence. While the crime rates respond systematically and consistently to the certainty of punishment, the observed behavior of the main deterrence variable, the severity of punishment, is not entirely consistent with the hypothesis as it is found to be effective in case of relatively less serious crimes of theft and cattle theft only. The behavior of the third deterrence variable representing the police and justice input appears quite complex. While the police and justice system has failed in apprehending the criminals, its presence remained somewhat effective in reducing the crime rate. Economic and demographic variables are found to
explain crime statistics to a great extent as predicted by economic theory.

The study leads to a number of conclusions and policy implications. In combating crime the society has the pragmatic choice between allocating additional resources to the criminal justice system (police, courts, jails, etc.) and to alleviation of causal social conditions. In this context the most striking conclusion of the study is that the return on expenditure on police and justice system is negligible, while crime rates appear quite responsive to improvements in socio-economic conditions. The empirical results suggest that there is a need to divert resources from maintaining a large criminal justice system towards the provision of social justice in terms of reduction in poverty, income inequality and unemployment. Most empirical studies on poverty, income inequality and unemployment in Pakistan are motivated on the presumption that the three economic problems are the so-called ‘social evils’ and they give rise to economic deprivation, social disruption and crimes in society, though these claims are seldom supported by any empirical content. Thus, this paper presents formal empirical evidence to substantiate these claims, thereby providing concrete reason in support of the ongoing drive against poverty, income inequality and unemployment.

The study finds that the police and justice input has negative marginal productivity as measured by the ability of police and justice system in convicting criminals. A possible reason for the system’s failure in performing its traditional duty, which is often highlighted in reports on police reforms, is that in Pakistan police departments are intensely involved in combating the rising wave of terrorism in the shape of attacks on political figures and the sectarian and ethnic violence. As a result the rising budget allocations to police and justice system are not reflected in improved performance of the system in terms of arrests and conviction for the traditional crimes against property. Thus, while designing socio-economic policy framework, various forms of terrorism also needs to be considered along with the list of social evils like poverty, income inequality and unemployment.

The results indicate that the system has given unduly more importance to inflicting heavy punishments in response to rising crime rates, whereas the data show that it is more rewarding to apprehend the offenders and make sure that they receive some punishment. Thus, the resources need to be diverted from those activities that are required to implement punishments towards those activities that make conviction and punishments more certain. This could mean, for example, diversion of resources from jails to courts and police departments.
The present study is the first attempt to analyze crime data in Pakistan on the basis of a formal statistical model and one of the most difficult but also the most rewarding task has been to compile data on crimes, convictions, punishments and other related variables. However, many interesting aspects could not be analyzed due to classification and secrecy of data, which turned out to be the main hurdle in research.

REFERENCES


