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Understanding Crime Dynamics: Social and Demographic Influences in Punjab, Pakistan

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Abstract
The aim of the present study is to delve into the complex interplay between social and demographic factors and various forms of crime in Punjab, Pakistan's largest province. By examining the determinants of total crime, property crime, and violent crime, the research sheds light on the underlying dynamics driving criminal activities in the region. Through empirical analysis using fixed and random effects models, the study uncovers significant insights into the factors influencing crime rates. One of the key findings of the research is the significant impact of deterrence measures on crime levels in Punjab. The study reveals that factors aimed at deterring criminal behavior, such as law enforcement efforts and the severity of legal penalties, exert a positive and statistically significant influence on reducing crime rates. This underscores the importance of effective law enforcement and a robust criminal justice system in curbing criminal activities. Furthermore, the research highlights the role of demographic factors, particularly population density, in stimulating criminal activities in Punjab. The findings suggest that areas with higher population densities tend to experience elevated levels of crime, reflecting the challenges posed by overcrowding and urbanization in fostering an environment conducive to criminal behavior. However, the relationship between education and crime presents a more nuanced picture, with mixed evidence emerging from the analysis. While education is often regarded as a potential deterrent to crime by fostering socio-economic development and providing individuals with alternative opportunities, the study finds varying effects of education on different types of crime in Punjab. Further investigation is needed to better understand the complex relationship between education levels and criminal behavior in the region. The findings of the study provide valuable insights for policymakers and law enforcement agencies in Punjab, offering evidence-based guidance for the development of effective crime prevention strategies. By addressing the underlying social and demographic determinants of crime, such as enhancing deterrence measures and addressing urbanization challenges, policymakers can work towards creating safer and more secure communities in the province.
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1. INTRODUCTION

Crime is a multifaceted issue influenced by a multitude of social, economic, cultural, and demographic factors. Understanding the root causes and underlying meanings of crime is essential for effective prevention strategies. It's crucial to recognize that the causes of crime can differ significantly from one country to another due to varying social and cultural characteristics. Social factors such as poverty, inequality, unemployment, and lack of access to education and social services can create conditions conducive to criminal behavior. Economic factors, including economic downturns, disparities in wealth distribution, and limited opportunities for economic advancement, can also contribute to criminal activities. Cultural factors such as societal norms, values, and attitudes towards crime and law enforcement play a significant role in shaping individuals' behavior. Additionally, demographic factors such as age, gender, and ethnicity can influence an individual's likelihood of engaging in criminal behavior. Addressing crime requires comprehensive strategies that address the complex interplay of these factors. Prevention efforts should encompass social and economic development initiatives, community empowerment programs, education and awareness campaigns, and targeted interventions to address underlying issues such as poverty, inequality, and social exclusion. By understanding the diverse root causes of crime and tailoring interventions to address specific social, economic, cultural, and demographic contexts, policymakers and communities can work together to create safer and more resilient societies.

Marshall and Clarke (1952) succinctly defined crime as "any act or omission prohibited by public law for the protection of the public and punishable by the state in a judicial proceeding in its own name." This definition underscores the legal and societal dimensions of crime, emphasizing its violation of established laws and its potential impact on public welfare and safety. By framing crime as an action or failure to act that is subject to punishment by the state through legal proceedings, this definition highlights the role of law enforcement and the justice system in addressing and deterring criminal behavior. Tappan (1960) offered a complementary definition of crime, describing it as "an instrumental act or omission in violation of criminal law, committed without justification, and sanctioned by the state as

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a felony or misdemeanor." This definition emphasizes the intentional nature of criminal behavior, highlighting that it involves actions or failures to act that contravene established criminal statutes. Moreover, it underscores the absence of legal justification for such actions, implying that they are undertaken without lawful excuse or justification. Lastly, the definition emphasizes the role of the state in sanctioning criminal acts through the criminal justice system, classifying them as either felonies or misdemeanors based on their severity. The study of crime from an economic perspective gained momentum in the 1960s, with Fleisher's work in 1966 being a notable contribution. Fleisher's findings highlighted that low income and unemployment were significant determinants of crime within society. This insight underscored the intricate relationship between economic conditions and criminal behavior, shedding light on the socio-economic factors that influence individuals' propensity to engage in unlawful activities. Fleisher's research paved the way for further exploration into the economic drivers of crime and the development of economic theories and models to understand and address this complex phenomenon. Becker's seminal work in 1968 introduced the concept of rational behavior in criminal activities. He proposed that individuals engage in a cost-benefit analysis when deciding between legitimate and illegitimate activities. According to Becker, an individual commits a crime when the expected utility or benefit of engaging in illegitimate activity outweighs that of engaging in legitimate activity. This framework suggests that individuals act in a rational manner, weighing the potential risks and rewards associated with criminal behavior. Factors such as the probability of apprehension, the severity of punishment, and the potential gains from criminal activity all play a role in shaping individuals' decisions to engage in unlawful behavior. By framing criminal behavior as a rational choice influenced by economic incentives, Becker's theory provided a novel perspective on the motivations behind crime. It laid the foundation for further research into the economic drivers of criminal behavior and informed policy discussions around crime prevention and deterrence strategies.

Ehrlich's work in 1973 built upon Becker's framework by examining the influence of time allocation on both legal and illegal activities and its impact on the crime rate. Ehrlich's empirical investigation supported Fleisher's earlier findings from 1966, demonstrating that an increase in the income of median-level families was associated with an uptick in crimes such as murder, rape, assault, and property crime. Additionally, Ehrlich's research revealed a positive correlation between unemployment and the crime rate. By highlighting the relationship between economic factors, time allocation, and criminal behavior, Ehrlich's work furthered our understanding of the complex interplay between socio-economic conditions and crime rates. This empirical evidence provided valuable insights into the mechanisms driving criminal activity and informed discussions on crime prevention strategies and social policy interventions. Ehrlich's research in 1973 marked a significant extension of Becker's rational choice theory by delving into the temporal aspect of individuals' decision-making processes regarding legal and illegal activities. By investigating how individuals allocate their time between lawful and unlawful pursuits, Ehrlich shed light on a crucial yet often overlooked dimension of criminal behavior. The empirical findings of Ehrlich's study not only corroborated Fleisher's earlier observations regarding the impact of income on crime rates but also unearthed new insights into the dynamics of criminal activity. Specifically, Ehrlich's research revealed that as the income of median-level families rose, certain types of crimes, including murder, rape, assault, and property crime, tended to increase as well. This nuanced understanding of the relationship between economic prosperity and criminal behavior underscored the multifaceted nature of socio-economic influences on crime rates. Moreover, Ehrlich's identification of a positive correlation between unemployment and crime rates added another layer of complexity to our understanding of the economic determinants of criminal activity. By demonstrating the link between joblessness and heightened criminal behavior, Ehrlich's findings highlighted the social consequences of economic downturns and underscored the importance of employment opportunities in crime prevention efforts.

The Uniform Crime Reports (UCR) of the United States of America for the year 2009 categorized violent crimes as a combination of several offenses, including murder, attempted murder, rape, robbery, and assault. These offenses are characterized by their direct or threatened use of force against individuals or property, posing a significant threat to public safety and well-being. On the other hand, property crimes encompass a range of offenses involving the unlawful acquisition, destruction, or interference with property belonging to others. In the UCR for 2009, property crimes included offenses such as burglary, larceny-theft, motor vehicle theft, and arson. Additionally, the category of property crimes may also encompass more specific offenses such as dacoity (a form of armed robbery), cattle theft, and other forms of theft. By providing a comprehensive breakdown of violent and property crimes, the UCR serves as a valuable tool for law enforcement agencies, policymakers, and researchers in tracking crime trends, identifying areas of concern, and formulating strategies to address criminal activity effectively. The crime report of Punjab for the years 2009 and 2010 highlights a concerning trend of increased criminal activity during this period. While the overall increase in reported crimes from 2009 to 2010 may appear negligible, a closer examination reveals significant spikes in specific categories of crime. Notably, incidents of rape and gang rape surged by 22%, indicating a distressing escalation in gender-based violence. Additionally, offenses such as robbery, vehicle snatching, and burglary experienced a staggering 109% increase, reflecting heightened risks to public safety and property. Kidnapping incidents rose by 13%, while cases of murder and attempted murder saw a notable uptick of 15% across Punjab.

Of particular concern is the rise in major crimes like murder, street crime, kidnapping, and gang rape, which outpaced increases in other crime categories. These trends underscore the urgent need for targeted interventions and enhanced law enforcement efforts to address the root causes of criminal behavior and ensure the safety and security of Punjab's residents. The findings of the crime report underscore the importance of comprehensive crime prevention strategies that address underlying socio-economic factors, strengthen law enforcement capabilities, and promote community

engagement and empowerment. By addressing the drivers of crime and implementing proactive measures to deter criminal activity, Punjab can work towards creating a safer and more secure environment for its citizens. The data indicates a significant increase in reported crimes in Punjab between 1996 and 2010, with the total number of reported crimes rising by approximately 50% during this period. Notably, there has been a rapid escalation in cases of robbery, dacoity, and cattle theft, suggesting a financially motivated nature of these crimes. Conversely, the incidence of murder and attempted murder has remained relatively low compared to other crime categories. The trend of increasing robbery, dacoity, and cattle theft points to underlying socio-economic factors driving criminal behavior in Punjab. Economic pressures, inequality, and lack of employment opportunities may contribute to individuals resorting to property crimes as a means of financial gain. The rise in cattle theft particularly stands out, with a notable acceleration observed after 2004, indicating a shift in criminal patterns. The persistent upward trend in dacoity throughout the years under study underscores the need for targeted interventions to address this specific form of armed robbery. Efforts to enhance law enforcement capabilities, improve surveillance, and strengthen community engagement may help curb the incidence of dacoity and other violent crimes. The data highlights the complex nature of crime dynamics in Punjab and underscores the importance of adopting a multifaceted approach to crime prevention. Addressing underlying socio-economic inequalities, improving livelihood opportunities, and bolstering law enforcement efforts are essential steps towards creating a safer and more secure environment for the residents of Punjab. It's evident from existing literature that the role of social factors in determining crime in Pakistan has been largely overlooked. While a few studies, such as those conducted by Gillani et al. (2009) and Jalil and Iqbal (2010), have explored the demographic determinants of total crime in the country, there remains a significant gap in understanding the broader social and demographic factors influencing crime rates. The alarming increase in criminal activities in Pakistan underscores the urgency of evaluating both the social and demographic determinants of crime at both aggregate and disaggregate levels. By examining these factors comprehensively, policymakers and researchers can gain insights into the underlying causes of crime and develop targeted interventions to address them effectively. To bridge this gap in research, the present study aims to utilize panel data from 25 districts in Punjab, the main province of Pakistan. By leveraging panel data analysis, the study seeks to provide a more nuanced understanding of the social and demographic drivers of crime in Punjab. This approach allows for the examination of trends over time and across different geographical regions, enabling researchers to identify patterns and correlations that may not be apparent from cross-sectional analyses alone. By shedding light on the social and demographic determinants of crime in Punjab, this study aims to inform evidence-based policymaking and intervention strategies aimed at reducing crime rates and improving public safety in Pakistan.

2. LITERATURE REVIEW

Becker's influential work in 1968 revolutionized economists' perspectives on illegal actions by introducing the concept of rational choice theory. In his groundbreaking publication, Becker proposed that individuals engage in a cost-benefit analysis when deciding whether to commit illegal acts, framing criminal behavior as a rational decision-making process influenced by potential rewards and risks. This modification of economists' thinking marked a departure from traditional views that characterized criminal behavior as irrational or solely driven by social or psychological factors. Instead, Becker's theory emphasized the economic incentives underlying illegal actions, highlighting how individuals weigh the potential gains from criminal behavior against the likelihood of detection and punishment. Fleisher's empirical paper in 1963, titled "The Effect of Unemployment on Juvenile Delinquency," laid the groundwork for Becker's work by exploring the relationship between economic conditions and criminal behavior. Fleisher's study provided empirical evidence suggesting that periods of high unemployment were associated with an increase in juvenile delinquency, pointing to the economic determinants of crime. By building upon Fleisher's findings, Becker expanded the understanding of how economic factors shape illegal actions, paving the way for further research into the economics of crime. His rational choice theory provided a theoretical framework that transformed the way economists analyze and approach criminal behavior, emphasizing the importance of incentives and decision-making processes in understanding and addressing crime.

Fleisher's endeavor to establish a connection between unemployment and adolescent delinquency culminated in the conclusion that there exists a positive and significant correlation between the two. His findings suggest that periods of unemployment coincide with heightened levels of juvenile delinquency, highlighting the socio-economic factors at play in shaping criminal behavior among young individuals. These results align with the research conducted by Grogger in 1995 and 1998, which similarly found a positive relationship between unemployment and various forms of criminal activity. Grogger's studies provided further empirical evidence supporting the notion that economic downturns and joblessness can exacerbate social problems, including crime and delinquency. By corroborating Fleisher's findings, the studies by Grogger underscore the importance of addressing economic disparities and promoting employment opportunities as part of broader efforts to prevent and reduce crime. Recognizing the link between unemployment and criminal behavior can inform targeted interventions aimed at providing support and resources to vulnerable populations, thereby addressing the underlying drivers of juvenile delinquency and promoting community well-being. Freeman's argument in 1991 posits that individuals who engage in criminal behavior tend to have lower levels of education and come from disadvantaged socio-economic backgrounds compared to the general population in the United States. He highlights statistics from 1986 indicating that a significant proportion of the prisoner population, particularly among individuals aged 18-24 and those from Black communities, had not completed more than 12 years of education. From this data, Freeman draws the conclusion that education serves as a protective factor against involvement in criminal

activities. The implication is that individuals with higher levels of education are less likely to engage in criminal behavior, as education equips individuals with the skills, knowledge, and opportunities necessary for lawful and productive pursuits. This argument underscores the importance of education in addressing social inequalities and preventing crime. By providing access to quality education and opportunities for skill development, policymakers can empower individuals to pursue lawful and fulfilling paths, thereby reducing the prevalence of criminal behavior and promoting social cohesion and economic prosperity.

Ehrlich's analysis in 1975 presents a contrasting perspective to Freeman's argument by suggesting that the relationship between education and involvement in criminal activities is not uniform. While education may indeed provide individuals with valuable skills and opportunities for lawful employment, Ehrlich argues that it can also have complex effects on both legal and illegal opportunities. According to Ehrlich, education may enhance an individual's self-productivity in various ways. Firstly, education can serve as a form of self-protection against conviction by equipping individuals with the knowledge and understanding of legal rights and responsibilities. Additionally, education can provide individuals with the skills and resources necessary to navigate legal occupational challenges and overcome barriers to lawful employment. In this view, education is not solely a deterrent to criminal behavior but also a means of empowerment that enables individuals to make informed choices and access legitimate opportunities for social and economic advancement. By acknowledging the multifaceted impact of education on legal and illegal opportunities, Ehrlich's analysis adds nuance to the understanding of the relationship between education and crime. It suggests that while education may contribute to reducing criminal involvement by enhancing self-productivity, its effects may vary depending on individual circumstances and broader socio-economic factors.

Omotor's study in 2010 offers further insight into the relationship between education and crime by analyzing panel data from 28 Nigerian states spanning from 2002 to 2005. In his analysis, Omotor specifically incorporates primary school enrollment as a measure of educational attainment and investigates its impact on crime rates across the different states of Nigeria. Contrary to the findings of Freeman and Ehrlich, Omotor's results suggest that education, as measured by primary school enrollment, does not have a significant explanatory effect on total crime and property crime rates in Nigeria. This implies that variations in educational enrollment levels across states do not consistently correlate with differences in crime rates. Omotor's study challenges the notion that education serves as a universal deterrent to criminal behavior, at least within the context of Nigerian states during the period under study. Instead, his findings suggest that other factors may play a more prominent role in influencing crime rates in Nigeria. By highlighting the limitations of education as a sole explanatory factor for crime, Omotor's research underscores the importance of considering a range of socio-economic, cultural, and institutional factors when analyzing crime patterns and designing effective crime prevention strategies. It emphasizes the need for nuanced and context-specific approaches to addressing the complex dynamics of crime in different regions and settings.

Buonanno and Leonida's study in 2005 provides additional insights into the relationship between education and crime using panel data from different regions of Italy spanning from 1980 to 1995. In their analysis, they include the enrollment of high school as a measure of educational attainment and examine its impact on crime rates. Contrary to the conventional view that higher education universally lowers crime rates, Buonanno and Leonida propose a non-linear relationship between education and crime. They argue that in regions where education levels are low, an increase in education tends to lower crime rates. This is attributed to the positive effects of education in promoting virtues such as hard work, honesty, and adherence to societal values, thereby reducing the likelihood of engaging in criminal behavior. However, in regions where education levels are already high, Buonanno and Leonida suggest that further increases in education may lead to a rise in certain types of crime, such as fraud and property crime. They posit that individuals with higher education levels may possess the skills and knowledge to engage in more sophisticated forms of criminal activity, potentially offsetting the positive effects of education on crime prevention. By highlighting the nuanced and context-dependent nature of the relationship between education and crime, Buonanno and Leonida's research underscores the need for a more nuanced understanding of the mechanisms through which education influences criminal behavior. Their findings emphasize the importance of considering socio-economic and cultural factors when examining the impact of education on crime rates and designing targeted interventions to address underlying drivers of criminal activity.

Lochner's empirical investigation in 2007 delves into the relationship between crime and education using three distinct types of data: individual-level data, state-level data, and self-report data on crime. In his analysis, Lochner explores the intricate interplay between educational attainment and criminal behavior to elucidate their relationship. Contrary to conventional wisdom, Lochner's findings challenge the notion of a straightforward relationship between crime and education. Instead, his research suggests a more complex and nuanced association between the two variables. Lochner's conclusions imply that the relationship between crime and education may not be as straightforward as previously assumed, and that various factors, including individual characteristics, socio-economic conditions, and institutional factors, may mediate this relationship. By incorporating multiple types of data and employing rigorous empirical methods, Lochner's study contributes valuable insights into the dynamics of crime and education. His findings underscore the need for a comprehensive understanding of the factors influencing criminal behavior and highlight the importance of considering contextual factors when examining the relationship between crime and education. This nuanced perspective can inform more targeted and effective strategies for crime prevention and social intervention.

3. The Model

The study aims to examine the impact of social and demographic variables on total crime, property crime, and violent crime. Three empirical models are specified for analysis: the All Reported Crime Rate Model, the Property Crime Rate Model, and the Violent Crime Rate Model. In these models, subscript "i" denotes the cross-sectional unit, and "t" denotes the time period.

The variables considered include:

RCR: All reported crime rate

PCR: Property crime rate (including burglary, theft, cattle theft, and dacoity)

VCR: Violent crime rate (encompassing murder, attempted murder, rape, robbery, and assault)

DE: Probability of conviction (calculated as the number of convicted individuals divided by the total number of arrests)

MER: Mosque enrollment/population

PER: Primary school enrollment/population

SER: Secondary school enrollment/population

HER: Higher secondary school enrollment/population

PDN: Population density (measured as the ratio of district area to its population)

Existing empirical literature on crime has categorized determinants into three main groups: deterrence variables, demographic variables, and socio-economic variables. Deterrence variables, such as the probability of conviction, are crucial in assessing the perceived risks and consequences of criminal behavior. Demographic variables, including population density, offer insights into the composition of communities where crime occurs. Socio-economic variables, such as mosque and school enrollment rates, provide a broader understanding of the social context influencing criminal activity. By analyzing each type of crime separately and considering a diverse set of social and demographic factors, the study aims to provide a comprehensive understanding of the determinants of crime rates. This structured approach facilitates the exploration of the complex interplay between individual, community, and societal factors in shaping patterns of criminal behavior. Empirically, the sign of the deterrence variable appears to be ambiguous, as highlighted by Buonanno and Leonida (2005). Their study found a negative impact of deterrence on all types of crime, including all reported, property, and violent crimes.

This finding suggests that increased deterrence, typically measured by factors such as the probability of conviction, may lead to a reduction in crime rates across various categories. The negative relationship between deterrence and crime implies that a higher likelihood of apprehension and more severe punishments act as deterrents, dissuading individuals from engaging in criminal behavior. Buonanno and Leonida's research underscores the importance of effective law enforcement and criminal justice policies in preventing and reducing crime. By increasing the perceived risks and costs associated with criminal activity, deterrence measures can help mitigate criminal behavior and promote public safety. However, it's important to note that the impact of deterrence on crime may vary depending on contextual factors, such as socio-economic conditions, cultural norms, and institutional capacity. Therefore, while Buonanno and Leonida's findings suggest a negative relationship between deterrence and crime, further research is needed to fully understand the complexities of this relationship and its implications for crime prevention strategies.

However, Fajnzylber et al. (2002) arrived at a contrasting conclusion, finding a positive impact of deterrence on crime. This suggests that increased deterrence, which could include factors such as higher arrest rates or stricter penalties, leads to a reduction in criminal behavior. This finding suggests that the threat of punishment acts as a deterrent, dissuading individuals from engaging in illegal activities. Additionally, several empirical studies have highlighted a correlation between education and criminal activity. It's been observed that individuals involved in criminal activities often have lower levels of education. This leads to the argument that education may increase the attractiveness of legal activities by enhancing individual skills and abilities. By providing individuals with greater opportunities for lawful employment and personal development, education may reduce the incentives for engaging in criminal behavior. These contrasting findings highlight the complexity of understanding the relationship between deterrence, education, and crime. While some studies suggest that deterrence measures can effectively reduce crime rates, others emphasize the role of education in providing alternatives to criminal activities. Further research is needed to reconcile these divergent perspectives and inform evidence-based policies aimed at addressing the root causes of crime.

In contrast to the findings suggesting a positive impact of education on reducing criminal behavior, Usher (1997), Imrohoroglu et al. (2001), and Cardenas and Rozo (2010) propose an alternative perspective. According to their research, education may actually motivate individuals to engage in illegal activities by providing them with better opportunities to evade conviction and apprehension. This argument posits that individuals with higher levels of education may possess greater knowledge and resources to navigate the legal system, potentially reducing their likelihood of being caught or punished for criminal behavior. Moreover, education may empower individuals to engage in more sophisticated forms of crime, such as fraud or white-collar crime, where higher levels of education may be advantageous.

Usher (1997), Imrohoroglu et al. (2001), and Cardenas and Rozo (2010) highlight the complex and multifaceted nature of the relationship between education and crime. While education may offer opportunities for lawful employment and personal development, it may also provide individuals with the means to engage in illegal activities more effectively. These findings underscore the importance of considering the broader socio-economic context and individual motivations when examining the impact of education on criminal behavior. By recognizing the potential dual effects of education on crime, policymakers and researchers can develop more nuanced strategies for crime prevention and intervention. While demographic variables like age structure, population growth rate, urbanization, race, and population

density are commonly utilized in crime studies, our study specifically focuses on population density as a key demographic factor. Population density, which measures the number of individuals residing within a specific area, is a critical determinant of crime rates. Higher population density often correlates with increased opportunities for social interaction and economic exchange, which can lead to heightened levels of criminal activity due to factors such as anonymity, social disorganization, and strained social control mechanisms. By focusing on population density as a demographic variable in our study, we aim to understand how variations in population concentration within different geographical areas may influence crime rates. This approach allows us to explore the spatial distribution of crime and identify potential hotspots or areas of heightened criminal activity. While other demographic variables may also play important roles in shaping crime patterns, population density serves as a key indicator of the concentration of individuals within a given area and its potential impact on social dynamics and criminal behavior. Through our analysis of population density, we seek to gain insights into the complex interplay between demographic factors and crime rates, contributing to a better understanding of the underlying mechanisms driving criminal activity. Jalil and Iqbal's study in 2010 uncovered a positive association between crime and population density. According to their findings, areas with higher population density tend to experience increased levels of criminal activity. This relationship can be attributed to the greater number of individuals concentrated within densely populated areas, which may create conducive conditions for unlawful behavior to occur. The higher population density in urban settings, for instance, can lead to heightened competition for resources, limited social cohesion, and reduced informal social control mechanisms, all of which may contribute to elevated crime rates. Additionally, the anonymity afforded by densely populated areas may embolden individuals to engage in criminal acts, as they perceive a reduced risk of detection or apprehension. By highlighting the positive association between crime and population density, Jalil and Iqbal's research underscores the importance of considering spatial factors in understanding crime patterns. Their findings suggest that efforts to address crime should take into account the unique social dynamics and challenges present in densely populated areas, and tailor interventions accordingly.

Hipp's study in 2007 presents a contrasting perspective, suggesting that an increase in population density, which equates to more people per square kilometer, may actually lead to a reduction in property crime. The rationale behind this argument is that higher population density creates a greater likelihood of apprehension for criminals, thereby acting as a deterrent to property crime. In densely populated areas, where there are more eyes on the streets and increased opportunities for social surveillance, potential offenders may perceive a higher risk of detection and apprehension. This increased visibility and social control can discourage criminal activity, particularly property crimes that require a degree of stealth and anonymity to go undetected. Hipp's findings highlight the importance of considering the role of social and environmental factors in shaping crime patterns. By recognizing the potential deterrent effect of population density on property crime, policymakers and urban planners can implement strategies to leverage the positive aspects of densely populated areas in reducing criminal activity.

4. RESULTS AND DISCUSSION

Table 1 summarizes the regression results for the Relative Competitive Position (RCR) using three different modeling techniques: Pooled OLS, Fixed Effects, and Random Effects. Each row corresponds to a specific variable, detailing the coefficient estimates, t-ratios, and the number of observations. In the Pooled OLS model, the coefficients for the variables are presented along with their respective t-ratios. Notable coefficients include DE (0.339), MER (0.124), and HER (0.057), with corresponding t-ratios of 3.03, 3.76, and 4.31, respectively. These values suggest statistically significant relationships between these variables and RCR. Transitioning to the Fixed Effects model, the coefficient estimates slightly differ compared to the Pooled OLS model. For instance, while the coefficient for DE remains positive (0.129), its t-ratio decreases to 1.85. Similarly, other variables such as MER and HER show changes in coefficient estimates and t-ratios compared to the Pooled OLS model. In the Random Effects model, the coefficients and t-ratios also differ from both the Pooled OLS and Fixed Effects models. Notable coefficients include DE (0.253), MER (0.127), and HER (0.050), with corresponding t-ratios of 4.07, 3.29, and 5.52, respectively. These values indicate significant relationships similar to those observed in the Pooled OLS model. Furthermore, the table provides additional information such as the number of observations for each model (175) and the R-squared values, which indicate the goodness of fit. The R-squared values are reported as 0.93 for Pooled OLS, 0.92 for Fixed Effects, and 0.94 for Random Effects, suggesting a relatively high level of explained variance in all models. Lastly, the Hausman Test statistic (3.77) and its corresponding p-value (0.58) are presented, providing insights into the choice between the Fixed Effects and Random Effects models. While the test result does not achieve statistical significance, it suggests potential considerations regarding model selection.

Table 1: **RCR: Dependent variable**

Variables	Pooled OLS		Fixed Effect		Random effect	
	Coefficient	T-ratio	Coefficient	T-ratio	Coefficient	T-ratio
DE	0.339	3.03	0.129	1.85	0.253	4.07
MER	0.124	3.76	0.104	2.26	0.127	3.29
PER	-0.0008	-0.08	0.009	1.44	0.004	0.61
SER	-0.013	-0.58	-0.036	-1.89	-0.038	-2.04
HER	0.057	4.31	0.033	3.22	0.050	5.52

PDN	2.221	5.86	3.651	6.86	3.228	6.63
Observations	175		175		175	
R^2	0.93			0.92	0.94	
Hausman Test	3.77	[0.58]				

Table 2 presents the regression results for the Price Competitiveness Ratio (PCR) using the Pooled OLS, Fixed Effects, and Random Effects models. Each row corresponds to a specific independent variable, displaying the coefficient estimates and t-ratios for each modeling approach. In the Pooled OLS model, the coefficient estimates and t-ratios are provided for variables such as DE (0.033*), MER (0.008**), PER (-0.002**), SER (0.004), HER (0.006*), and PDN (0.861*). Notably, variables like DE, MER, PER, and HER exhibit statistically significant relationships with PCR based on their t-ratios. Transitioning to the Fixed Effects model, the coefficient estimates for DE (0.005), MER (-0.002), PER (-0.0005), SER (0.005), HER (0.005*), and PDN (2.96*) show changes compared to the Pooled OLS model. While the t-ratios for some variables decrease, variables like PDN maintain strong statistical significance. In the Random Effects model, the coefficient estimates and t-ratios for DE (0.272**), MER (0.007), PER (-0.002**), SER (0.0005), HER (0.007*), and PDN (0.870*) demonstrate differences compared to both the Pooled OLS and Fixed Effects models. Notably, PDN maintains a high level of statistical significance across all models. Additionally, the table provides information such as the number of observations (175) and the R-squared values, indicating the proportion of variance explained by the models. The R-squared values are reported as 0.88 for Pooled OLS, 0.87 for Fixed Effects, and 0.85 for Random Effects, suggesting good model fit overall. Finally, the Hausman Test statistic (9.50) and its corresponding p-value (0.12) are presented, providing insights into the choice between the Fixed Effects and Random Effects models. While the test result does not achieve statistical significance, it suggests potential considerations regarding model selection.

Table 2: PCR: Dependent variable

Variables	Pooled OLS		Fixed Effect		Random effect	
	Coefficient	T-ratio	Coefficient	T-ratio	Coefficient	T-ratio
DE	0.033*	2.76	0.005	0.41	0.272**	2.60
MER	0.008**	2.16	-0.002	-0.19	0.007	1.54
PER	-0.002**	-2.23	-0.0005	-1.59	-0.002**	-2.57
SER	0.004	1.63	0.005	-0.16	0.0005	0.19
HER	0.006*	4.08	0.005*	2.88	0.007*	4.88
PDN	0.861*	16.61	2.96*	4.51	0.870*	11.70
Observations	175		175		175	
R^2	0.88		0.87		0.85	
Hausman Test	9.50	[0.12]				

Table 3 displays the regression results for the Volume Competitiveness Ratio (VCR) using Pooled OLS, Fixed Effects, and Random Effects models. Each row presents the coefficient estimates and t-ratios for specific independent variables across the three modeling approaches. In the Pooled OLS model, the coefficient estimates and t-ratios are provided for variables such as DE (0.052*), MER (0.018*), PER (-0.0009), SER (0.003), HER (0.003***), and PDN (0.365*). Notably, variables like DE, MER, HER, and PDN exhibit statistically significant relationships with VCR based on their t-ratios. Transitioning to the Fixed Effects model, the coefficient estimates for DE (0.011), MER (0.005), PER (0.0007), SER (-0.003), HER (-0.001), and PDN (5.041*) show differences compared to the Pooled OLS model. While some variables lose statistical significance, PDN remains highly significant. In the Random Effects model, the coefficient estimates and t-ratios for DE (0.054*), MER (0.017*), PER (-0.0009), SER (-0.004), HER (0.004*), and PDN (0.456*) demonstrate changes compared to both the Pooled OLS and Fixed Effects models. Variables like DE, MER, HER, and PDN maintain statistical significance in this model. Additionally, the table provides information such as the number of observations (175) and the R-squared values, indicating the proportion of variance explained by the models. The R-squared values are reported as 0.616 for Pooled OLS, 0.524 for Fixed Effects, and 0.598 for Random Effects, suggesting reasonable model fit overall. Finally, the Hausman Test statistic (4.97) and its corresponding p-value (0.45) are presented, offering insights into the choice between the Fixed Effects and Random Effects models. While the test result does not achieve statistical significance, it implies considerations regarding model selection.

Table 3: VCR: Dependent variable

	Pooled OLS		Fixed Effect		Random effect	
Variables	Coefficient	T-ratio	Coefficient	T-ratio	Coefficient	T-ratio
DE	0.052*	3.85	0.011	1.26	0.054*	5.73
MER	0.018*	4.64	0.005	0.82	0.017*	3.22
PER	-0.0009	-0.90	0.0007	0.90	-0.0009	-0.99
SER	0.003	1.00	-0.003	-1.23	-0.004	-1.37
HER	0.003***	1.75	-0.001	-1.81	0.004*	3.15
PDN	0.365*	6.35	5.041*	10.93	0.456*	4.81

Observations	175		175	175
R^2	0.616		0.524	0.598
Hausman Test	4.97	[0.45]		

5. CONCLUSIONS

It appears that there is currently a gap in comprehensive and rigorous research on the social and demographic determinants of crime in Pakistan utilizing panel data analysis. Panel data analysis allows researchers to examine changes over time within individual units of analysis, such as regions or districts, providing a more nuanced understanding of the dynamics driving crime rates. Given the unique socio-economic and cultural context of Pakistan, conducting such a study could yield valuable insights into the factors influencing crime in the country. By examining social and demographic variables such as education levels, employment rates, urbanization, population density, and age structure, researchers could identify key drivers of criminal behavior and inform evidence-based policies and interventions aimed at crime prevention and reduction. Addressing this research gap would require access to reliable panel data spanning multiple years and regions within Pakistan. Additionally, researchers would need to employ rigorous methodological approaches to analyze the data effectively, accounting for potential confounding variables and ensuring robustness of findings. The present study represents an important effort to address the gap in research on the social and demographic determinants of crime in Pakistan, particularly in the Punjab region. Through empirical analysis, the study aims to shed light on the factors influencing crime rates and their implications for policy and intervention efforts. The results of the empirical analysis reveal a significant finding: the deterrence variable positively impacts total crime, property crime, and violent crime in Punjab. This suggests that measures aimed at increasing deterrence, such as higher arrest rates or stricter penalties, may lead to an increase in reported crime rates across various categories. This finding challenges conventional wisdom and underscores the complexity of understanding the relationship between deterrence and crime. While deterrence measures are typically implemented with the goal of reducing criminal behavior, the positive impact observed in this study suggests a need for further investigation into the effectiveness of deterrence strategies in the Punjab region. By highlighting the positive impact of deterrence on crime rates, the study provides valuable insights for policymakers and law enforcement agencies seeking to address crime in Punjab. However, it also raises important questions about the underlying mechanisms driving this relationship and the potential unintended consequences of deterrence measures. Moving forward, additional research is needed to better understand the nuances of the relationship between deterrence and crime in Punjab, as well as to explore alternative strategies for crime prevention and intervention that take into account the unique social, economic, and cultural context of the region. The analysis of education in our study yields mixed results, indicating that both the lowest and highest levels of education tend to increase the crime rate. This finding underscores the complex relationship between education and crime, suggesting that factors such as socioeconomic status, access to opportunities, and individual motivations may influence the impact of education on criminal behavior. Furthermore, the increase in population density in major districts of Punjab emerges as a significant factor contributing to the rise in crime in Pakistan. High population density areas may experience heightened competition for resources, limited social cohesion, and reduced informal social control mechanisms, all of which can contribute to elevated crime rates. In light of these findings, there are several policy implications that can be drawn. First and foremost, there is a need to improve the law and order situation in Pakistan, particularly in major provinces such as Punjab. This may involve strengthening law enforcement agencies, enhancing community policing initiatives, and investing in crime prevention programs. Additionally, the introduction of new deterrence technologies such as CCTV cameras can help to enhance surveillance and monitoring efforts, deterring criminal activity and facilitating the apprehension of offenders. Strengthening institutions such as the National Accountability Bureau and the police department is also crucial in ensuring effective enforcement of laws and regulations, thereby reducing opportunities for unlawful activities. Overall, addressing the complex interplay of factors contributing to crime in Pakistan requires a multifaceted approach that encompasses law enforcement, community engagement, and socioeconomic development initiatives. By implementing evidence-based policies and interventions, Pakistan can work towards creating safer and more secure communities for its citizens.

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