Journal of Crime and Criminal Behavior
Vol. 5, No. 1, 2025, pp. 85-102

URL: www.arfjournals.com
https://doi.org/10.47509/JCCB.2025.v05i01.05

Crime and Criminal Behavior in India: A Panel Data Econometric Analysis of Property Thefts

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TO CITE THIS ARTICLE

T. Lakshmanasamy (2025). Crime and Criminal Behavior in India: A Panel Data Econometric Analysis of Property Thefts. *Journal of Crime and Criminal Behavior,* 5: 1, pp. 85-102. *https://doi.org/10.47509/JCCB.2025.v05i01.05*

Abstract: It is commonly observed that most property thefts are done by mostly school dropouts and unemployed youths. Such crimes occur due to many reasons, primarily by the opportunity to steal due to the negligence of property owners, motivation for economic gains, or the increasing number of criminals. This paper analyses the causal relationship between school dropout, unemployment and crime in India using panel data at the state level for 2012 to 2022. Empirically, the effects of the unemployment rate and school enrolment rate on motor vehicle theft are estimated by the panel fixed effects and random effects methods. The panel estimates show that motor vehicle theft increases by 1.4 to 1.7 times and decreases by 2 to 11% respectively with an increase in the unemployment and school enrolment rates. The study reveals the dominance of the 'opportunity effect' over the 'motivational effect' on criminal behavior. The paper suggests that the correctional focus should shift from the 'supply of offenders' to the 'supply of victims'.

Keywords: School dropout, unemployment, crime, property theft, panel fixed and random effects estimation

Introduction

Persistence of unemployment is one of the major features of India. The unemployment situation, especially the educated unemployment, is grim and has increased by millions in recent years. The reasons for this persistent unemployment scenario are (i) high population, (ii) poverty, (iii) illiteracy and higher dropout from

Received : 19 April 2025 • **Revised :** 22 May 2025 • **Accepted :** 28 May 2025 • **Published :** 1 June 2025

schools, (iv) excess dependence, low productivity, lack of alternative employment in agriculture, (v) lack of mobility, (vi) unskilled workforce, (vii) lack of information on opportunities and gainful employment, and much more. Though the scope and levels of educated employment opportunities have improved in recent years, poor skill and technical knowledge plague gainful earnings opportunities. Being the second-largest populated country, India has the advantage of reaping demographic dividend with its sizable 65% population below the age of 35. But, the majority of the youths are without skills and training, and gainfully unemployable. As a result, there exists huge youth unemployment in India. Added to this many youths drop out of schools and colleges for various reasons. The high school dropout and unemployment levels, in conjunction with the lack of job opportunities for these unskilled and poorly educated youths, adversely affect the youth psychology and their behavior in India.

A major consequence of India's massive unemployment situation is its direct impact on crimes and unlawful activities of youths. The increasing crime rates are a result of the deterioration of living standards and lack of gainful employment for youths. The pursuit of materialistic living and the lack of opportunity to earn money pushes the youths to engage in unlawful and criminal activities. Added to this are their family commitments and the consequent psychological and emotional pressures. Their urge for quick money makes youths vulnerable to offences like burglary, theft, fraud, extortion, robbery, murder, money laundering, trafficking, etc. Apart from unemployment, a host of factors influence the level of crime in a society. The prevailing sociocultural norms of the society and the demographic, political, economic judicial structures of the country that provide opportunities for illegal and criminal activities also contribute to the motivation to commit criminal activities. Though a lot of efforts are being put into retaining youths in the educational system and elaborate policing and law and correctional measures are there to control youth criminal activities, the crime rates are only increasing with school dropout and unemployment.

A direct consequence of the rising crime rate is the number of people falling victim, losing property, and even dying increases with the increase in crime rate in the country. Individuals have to spend sizable resources to safeguard their properties and in the event of theft or crime on damages and litigation. At the societal level, property destruction due to vandalism, juvenile offences and other violent crimes

is another serious effect of the rising crime rate on the health of society. Increasing the crime rate also increases the cost of living, in terms of the cost borne by society to prevent crimes such as policing, justice and imprisonment, apart from the loss of property and lives. Increasing crime rates also hinder the development of economy and the society compelling the government to devote resources to policing, prevention, investigation, courts, prosecution, litigation, prison maintenance, combating instruments, etc. which could have been invested in poverty alleviation, increasing jobs, health, education, investment, etc. Huge sums of money are spent on building prisons, purchasing instruments to combat crime as well as making payments to people involved in crime control and the justice system. Therefore, increasing criminal activities in a country increases not only individual expenses but also government expenditures, thereby retarding social and economic development.

Figures 1 and 2 present the scenario of various types of crimes classified under the Indian Penal Code, and the major components of property thefts in India. The crimes in India consist of violent crimes like murder, and property crimes like theft, burglary and cheating. The majority of crimes in India are property-related, with motor vehicle theft being the major one. Auto theft is a major property crime, as it is often reported for insurance reasons, while other property crimes are not always reported (Freeman, 1999). Auto theft is largely committed by youths, especially school dropouts and unemployed youths.

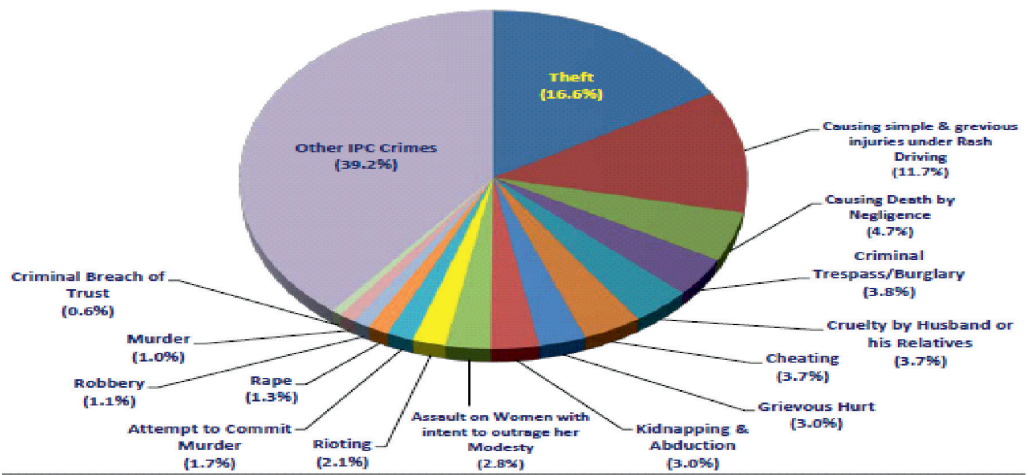

Figure 1: Crime in India

Source: National Crime Records Bureau.

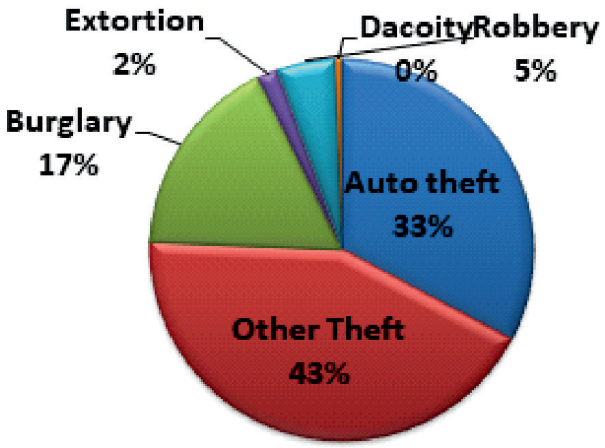

Figure 2: Major Property Crimes in India

Source: National Crime Records Bureau.

With high unemployment and crime rates, it is necessary to examine if unemployment fuels the crime rate in India. The trends in both the rates are not the same and both are fluctuating over the years. Examining the trends alone could mislead the direction and the relation of unemployment with the crime rate. A closer look is necessary to understand the causality between the unemployment rate and the crime rate. It is important to identify how the changes in the unemployment rate affect the changes in the crime rate. Specifically, the dynamics of unemployment-crime nexus warrants a quantitative analysis. Studies that analyse the unemployment-crime relationship in India largely omit the rate of change of unemployment which could act as an important intervening variable in the effect of unemployment on crime.

In view of the lack of systematic study on the dynamics of unemployment on crime, this paper examines the causal effect of changes in the unemployment rate on the crime rate over a panel of four years from 2012 to 2022. Further, this study also analyses the causal effect of the school enrolment rate on the crime rate. Given the multiplicity of crimes in India, this paper considers the crime of motor vehicle theft as it is the largest property crime which in turn constitutes a major part of crimes in India. The data are obtained from the National Crime Records Bureau (NCRB), Annual Employment and Unemployment Survey, and U-DISE (Unified District Information System for Education. Empirically, the effects of the unemployment

rate and school enrolment rate on the crime rate are estimated by the panel fixed effects and random effects methods and the Hausman specification test is applied to validate the estimation.

Literature Review

Theoretically, crime is a causation activity related to motivation and opportunity. Individual criminal behavior is influenced by certain biological, sociological and economic conditions. Certain factors motivate and induce individuals to commit the crime and/or certain opportunities lead to the act of crime. The criminal behavior at large is looked through the prism of the 'supply of offenders' and 'supply of victims'. The supply of suitable victims is the focus of criminologists and sociologists, but economists side with the supply of offenders focusing on the economic behavior of potential offenders. The criminological theories explain the causes of crime in terms of biology and sociology. The biological theories seek within individuals the causes of the crime. Some people are identified as 'born criminals' on the basis of distinct physiological structures. More sophisticated biological approaches search for elements of crime in genetic, biochemical and neurophysiological structure. They suggest that conditions for crime may include poor diet, hormone imbalance, learning disabilities, damaged brain, abnormality and intelligence. In other words, the biological theories see offenders as 'others', different from non-criminals in some way.

Sociological theories view criminal behavior as external to the individual emphasising place and space. They suggest that some external forces such as peer group, neighbourhood and family experiences shape individual attitudes and behavior towards crime. The defensible space theory relates to the design of physical space with the crime. The broken windows theory tries to link the low-level disorder to crime. The routine activities theory explains how everyday ordinary movements and activities of people provide motivation and opportunity for criminals to commit crimes. The economic theories of crime weigh the costs and benefits of committing the crime, emphasising the opportunity cost, especially the probability of being caught. The main cost of crime is not the money involved but the probability of crime being detected and caught, and the severity of punishment if caught. If the chance of the crime being detected is less, the incentive to commit a crime is high.

Since Gary Becker's (1968) seminal contribution to the economics of crime, the economic approach to crime is based on a simple cost-benefit analysis. Potential criminals make their criminal decisions weighing the benefits and the costs of committing a crime. The benefit is the value of theft while the costs include both the direct money and indirect opportunity costs. The main cost of an offence is the probability of being caught, and if caught, the severity of punishment. The potential criminal has an individual risk preference based on which the criminal activity will be decided. Building on the crime model of Becker (1968), Ehrlich (1996) develops a theory of the 'supply of offences'. In this 'market model' of crime, the net return of an offence equals the payoff expected from crime, less the direct and opportunity cost of illegitimate activity. That is, net return from crime = nominal financial gain - [direct cost + wage foregone - (probability conviction x punishment)]. Therefore, if only the net return from the offence exceeds the cost before the individual will commit a crime, depending on his risk preference, utility and disutility associated with the illegal activity. The Ehrlich model of the 'supply of illegitimate activity' is being widely used for analysing various crimes.

Britt's (1997) theory of the unemployment-crime relationship is based on two opposite premises - motivation and opportunity. With rising unemployment, economic condition deteriorates and crime is seen as a source of income. With less merchandise in the 'market' to be stolen because of low levels of production and consumption activities, the potential offenders look for opportunities. But, under rough economic conditions, potential victims are more cautious about protecting their property and places become guarded and less suitable for an offence. Because the potential victims do not have money or excess material goods and personal property is more guarded, the opportunities for crime are less. Therefore, depressed economic conditions should be negatively related to crime. On the other hand, the individual's motivation to commit a crime is high due to the falling personal living conditions caused by unemployment. A potential offender is more likely to commit a criminal act during a period of unemployment to maintain a certain level of living. There exists extensive empirical literature on the relationship between unemployment and crime rates. Although the approaches are similar, the empirical results turn out dissimilar. Raphael and Winter-Ebmer (2001) study seven felony offences in the US. It is observed that the effect of unemployment on all types of property crimes is significantly positive, except for violent crime which is mixed.

Melick (2003) analyses the motivational vs opportunity perspectives for motor vehicle theft in the US. The unemployment rate captures the opportunity perspective while a change in the unemployment rate captures the motivational perspective. The panel fixed effects estimates show that the crime of motor vehicle theft is significantly negatively related to the unemployment rate and positively to changes in the unemployment rate.

Edmark (2005) examines the unemployment effect on property crime in Sweden. The fixed-effects results show property crimes increase with a rise in the unemployment rate. The other significant determinants of crime rate in Sweden are divorce rate, population density and clear-up rate. The estimates reveal a negative relationship between population density and aggregate property crime, suggesting the opportunity perspective for the crime.

Lin (2008) study the unemployment-crime relation in the US considering seven crime categories as dependent variables and the total number of prisoners and consumption of ethanol per person among the independent variables, with real exchange rates and oil prices as the instrumental variables. The estimates reveal that there exists a statistically significant, though relatively small, positive effect of unemployment on property crimes in the US.

Goa, Liu and Kouassi (2017) analyse the contemporaneous effect of unemployment on the crime rate in the US. The panel fixed-effects estimates show that the unemployment rate and violent crime rates in the US are negatively related. The paper notes that because of unemployment people stay at home and hence properties are guarded. Therefore, the potential targets and the opportunity for crime are less for potential offenders. It is also observed that male youths between the ages of 14-25 years constitute a major proportion of offenders of both violent crimes and property crimes, providing evidence in support of the criminal opportunity effect theory.

Data and Methodology

To analyse the causal effect of unemployment on crime in India, this paper uses panel data for 28 states in India for the period 2012 to 2022. The variables considered are motor vehicle theft rate, unemployment rate, school enrolment rate and change in the unemployment rate. The relevant data on motor vehicle theft are obtained from the National Crime Records Bureau (NCRB), on unemployment from the

Annual Employment and Unemployment Surveys, and the enrolment data from the U-DISE (Unified District Information System for Education).

Panel Data Econometrics Method

Panel data is longitudinal data that consists of both cross-section and time-series observations over multiple time periods for the same units. The panel data considers explicitly individual heterogeneity and has many variations, less collinearity of variables and more degrees of freedom. Compared to either cross-section or time series data, the panel data is best suited for studying the dynamics of changes, as it contains information on the same units over time. The common panel estimation techniques are pooled regression, least squares dummy variable regression, fixed effects and random effects regression methods.

The pooled panel regression treats each observation as independent from others over the panel. The pooled regression model is specified as:

$$yit = \alpha + \beta x_{it} + \lambda_i + u_{it} \quad (1)$$

where y is the dependent variable, x is a set of independent variables, λ_i represents the individual effects, u is the stochastic error term and α and β are parameters to be estimated. Though the estimates are efficient, the pooled model does not encompass the individual effects as it is assumed to be constant. If the individual effects are correlated with the error term, the pooled regression estimates are biased.

The panel fixed effects model recognises that some unobservable characteristics that are unique to the individual, but time-invariant, may influence the outcome. As they are not there explicitly in the regression, the presence of unobservables may impact the outcome and bias the estimates, and hence they have to be controlled. As such individual-specific unobservables are time-invariant, they are added with the constant term and hence assumed to be uncorrelated with the other explanatory variables and the error term. The panel fixed effects regression model is specified as:

$$y_{it} = (\alpha + \lambda_i) + \beta x_{it} + u_{it} \quad (2)$$

The panel fixed effects model can be estimated in three ways: least squares dummy variable (LSDV), within-group and between-group regressions.

The LSDV method assumes that the individual effects are fixed over time in each cross-section and hence each cross-sectional unit is introduced as dummy variables in the estimating equation. The LSDV regression model is specified as:

$$y_{it} = \beta x_{it} + \gamma_i d_i + u_{it} \quad (3)$$

where d represents a dummy for each cross-section observation. However, the LSDV inserts as many dummies as the cross-section units in the estimating equation and hence so many parameters have to be additionally estimated, enlarging the number of parameter estimates and reducing degrees of freedom of the regression model, and sometimes leading to dummy variable trap.

Instead of knowing the statistical properties of the unobserved heterogeneity, the individual effects could also be eliminated by simply taking the cross-section (within-group) average. Thus, the within-group fixed effects regression model is specified as:

$$(y_{it} - \bar{y}_i) = \beta(x_{it} - \bar{x}_i) + (u_{it} - \bar{u}_i) \tag{4}$$

This time-averaging within each cross-section eliminates all the time-invariant variables thus eliminating the λ_i from the estimating equation. Then, the regression parameters can be simply estimated using the within-group averages as:

$$\hat{\beta}_W = \frac{\Sigma_{i=1}^{n}\Sigma_{t=1}^{T}(x_{it} - \bar{x}_i)(y_{it} - \bar{y}_i)}{\Sigma_{i=1}^{n}\Sigma_{t=1}^{T}(x_{it} - \bar{x}_i)^2} \tag{5}$$

In the between-group fixed effects regression method, instead of eliminating the individual effects from the regression, the individual-specific effects λ_i are amplified by averaging out all the within-cross-section variations, leaving only between-cross-section variations. Thus, there will be no estimate for those variables which are constant across cross-section units. The between-group fixed effects regression model is specified as:

$$\bar{y}_i = \beta\bar{x}_i + \bar{u}_i \tag{6}$$

This averaged equation shows the variation of the group means around the overall mean and the parameters can be consistently estimated as:

$$\hat{\beta}_B = \frac{\Sigma_{i=1}^{n}\Sigma_{t=1}^{T}\bar{x}_i - \bar{x}(\bar{y}_i - \bar{y})}{\Sigma_{i=1}^{n}\Sigma_{t=1}^{T}\bar{x}_i - \bar{x})^2} \tag{7}$$

However, in all three fixed effects estimations, the assumption is that the error terms are uncorrelated. If the errors are correlated, the fixed effects regression estimates are biased and inconsistent.

Instead of assuming that the individual-specific heterogeneity is time-invariant, the panel random effects regression recognises individual effects λ_i to be random, and hence need not be absorbed in the intercept term of the regression. As λ_i is now random and has a distribution, but unobserved, it becomes a part of the error term.

Assuming that λ_i is uncorrelated with the other independent variables, a distribution function can be specified for the composite error term. The panel random effects model is specified as:

$$y_{it} = \alpha + \beta x_{it} + \varepsilon_{it} \quad (8)$$

where $\varepsilon_{it} = (\lambda_i + u_{it})$. The ordinary least squares regression estimates of the random effects model are consistent, but inefficient because of serial correlation in errors i.e. $Cov(u_{it}, u_{is}) = \sigma^2 \neq 0$. To avoid inefficiency, the generalized least squares regression method is to be used in the estimation. It is important to note that if there are omitted variables in the regression, there might be a correlation between the individual-specific heterogeneity λ_i and the other independent variables.

Thus, the panel random effects regression estimates are consistent but inefficient under the assumption of uncorrelated individual-specific heterogeneity and other explanatory variables. Alternatively, the estimates of panel fixed effects regression model estimates are consistent but inefficient under the assumption that the individual-specific heterogeneity is constant. Therefore, the choice between fixed effects and random effects panel regression estimation methods is critical.

Hausman (1978) has devised a test to choose between the two on the basis that both the random and fixed effects estimators should be approximately the same if the zero-correlation assumption [$Cov\ (\lambda_i, x_{it})=0$] holds, but different if the assumption is false. The Hausman test defines the null and alternative hypotheses as: H_o: $Cov\ (\lambda_i, x_{it})=0$ - no correlation between the individual-specific heterogeneity and independent variables, and the appropriate specification is the random effects model, H_1: $Cov(\lambda_i, x_{it}) \neq 0$ - individual-specific heterogeneity and independent variables are correlated and the appropriate specification is the fixed effects model.

Then, the Hausman statistic is specified as:

$$H = (\hat{\beta}_{RE} - \hat{\beta}_{FE})' \Omega^{-1} (\hat{\beta}_{RE} - \hat{\beta}_{FE}) \sim \chi_k^2 \quad (9)$$

Under the null hypothesis, both the random effects and fixed effects estimators are unbiased and consistent, but the random effects estimator is more efficient as it relaxes the time-invariant assumption and allows randomness of the individual-specific heterogeneity λ_i. Hence, the standard error $(\hat{\beta}_{RE})$ < standard error $(\hat{\beta}_{FE})$. The Hausman statistic has $\chi 2$ distribution. If the calculated value of the Hausman statistic is greater than the critical value the null hypothesis is rejected and the conclusion is that the fixed effects model is more appropriate.

Empirical Analysis

In the empirical analysis of the relationship between unemployment and crime in India, the dependent variable considered is the motor vehicle theft rate and the independent variables are the unemployment rate, school enrolment, and change in the unemployment rate which captures the motivation for theft over time. The descriptive statistics presented in Table 1 show that the average motor vehicle theft rate is 39 per 100,000 inhabitants in India. While the average unemployment rate is 4. 65%, the rate of change in the unemployment rate is substantial, 31% over the time period. The mean school enrolment rate is 69.17%.

Table 1: Descriptive Statistics of Variables

Variable	*Description*	*Mean*	*Std. dev.*
Mvt	Number of motor vehicles stolen per 1,00,000 inhabitants	28.96	16.74
Unemp	Labour force without work (%)	4.65	2.99
Enrl	Number of students enrolled in all types and classes of schools (lakhs)	69.17	79.22
Dunemp	Change in the unemployment rate	31.05	71.31

The correlation graph presented in Figure 3 shows a positive association between the unemployment rate and motor vehicle theft rate and a negative relationship between school enrolment and motor vehicle theft rate. The spread of the graph indicates that motor vehicle theft increases with an increase in the unemployment rate and decreases with the increase in school enrolment.

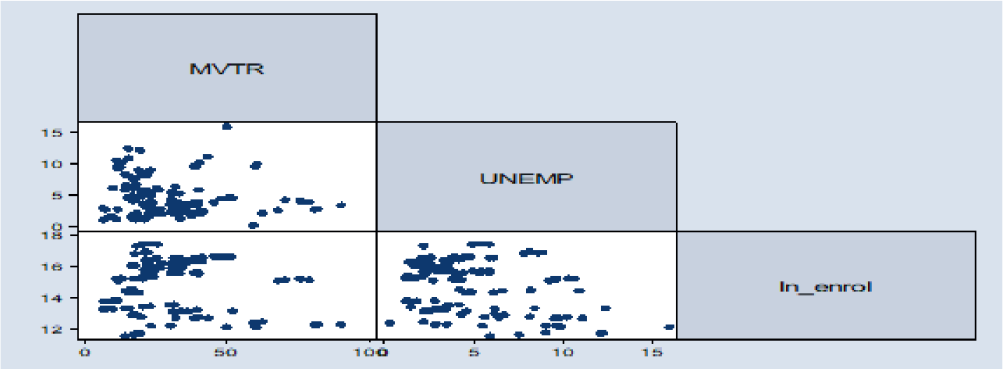

Figure 3: Correlation between Theft, Enrollment and Unemployment

The testing hypothesis of this paper is the positive effect of the unemployment rate on the crime rate since the unemployed seek some standard of living with quick money acquired by theft as unemployment motivates individuals to commit a crime. The panel model is estimated by pooled OLS, LSDV, within-group fixed effects, between-group fixed effects and random effects regression methods. The estimating panel regression model is specified as:

$$Mvt_{it} + \beta_0 + \beta_1 Unemp_{it} + \beta_2 \ln(Enrl)_{it} + v_{it} \quad (10)$$

where v_{it} represents u_{it} for OLS, LSDV, within-group fixed effects and between-group fixed effects models, and ε_{it} for random effects model.

Table 2 presents the panel estimates of all specifications. The estimated pooled regression coefficients of unemployment and school enrolment are negative but statistically insignificant. As the pooled regression is simply an OLS regression, it does not take into account the unobserved heterogeneity. The F-statistic is poor and also insignificant. The R-square value is just 1 percent showing that pooled OLS regression is not the best way to estimate panel data.

Table 2: Panel estimates of crime

Dependent variable: Motor vehicle theft

Variable	*Pooled regression*	*LSDV*	*Within fixed effects#*	*Between fixed effects*	*Random effects*	*Fixed effects regression@*
Uemp	-0.716 (0.502)	1.63* (0.28)	1.63* (0.28)	-1.43 (1.27)	1.43* (0.27)	1.75* (0.28)
lnEnrl	-1.61 (0.94)	-11.17*** (6.7)	-11.17*** (6.7)	-2.08 (2.14)	-0.75*** (1.95)	-7.33 (8.3)
Dunemp	-	-	-	-	-	-1.32*** (0.01)
State dummies	no	no	yes	no	no	yes
Year dummies	no	no	no	no	no	yes
Constant	56.20* (15.15)	20.76* (5.66)	-	-	-	-
F-value/Wald chi^2	1.23	16.88	16.88	1.79	27.43	6.77
Prob>F/ chi^2	0.166	0.00	0.000	0.46	0.00	0.000
σ_u	-	-	-	-	16.34	-
σ_ε	-	-	-	-	4.49	-
ρ	-	-	-	-	0.930	-

Variable	*Pooled regression*	*LSDV*	*Within fixed effects#*	*Between fixed effects*	*Random effects*	*Fixed effects regression@*
Within R^2	-	-	0.235	0.217	0.224	-
Between R^2	-	-	0.005	0.060	0.011	-
Overall R^2	-	-	0.006	0.023	0.002	-
Adj. R^2/R^2	0.10	0.92	-	-	-	0.31

Note: Standard errors in parentheses. # state dummies included. @ year dummies included. *, **, *** significant at 1, 5, 10% levels.

The LSDV regression captures the unobserved heterogeneity, the unique characteristics of a state, by the inclusion of state dummies in the estimation. In the LSDV regression, the effect of the unemployment rate on the crime rate is positive and highly significant and the impact of school enrolment on crime is negative and significant at 10% level. For every percentage point increase in the unemployment rate, there will be about 1.63 more stolen vehicles per 100,000 inhabitants. A percentage increase in school enrolment will decrease motor vehicle theft by 11.17%. This result suggests that the motivational perspective outweighs the opportunity perspective of crime in India. Most of the state dummies are negative and significant, compared to the reference state Andhra Pradesh (Table 3). The F-value is 62.69 and statistically significant showing the fit of the LSDV model.

The within-group fixed effects estimates confirm the LSDV estimates. The unemployment rate and crime rate are significantly positively related and there is a significant negative relation between school enrolment and crime rate. These two variables explain about 23% of states' variations in the crime rate in India. The significance of the F-statistic rejects the null hypothesis that the coefficients on the regressors are all jointly zero, suggesting the fit of the specified model.

The between-group fixed effects panel regression estimates show an insignificant negative relationship between unemployment and crime rates and school enrolment and crime rate. While the within-state effects explain the variations in crime rate by 22%, the between-state effect accounts for only 0.5% of variations in crime rate in India. Further, the insignificant F-statistic implies that the coefficients of the regressors are all jointly zero, and hence the between-group regression model is not appropriate to estimate the relationship between the unemployment rate and crime rate.

In the random effects panel regression model, which accounts for the randomness of state heterogeneity, the effect of the unemployment rate on motor vehicle theft is positive and highly significant. A percentage increase in the unemployment rate will increase the motor vehicle rate by almost 1.5 times. The school enrolment coefficient is negative and significant at a 10% level showing that motor vehicle theft rates will fall by 0.75% with a one percent increase in school enrolment in India. The estimate of σ_u is 16.34 and σ_ε is 4.49 and, by assertion, the correlation between state heterogeneity (λ_i) and the independent variables (x_{it}) is zero. The rho (ρ) value of 0.93 shows that 92% of variations in the crime rate are due to differences across the panels. The significant Wald-chi square value of 27.4 rejects the hypothesis that the coefficients in the model are zero, and hence the random effects model is correctly specified.

Table 3: Panel Least Squares Dummy Variable Estimates of Crime with State Dummies

Dependent variable: Motor vehicle theft

Variable	*Estimate*	*Variable*	*Estimate*
Uemp	1.63* (0.28)	Maharashtra	18.11* (4.2)
ln(Enrl)	-11.17*** (6.7)	Manipur	-27.19 (25.6)
Arunachal Pradesh	-41.53 (29.0)	Meghalaya	-35.04 (22.8)
Assam	-4.55 (6.2)	Mizoram	1.20 (32.63)
Bihar	-11.87** (6.03)	Nagaland	-55.66** (28.1)
Chhattisgarh	-16.82** (7.75)	Odisha	-14.33* (5.3)
Goa	-43.45 (34.3)	Punjab	-22.68* (8.9)
Gujarat	-8.64** (3.4)	Rajasthan	10.14* (2.9)
Haryana	28.88* (9.4)	Sikkim	-74.59** (38.2)
Himachal Pradesh	-46.92** (20.2)	Tamil Nadu	-14.05* (3.1)
Jammu & Kashmir	-43.25* (15.2)	Tripura	-59.26** (24.7)
Jharkhand	-18.02* (5.2)	Uttar Pradesh	0.69 (9.9)
Karnataka	-1.85 (3.7)	Uttarakhand	-38.90** (16.0)
Kerala	-42.20* (9.7)	West Bengal	-8.25** (3.37)
Madhya Pradesh	6.51* (3.5)	Constant	20.76* (5.66)
F-value	16.88		
Prob>F	0.00		
R^2	0.92		

Note: Standard errors in parentheses. *, **, *** significant at 1, 5, 10% levels.

The appropriate panel model for the data is to be decided by the Hausman test, for which the null hypothesis is that the random effects model is the preferred model and the fixed effects model is the alternative. The Hausman test basically tests whether errors are correlated with the independent variables, for which the null hypothesis is that they are not. Table 4 shows that the Hausman test rejects the null hypothesis as the chi-square values are significantly high. Therefore, the fixed effects model which produces consistent coefficient estimates is fit for the data.

Table 4: Hausman Specification Test of Fixed Effects vs Random Effects Specification

Variable	$\hat{\beta}_{FE}$	$\hat{\beta}_{RE}$	$\hat{\beta}_{FE}-\hat{\beta}_{RE}$	$\sqrt{diag(V_{FE}-V_{RE})}$ *std. error*
Unemployment	1.63	1.43	0.20	0.60
Enrollment	-11.17	-0.75	-10.41	8.01
β_{FE} consistent under H_0 and H_1			β_{RE} inconsistent under H_1 efficient under H_o	
Test: H_o: difference in coefficients not systematic				
$\chi^2 = (\beta_{FE}-\beta_{RE})'(V_{FE}-R_{RE})^{-1}(\beta_{FE}-\beta_{RE}) = 24.13$				Prob>χ^2 =0.00

Since the results from the Hausman test show that the fixed effects model is consistent, the panel model is reestimated by including the time dummies to capture the changes in the crime rate over time. Adding the year effects in the regression eliminates the causing factors for year-to-year changes in the crime rate. The expanded panel fixed effects regression model is:

$$Mvt_{it} + \beta_0 + \beta_1 Unemp_{it} + \beta_2 \ln(Enrl)_{it} + \beta_3 Dunemp + \beta_4 2013 + \ldots + v_{it} \qquad (11)$$

where the year 2012 is the reference category. A new variable, the change in the unemployment rate over time (Dunemp) is also included to see how changes in unemployment over time affect the crime rate. The estimated results presented in the last column of Table 2 show that both the positive effect of the unemployment rate and the negative effect of school enrolment on the crime rate increases with the inclusion of the year dummies and changes in the unemployment rate. The coefficients of the unemployment rate and changes in the unemployment rate are statistically significant.

While an increase in the absolute number of unemployed increases thefts, a fall in the unemployment rate will decrease crimes in India. As the unemployment rate

increases over the years, the crime rate falls 1.32 times which almost nullifies the positive effect of the unemployment rate. The year dummies are also negative, but statistically insignificant, showing that over the years the effect of unemployment on motor vehicle theft decreases. In the year 2013, the motor vehicle theft rate was 1.47 less than that of the previous year. And in 2016, the theft rate was a negative 2.20. The empirical results of this study contradict the motivation perspective of crime.

However, with increasing unemployment, people themselves do not have money and material goods which makes the victims less suitable for theft. Moreover, unemployed people will guard their personal property with more vigil, providing less opportunity for stealing. Thus, the contradicting result is to be seen from the viewpoint of the opportunity perspective of crimes which states that unemployment and crime are negatively related. At a high level of unemployment, the unemployment rate becomes stationary and motor vehicle theft drops considerably. The empirical estimates of this paper show that the motivational effect dominates under stationary unemployment levels, while the opportunity effect dominates in times of volatility in unemployment.

Conclusion

In history, crime often hampers the development of society. Crime, whether blue-collar or white-collar, is a harmful act, the omissions against the public are viewed as criminal activities which the state wishes to prevent with severe punishments of fines, imprisonment, and/or death. Criminal activities may be violent like murder or property crimes like theft. Among the many types of property crime, the highest reported crime is motor vehicle theft. There exists a common view that most motor vehicle thefts are committed by youngsters, especially school dropouts and the unemployed. In pursuit of living requirements or maintaining some living level or quick money, the unemployed engage in thefts. The motor vehicles become easy targets as the vehicle is in an open place and can be quickly changed and sold with some criminal nexus. Unlike other property crimes, the risk involved is less as the target is known, open, visible and can be quickly steeled and disposed of. The reporting of motor vehicle theft is high for reasons of the insurance claim.

The unemployment-crime relationship is explained by some theories in terms of the 'supply of offenders' and 'supply of victims'. Economic theories emphasise

the costs and benefits of crime, the costs being the opportunity cost in terms of the probability of crime being caught and the quantum of punishment. Sociological theories explain the unemployment-crime relation in terms of motivational and opportunity perspectives. The motivational perspective posits that the deterioration of economic conditions motivates the unemployed to resort to criminal activities in search of quick money to maintain a living standard. The opportunity perspective postulates crime as a supply of potential offenders and suitable victims. Thus, there exists a market for crime with potential offenders and victims, the theft offenders being mostly school dropouts and unemployed youth.

With a view to understanding the nexus between unemployment and crime in India, this paper analyses the motor vehicle theft crime. The period of study is from 2012 to 2022 and the variables in the study include motor vehicle theft rate, unemployment rate, school enrolment and the change in the rate of unemployment. The state-level data are collected from the NCRB, Employment- Unemployment Survey of India and DISE. In the empirical analysis, this paper uses panel data methodologies of pooled regression, LSDV, fixed effects and random effects methods to estimate the effect of unemployment on crime. The Hausman test shows that the fixed effects model is the appropriate estimation method for the data to obtain consistent estimates. In all the panel estimates, the effect of the unemployment rate on motor vehicle theft is positive and statistically significant and the school enrolment effect on crime is significantly negative. An increase in the unemployment rate increases motor vehicle theft by 1.4 to 1.7 times and an increase in school enrolment decreases motor vehicle theft by 2 to 11%. The change in the unemployment rate reduces motor vehicle theft almost equal to that of the unemployment rate.

The opposing effects of unemployment and changes in unemployment on crime in India show the dominance of the opportunity effect over the motivational effect. This new insight, the effect of the swings in the unemployment rate on the crime rate, points that the focus should be redirected from the view of the 'supply of offenders' to the 'supply of victims'. The policies towards youth, be it enrolment or unemployment, should be directed to guard against the opportunity to commit criminal acts. Aiding school dropouts and the unemployed through difficult times with safety nets like unemployment insurance, part-time jobs, earning while learning, etc. would desist unemployed youths from committing criminal and unlawful activities.

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