RESEARCH SYNOPSIS

Income Inequality and Crime: Dynamic Impacts Using Panel Data

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ECO342A: Econometrics II
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INTRODUCTION

Income inequality has been a topic of increasing concern in recent years as the gap between the rich and poor continues to widen in many countries around the world. The underprivileged are getting more impoverished with respect to their wealthier counterparts. But what effects will this pattern have? One of the potential consequences of this trend is an increase in crime rates, as those who are left behind by economic growth may turn to illegal means to make ends meet. However, the connection between income inequality and crime is complex and multifaceted, and there is much debate among scholars about the nature and extent of this connection. This research paper seeks to explore the dynamic effects of income inequality on crime, using a comprehensive theoretical framework and empirical analysis of data from a range of sources. Through this investigation, we hope to shed light on the underlying mechanisms that drive this relationship and provide insights into the ways in which policymakers can address the root causes of crime in our societies.

WHAT I AIM TO DO

Through this base paper, I aim to analyse the effect of income inequality on crime across different Indian states through panel data analysis and will also apply different nonparametric analysis methods and try to address the endogeneity issues through fixed effects(unobserved heterogeneity constant over time) or first difference model(unobserved heterogeneity changes over time).

LITERATURE REVIEW

The views of different researchers
- ***Fajnzylber et al. (2002)-*** positive and significant relationships between income inequality and violent crime in a panel of countries
- ***Demombynes and Ozler (2005)-*** inequality is associated with property and violent crimes in South African neighbourhoods.
- ***Enamorado et al. (2016)-*** One point increase in the Gini coefficient raises drug-related homicides.

- ***Kelly (2000) and Choe (2008)-*** Found that income inequality has no influence on property crime but has a significant and robust impact on multiple indicators of violent crime using state-level data for the United States.
- ***Brush (2007)- mixed evidence-*** Inequality has a positive link with crime in a cross-section of U.S. counties but a negative association in time-series analysis.
- ***Doyle et al. (1999) and Neumayer (2005) -*** no significant link between inequality and violent crime
- ***Time series regression by Saridakis (2004)-*** a short-term– but no long-run– relationship between income inequality and crime.

A major endogeneity issue caused by measurement error, unobserved heterogeneity, and the simultaneous determination of crime and income inequality underlies these contradictory empirical results. The mixed evidence on the relationship between income inequality and crime is due to a problem of causality. Income inequality and crime may both be caused by the same factors, making it difficult to determine which causes which. For example, an increase in crime may lead to higher-income individuals leaving the area, which in turn decreases income inequality. Additionally, attempts to reduce crime through policies like education may also decrease inequality, making it hard to isolate the effect of inequality on crime. Furthermore, cross-country studies are prone to measurement error and unobserved heterogeneity, which make it challenging to compare crime and inequality statistics across countries. Overall, it is difficult to establish a clear cause-and-effect relationship between income inequality and crime.

The base paper estimated a panel SVAR model to assess the relationships among multiple variables in a system and identify the relative importance of various shocks on the system. for US state-level data set from 1960-2015 for fifty U.S. states and D.C. (56 observations per state). More than 2800 observations were obtained by combining the cross-sectional and time-series aspects of the data. Different reference papers also show institutions' qualities influence how closely economic inequality and crime are related.

RESEARCH GAP

- The problem of simultaneity bias in regression of crime on income inequality- the two variables are related here.
- Omitted variables and measurement errors can lead to biased estimates.
- Inadequate attention to mediating factors- such as poverty, education, employment opportunities, etc.
- Limited attention to policy implications
- Inadequate consideration for reverse causality

DIFFERENT ESTIMATION METHODS

- Panel data that allow for the control of individual-level factors that may be connected with both crime and income inequality can be used to address unobserved heterogeneity in this topic.
- Additionally, researchers can use fixed effects models, GMM estimation that control for individual-specific unobserved heterogeneity that does not vary over time.
- Researchers can use instrumental variable (IV)(differences-in-differences) methods that exploit exogenous sources of variation in income inequality to estimate causal effects.

SPECIFIED MODEL

1. Institutional quality is used as an interactive term to investigate the marginal effect of income inequality on the crime rate

$CMR_{it} = \alpha 0 + \beta 1 CMR_{it-1} + \beta 2 IE_{it} + \beta 3 INST_{it} + \beta 4 RGDPC_{it} + \beta 5 Uem_{it} + \beta 6 Ub_{it} + \beta 7 INF_{it} + \beta 8 Edu_{it} + \mu i + \varepsilon it$

Interactive equation- $CMR_{it} = \alpha 0 + \beta 1 CMR_{it-1} + \beta 2 IE_{it} + \beta 3 INST_{it} + \beta 4 (IE_{it} \times INST_{it}) + \beta 5 RGDPC_{it} + \beta 6 Uem_{it} + \beta 7 Ub_{it} + \beta 8 INF_{it} + \beta 9 Edu_{it} + \mu i + \varepsilon it$

IE- income inequality (Gini coefficient)
CMR_{it-1} - lagged dependent variable
CMR- Crime rate
RGDPC- real gross domestic product per capita
Uem- the unemployment rate
Ub-Urbanization
Edu- tertiary education
INF- inflation
ε-error term
INST- the interaction of institutions with crime rate(control variable)
$IE \times INST$- interaction term of an institution with income inequality on crime rate
 i-country and t-year
$\beta 1, \beta 2, \beta 3, \beta 4, \beta 5, \beta 6, \beta 7$ are the slope parameters to be estimated

Significance of signs
β2- expected to be +ve signifies higher income inequality, higher violent crime
 β3-expected to be -ve- better the institutional quality better the crime rate
$\beta 4$- can be both +ve/-ve(buffer)
β5- expected to be -ve- avg income increases crime rate decreases
β6, β7, and β8- expected to be of +ve sign- increase in unemployment, inflation rate and inflation increases the crime rate
$\beta 9$- expected to be +ve- higher level of education lower the crime rate

And $A_0\widetilde{x}_{it} = B(L)\widetilde{x}_{i,t-1} + \widetilde{u}_{it}$

A reduced-form panel VAR model
implemented using the GMM estimator suggested by Arellano and Bover (1995)

BASE MODEL FOR MY RESEARCH

$$CMRit = \alpha 0 + \beta 1 CMRit-1 + \beta 2Eit + \beta 3Population\_density it + \beta 4Uemit + \beta 5INFit + +\beta 6grit + \beta 7eduit + \beta 8GSDPCit + \varepsilon it$$

$CMRit$- Crime rate in state i at time t
$CMRit$-1-Crime rate in state i at time t-1 (lagged dependent variable)
$IEit$- Income inequality (SPI Index) in state i at time t
$GSDPCit$- Gross State Domestic Product in state i at time t
$Uemit$- The unemployment rate in state i at time t
$INFit$- Inflation rate for region i at time t
$Population\_density$it- Population density for region i at time t
eduit- Education level (net enrollment rate in primary education) in state i at time t
grit- Demographic factors (gender ratio) in state i at time t
εit- Error term

HYPOTHESIS

1. Will examine the relationship between income inequality and crime rates in India, similar to the studies done in the United States, and claim that higher income inequality causes higher crime rates. By using threshold regression and various panel data analysis techniques, we can better identify the causal effect of income inequality on crime rates and control for endogeneity.
2. In India, institutional quality moderates the association between income inequality and crime: Based on the results of the study indicated in the base paper for US, this hypothesis would investigate whether India's institutions have an impact on the relationship between income inequality and crime.
3. Will examine the relationship between income inequality and crime in India for IPC+SLL crimes and check how much they get affected by other factors present. Compare SPI Index with different crime measures.
4. Will try to analyze different policies focusing on poverty reduction, education, and employment opportunities that must have been implemented and check for the impact of income inequality on crime across different states.

METHODOLOGY

1. I will be using panel data analysis(a panel VAR model). The panel VAR (Vector Autoregression) model is a statistical technique used to analyze the dynamic relationship between multiple time series variables. Panel VAR models may be used to calculate the causal impact of income inequality on crime rates when examining the link between those two variables while controlling for other relevant factors that may affect crime rates. I would need to gather relevant data on income inequality and crime rates for multiple Indian states over time. Once I have the data, I would set up a panel VAR model that includes income inequality and crime rates as endogenous variables. The model would also need to include other exogenous variables that may affect both income inequality and crime rates, such as unemployment rates, education levels, and institutional quality. After setting up the model, I would estimate the coefficients of the endogenous and exogenous variables using appropriate econometric techniques. This will allow to analyze the dynamic relationships between income inequality and crime rates while controlling for other relevant factors. To address potential endogeneity or reverse causality issues in the model, I would try to use GMM estimation or first difference model(unobserved heterogeneity changes over time).

GMM Estimation

- In contrast to OLS and fixed-effects estimations, GMM provides reliable estimates.In contrast to OLS and fixed-effects estimations, GMM provides reliable estimates.Lagged values for the dependent variable are incorporated into the GMM mode which helps in internally transforming the datal. As a result, the endogeneity issues are resolved, and the valid estimates are generated utilizing a strict GMM process.

Using the Arellano-Bover GMM estimator, the general model form to be used is

Crimei,t = α0+ α1Crimei,t-1 + α2Income_Inequalityi,t + β1 controli,t + β2 instrumentsi,t + εi,t

Crime,t- the crime rate for individual i for time period t
Crimei,t-1- One period lagged operator(previous year crime rate)
Income_Inequalityi,t - the income inequality measure for individual i for time period t
α1 and α2 - Parameters
Controli,t- vector of control variables that may affect crime rates, such as demographics, economic conditions, and social factors.
β - vector of parameters to be estimated for the control variables.
εi,t-error term that captures unobserved factors affecting crime rates.

- The three main endogeneity sources—unobserved heterogeneity, simultaneity, and dynamic endogeneity—can be controlled for using the GMM model.
- Instruments should be chosen such that they are correlated with the endogenous regressors but not correlated or orthogonal to the errors.

- In GMM one minimizes e'ZWZ'e, where W is the weighting matrix and Z is a matrix of instruments and the moment or orthogonality condition is E(Z'u)=0

2. Using different non-parametric analyses on Indian states, such as kernel regression a useful tool to gain insights into the relationship between income inequality and crime in India without making any assumptions on the relationship's functional structure

3. I will try to apply **threshold regression** to study the impact income inequality on crime rates in India using panel data.

THRESHOLD

Crime rate = β0 + β1Income inequality + γDβ2(Income inequality > t) + β3Control variable + ε

Crime rate- the dependent variable representing the crime rate in a given area or time period.
Income inequality- the independent variable representing the level of income inequality in the same area or time period.
β0, β1, β2,β3- Parameters to be estimated
*threshold(t)-*the point at which the relationship between income inequality and crime rates changes
*ε-*the error term
Control variable- a variable that is correlated with both income inequality and crime rates. This could be, for example, population density or education level.
D - dummy variable that takes the value of 1 if Income inequality is above the threshold level t and 0 otherwise.

Threshold regression with dynamic panel data is a statistical technique used to model the relationship between variables in panel data, where the relationship may change depending on the values of certain threshold variables. It allows for the estimation of separate coefficients for different regimes or states of the threshold variable. Dynamic panel data refers to panel data that includes lagged values of variables, allowing for the consideration of time dynamics and potential endogeneity issues. This approach can provide insights into how different variables interact and influence each other in different states or regimes and can help uncover complex relationships that may not be captured by traditional linear regression methods.

DATA SOURCES

https://www.indiastat.com/
https://ncrb.gov.in/en/crime-india
Gini index - India | Data (worldbank.org)

OBJECTIVE AND SIGNIFICANCE

This study's goal is to use panel data analysis to look into the connection between income inequality and crime in India. The study specifically seeks to determine whether income inequality has an impact on the prevalence of crime in India and to identify the ways in which it does. Additionally, the study will examine how socioeconomic and demographic factors for ex-age, gender, education level, and unemployment influence the link between income inequality and crime. Through the use of proper econometric methods and fixed effects or fixed difference regression, the study will also address the issue of endogeneity. Also, the study will use regression models to evaluate the non-linear association between income inequality and crime using kink, threshold, and difference-in-differences (DID) measures. This study will advance the field of literature by providing new insights into the relationship between income inequality and property and violent crime in India. Moreover, the study's findings could have significant policy implications for crime prevention and reduction in India. Policymakers could think about introducing policies to minimize economic disparity, such as progressive taxation, social welfare programmes, and labor market changes if it is discovered that income inequality significantly predicts crime. The decrease in crime and the improvement of social welfare in India may both benefit from these approaches. Additionally, understanding the non-linear relationship between income inequality and crime could inform the development of targeted interventions to reduce crime among vulnerable groups in society.

EXPECTED RESULTS OR CONCLUSIONS

We expect that, by analysing the relationship between demographic, education, unemployment, income inequality (Gini coefficient), and crime rates using the Indian panel dataset, one can gain insights into the specific factors that contribute to crime in India. It will probably show a positive link between income inequality and crime rates in the nation. By addressing the endogeneity issue, the research will provide robust evidence of the causal effect of income inequality on crime. The use of a variety of econometric techniques, such as the panel VAR model, kink, threshold, and DID, will help to identify the precise nature of the relationship between income inequality and crime rates in India. The research is expected to provide essential insights into the mechanisms through which income inequality affects crime rates in the country and can contribute to the development of policies aimed at reducing income inequality and promoting social welfare.

BASE PAPER
https://drive.google.com/drive/folders/1oAUfJlXU9UuvcEI3rwYZjd79E6jFubYH?usp=sharing

REFERENCES
https://drive.google.com/drive/folders/1MeTbzeKJs-WkytmIdj9W9DTAMiWk6HtP?usp=sharing

PLAGIARISM REPORT

https://drive.google.com/drive/folders/1hCy4lYCvQz74hc4OKwixmo7KyK9Lihh4?usp=sharing