

## Gender-based Crime and Economic Growth in India

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### Abstract

*The present study attempts to investigate the present status of total crimes against women across Indian states and to investigate the relationship between the rate of crime against women and economic growth in India for the period 1988-2016. In order to investigate the relationship between economic growth and rate of crime against women the 'Granger Causality' technique is applied along with standard econometric tools like unit root test and co-integration test. The results show that the rate of crime against women is continuously rising in India. The results also reveal that Rate of Crime against women has a negative impact on GDP per capita in the long-run. Finally, the study concludes that more fundamental economic and social changes are necessary to enhance the autonomy and power of women.*

**Keywords:** *Crime against women, Granger Causality Relation, economic growth, unit root test, GDP per capita.*

**JEL Classification:** *J16, C22, K14*

### 1. Introduction

Crime against women is a serious global problem and a threat to gender equality in the present day world. Crime against women which is a serious form of Crime caused by several socioeconomic factors and has far-reaching impacts that hinder in achieving developmental goals of a country. Development in true sense cannot be attained with gender inequality. Crimes against women occur when a family member, intimate partner, ex-partner or any unknown person attempts to physically or psychologically dominate another. This may be of physical violence, emotional violence, economic violence, stalking etc. All types of violence lead to serious social and economic consequences. This problem needs special attention and care so that proper steps can be taken to overcome this obstacle of development by bringing gender equality.

Many attempts have been made to define crime, but till date, it is not possible to discover the most scientific definition of crimes against women. According to NCBR (2013,2014 and

2015) "...although women may be victims of any of the general crimes such as 'murder', 'robbery', 'cheating', etc., only the crimes which are directed specifically against women are characterised as 'crimes against women'. Various new legislations have been brought and amendments have been made in existing laws with a view to handle these crimes effectively. These are broadly classified into two categories, viz.,

1. The crimes under the Indian Penal Code (IPC)
2. The crimes under the Special & Local Laws (SLL)

Under the first category Rape (Sec. 376 IPC), Attempt to commit rape (Sec 376/511 IPC), Kidnapping & abduction of women (Section 363,364,364A, 366 IPC) etc., are the major crime heads whereas for the second category, the Dowry Prohibition Act, 1961, the Protection of women from Domestic Violence Act, 2005, the Immoral Traffic (Prevention) Act, 1956 related to women only etc., are included" (NCBR, 2013, 2014 and 2015).

Among various crimes, a crime against women is one of the greatest obstacles to gender equality. It obstructs women to secure their fundamental rights to equal protection under the law and the right to life and liberty. Types of such crimes are: pushing, shaking, throwing something at her, slapping, arm twisting, hair pulling, punching, kicking, dragging, beating, trying to choke or burn her on purpose, and threatening her or attacking her with a weapon, forcing women to perform sexual activity without her will, forcibly taking her money and wealth etc.

Woman in the Vedic age was enjoying a higher status. She was the nerve – centre of the domestic work and was its empress. Domestic happiness and conjugal happiness are constant topics mentioned in the Rig Veda. But nowadays violence affects the lives of millions of women and girls in all socio-economic classes around the world. The basic reasons for a crime against women are- their inferior status in a male-dominated society educationally, economically, politically and socially. Besides, there are also so many reasons like more awareness in women of their rights in the form of access to "Mahila Courts", legal cells and crime cells for women help directly or indirectly to encourage women to register their complaints. "Low rate of punishment of guilty" caused by a lack of evidence and lack of guidance, loopholes in existing laws are some of the reasons for the rise in crime against women. "Law Pertaining to the Problem of Violence", "International Conventions", "the Constitution" and various other legal provisions provide certain rights for women but these laws are not properly implemented.

Till date, various studies have been undertaken to study the relationship between crimes against women and economic growth and many scholars tried to estimate the direct and indirect costs of crime on the society. Though the number of studies, which examine the impact of crime against women on economic progress, are growing a clear conclusion on the association between them has not been defined.

Crimes against women had increased day by day and lack of proper reporting was responsible for less and inappropriate studies on regional variations of crimes (Mukherjee, et al., 2001). Again working women were the main victims of violence outside the home and in regions having high female ratios had low rates of crimes against women (Mukherjee, et al., 2001). Low and declining sex ratios in India were the results of the strong preference of sons

of most of the families (Oldenburg, 1992). In India, districts with higher sex ratio had a lesser rate of violence against women (Dreze, and Khera, 2000). The social norms and practices, as well as the existing police system, were responsible for large scale wives abasements in India (Martin, et al., 1999). Among other factors, the patriarchal societal system and outdated cultural norms play an important role in Crimes against women in India (Visaria, 2000). Because of the absence of proper empowerment works women were not able to work for their physical, psychological and financial wellbeing (Chacko, 2003). Traditional patriarchal social system, various cultural and political factors were responsible for the high rate of crime against women in developing countries of the world (Ahmed, 2005). In India, there were various deterrence and socioeconomic variables which lead to a rise in crime rates against women and their effects were different in India compared to the developed nations (Dutta, and Hussain, 2009). This is because, in the Indian society, women had always been considered as the weaker and vulnerable section and implementation of laws granting rights to women had been so neglected and slow that they were far lagged behind men in terms of social, economic and political aspects (Mangoli and Tarase, 2009). Factors like population density, Sex ratio, Literacy Rate and Per capita income played an utmost important role in determining the crime rate against women in India (Gupta and Sachdeva, 2017).

In aggregates, various studies have been carried out to understand the pattern and causes of crimes against women and their association with economic growth (Ojog, 2014). However, no such specific studies have been carried out for India. Though Debnath and Das, (2017), tried to study the nexus between crime and economic affluence in India the nexus between crimes against women and economic growth have not studied yet.

Given this background, the purpose of the study is to investigate the linkage between the rates of crime against women in India with economic growth. The rest of the study is organised in following ways: section 2 deals with concept and methodology, section 3 deals with the detail discussion of the data, methodology and detail specification of variables; section 4 presents the estimation and empirical results; finally, in section 5 the conclusion and discussion of the study is presented.

## **2. Concept and Methodology**

According to NCBR (2013,2014 and 2015) although women may be victims of any of the general crimes such as ‘murder’, ‘robbery’, ‘cheating’, etc., only the crimes which are directed specifically against women are characterised as ‘crimes against women’. Various new legislations have been brought and amendments have been made in existing laws with a view to handle these crimes effectively. These are broadly classified into two categories, viz.,

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In order to investigate the relationship between economic growth and rate of crime against women we have considered the 'Granger Causality Relation'. The "Granger Causality" test is a statistical hypothesis test for determining whether one-time series is useful in forecasting another, first proposed in 1969. This test is a very popular method for causality analysis in time series due to its computational simplicity. Granger stated that regressions ordinarily reflect mere correlations, but causality in economics could be tested for by measuring the ability to predict the future values of a time series using prior values of another time series. A time series X is said to Granger-cause Y if it can be shown, usually through a series of t-tests and F-tests on lagged values of X ( and with lagged values of Y also included), that those X values provide statistically significant information about future values of Y.

### 3. Model Specification

This study hypothesized that crime against women has a statistically significant negative impact on economic growth. In this section, an attempt has been made to specify models for the hypothesis concerning the impact of the rate of crime against women on the economic growth of India.

Following Ojog, (2014), we will consider the following two regression equations:

$$\ln(\text{Economic Growth}) = \alpha + \beta \ln(\text{Rate of Crime against Women})$$

(1)

Control variables for the model are stated below in the lines of Ojog, (2014):

#### Control variables:

1. Population Growth (PG)
2. Saving (S)
3. Social Sector expenditure (SSE)
4. Manufacturing export (ME)
5. Medium and high technology export (MHTE)
6. FDI inflows (FDI)
7. Trade openness (TO)

### 4. Data and Variables

This section deals with the details discussion of the data sources and specifications of the variables used for the estimation of the regression equations.

#### 4.1. Data

This research work is conducted on the basis of the secondary data. Data are compiled from the following sources: "Crime in India" published by "National Crime Records Bureau", "Census of India" published by "Office of Register General of India", "Open Government Data" published by Niti Aayog, The World Bank database, etc.

#### 4.2. Variable:

In order to investigate the relationship between economic growth and rate of crime against women we have considered the '*Granger Causality Relation*'. The dependent and the independent variables for the regression are as follows:

#### **The dependent variable**

***Economic Growth*** is the dependent variable and it is defined as *GDP per capita growth*. Gross domestic product (GDP) is the pecuniary value of all the finished goods and services produced by all the resident producers within the borders of a country, usually computed on an annual basis, and which includes any product taxes and excludes the subsidies in the value of the goods (The World Bank Group, 2014).

#### **The independent variable**

***ln(Rate of crime against women)*** is the independent variable and it is computed as the natural logarithm of a total number of crimes recorded by the police. *In order to test the hypothesis*, according to the study of Goulas and Zervoyianni, (2012) data on the ***rate of crime against women*** is going to be used, but due to relatively high numbers in the crime data, the variables will be logarithmized. The natural logarithm (Ln) transformation is used in order to reduce the fluctuations, make the pattern of the ***rate of crime against women*** variable more interpretable and be able to reach conclusions that broaden beyond the data itself. Moreover, the variable is transformed in order to normalize the residuals. Using the Ln, the initial variable is replaced in order to change the configuration of a distribution. Each data point of the variable ***rate of crime against women*** is replaced with the transformed value ***ln(rate of crime against women)***, where logarithm to base *e*, express the base of an irrational number *e*, which has an approximate value of 2.7183. All the data on crime against women is expressed in terms of crime rate against women and it was retrieved from the NCRB.

#### **Control variables**

***Savings***, depicted as savings as a rate of GDP, represents the capital stock. The data has been retrieved from *The World Bank* database (The World Bank Group, 2014).

***Population Growth*** is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage and the data for this control variable was retrieved from *The World Bank* (The World Bank Group, 2014).

***Openness to Trade*** is defined as trade, which is the sum of imports and exports of goods and services, and it is computed as a percentage of GDP (The World Bank Group, 2014). Crime is expected to decrease the quantity of goods and services traded, due to lowering the available human and financial resources for manufacturing the products. As a result this will have a negative effect on economic growth. The data on trade has been retrieved from *The World Bank* (The World Bank Group).

***FDI inflow*** is defined as foreign direct investment (FDI) inflows and is computed as a percentage of gross domestic product (GDP).

**Technological Change** is represented through high-technology exports, products with high research and development intensity, which are measured as a percentage of manufactured exports (The World Bank Group), etc.,

The details specifications and the descriptions of the variables are presented in table-1.

**Table-1: Lists of variables**

<b>Variables</b>	<b>Definition</b>
Rate of crime against women	<p>Although Women may be victims of any of the general crimes such as ‘Murder’, ‘Robbery’, ‘Cheating’, etc, only the crimes which are directed specifically against Women are characterised as ‘Crimes Against Women’. Various new legislations have been brought and amendments have been made in existing laws with a view to handle these crimes effectively. These are broadly classified under two categories.</p> <p><b>The Crimes under the Indian Penal Code (IPC)</b> Rape (Sec. 376 IPC), Kidnapping &amp; Abduction for specified purposes (Sec. 363 - 373 IPC) , Homicide for Dowry, Dowry Deaths or their attempts (Sec. 302/304-B IPC), Torture - both mental and physical (Sec. 498-A IPC) , Molestation (Sec. 354 IPC), Sexual Harassment (Eve Teasing) (Sec. 509 IPC), Importation of girls (up to 21 years of age) (Sec. 366-B IPC).</p> <p><b>The Crimes under the Special &amp; Local Laws (SLL)</b> Although all laws are not gender specific, the provisions of law affecting women significantly have been reviewed periodically and amendments carried out to keep pace with the emerging requirements. The gender specific laws for which crime statistics are recorded throughout the country are - Immoral Traffic (Prevention) Act, 1956, Dowry Prohibition Act, 1961, Indecent Representation of Women (Prohibition) Act, 1986, Sati Prevention Act, 1987.</p>
GDP per capita (constant 2010 US\$)	Gross Domestic Product (GDP) Per capita growth, GDP is the pecuniary value of all the finished goods and services produced by all the resident producers within the borders of a country, usually computed on an annual basis, and which includes any product taxes and excludes the subsidies in the value of the goods (The World Bank Group, 2014).
Population Growth	<b>Population Growth</b> is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage and the data for this control variable was

	retrieved from <i>The World Bank</i> (The World Bank Group, 2014).
Saving	Savings as a rate of GDP, represents the capital stock. The data has been retrieved from <i>The World Bank</i> database (The World Bank Group, 2014).
Social Sector expenditure	Social Sector expenditure refers to total program expenditure including on benefits and on administrative costs. Program level expenditure is expressed as a % of GDP of the respective year and is aggregated by harmonizes program categories (unconditional cash transfers, conditional cash transfers, social pensions, school feeding, in kind transfers, fee waivers, public works and other social assistance) for all social assistance programs (expenditure on social insurance and labour market programs is not yet available).
Manufacturing export	% of manufactured exports data retrieved from The World Bank Group
Medium and high technology export	Export products with high R&D intensity such as aerospace, computers, pharmaceuticals, scientific instruments and electrical machinery ( % of manufactured exports data retrieved from The World Bank Group)
FDI inflows	<i>FDI inflow</i> is defined as foreign direct investment (FDI) inflows and is computed as a percentage of gross domestic product (GDP).
Trade Openness	Openness to Trade is defined as trade, which is the sum of imports and exports of goods and services, and it is computed as a percentage of GDP (The World Bank Group, 2014).

*Source: Authors' own specification based on World Bank and NCRB data, Maity, and Sinha, (2018) specification.*

Hence our specified model may be presented by the following equations:

The table -1 shows the list of endogenous and exogenous variables for the study. Here GDP per capita is the dependent variable; the rate of crime against women are the independent variables. The control variables are: population growth, saving, social sector expenditure, manufacturing export, medium and high technology export, FDI inflows and trade openness.

#### 4. Results

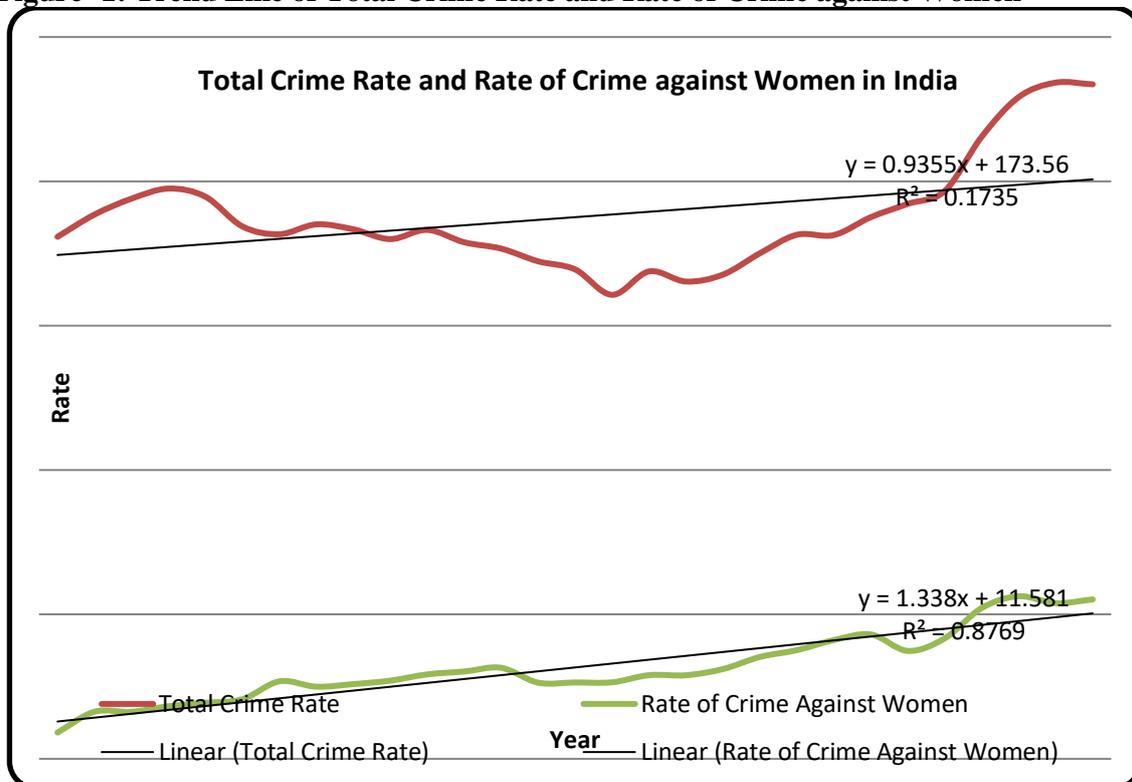
This section contains the analysis of results where we are presenting the discussion of the

estimated results in the form of the trend line and tables showing general pattern and direction of the time series data, a summary of the features of the data on dependent and independent variables and the relationship among variables respectively.

#### 4.1. Trend Line

Two linear trend lines are drawn below to visually show the general pattern and direction of the time series data on total crime rate and rate of crime against women for the period 1988-2016. Data are compiled from the following sources: 'Crime in India' published by 'National Crime Records Bureau', 'Census of India' published by 'Office of Register General of India'.

**Figure -1: Trend Line of Total Crime Rate and Rate of Crime against Women**



*Source: Authors' own calculation based on NCRB data*

It is clear from the figure-1 that the linear trend line of total crime rate shows a continuous rise from the period 1988-1993, after that, that is, from 1993-2003 it shows a falling trend. It again starts rising from 2003-2016. On the other hand, the trend line of the rate of crime against women is continuously rising from the period 1988-2016 indicating rate of crime against women is continuously rising in India.

#### 4.2. Descriptive statistics

Descriptive statistics of the concerned variables are used in table-2 to summarise the features of the data on dependent and independent variables respectively. This table is constructed to describe the measures of central tendency namely, mean, median, maximum and minimum as well as one measure of dispersion i.e., standard deviation of the dependent and independent variables: rate of crime against women, GDP per capita (constant 2010 US\$), population growth, saving, social sector expenditure, manufacturing export, medium and high technology export, FDI inflows and trade openness.

**Table-2: Descriptive statistics**

Variables	Mean	Median	Maximum	Minimum	S.D	Observations
Rate of crime against women	31.650	28.970	56.300	9.100	12.165	29
GDP per capita (constant 2010 US\$)	961.397	801.508	1861.491	500.013	413.611	29
Population Growth	1.666	1.696	2.143	1.148	0.311	29
Saving	31.195	29.765	41.001	23.896	5.032	29
Social Sector expenditure	4.550	3.546	11.030	1.434	3.031	29
Manufacturing export	70.853	72.039	79.203	61.877	5.116	29
Medium and high technology export	22.930	21.546	34.000	16.091	5.143	29
FDI inflows	1.106	0.872	3.657	0.028	0.909	29
Trade Openness	0.343	0.288	0.577	0.146	0.140	29

*Source: Authors' own calculation based on World Bank and NCRB data*

It is clear from table-2 that the average value of the rate of crime against women for the period 1988-2016 is 31.650 and 961.397 for GDP per capita (constant 2010 US\$). Averages for other controlled variables are also calculated. In the table median, maximum and minimum as well as one measure of dispersion i.e., the standard deviation of the dependent and independent variables are also shown. The value of the standard deviation of the rate of crime against women for the same period is 12.165 and 413.611 for GDP per capita (constant 2010 US\$). All results are calculated for 29 observation, these observations are for 29 years that is from 1988-2016.

#### 4.3. Unit root test for total crime rate, rate of crime against women and GDP in India

Unit root test is carried to check whether the time series variables: Rate of crime against women and GDP in India are non-stationary and possess unit roots. In time series literature, the Random Walk Model is also known as a unit root process. If we rewrite

$$Y_t = Y_{t-1} + u_t \quad (2a)$$

$$\text{As } Y_t = \rho Y_{t-1} + u_t \quad (2b)$$

If in (3b),  $\rho = 1$ , we face non-stationarity meaning the variance of  $Y_t$  changes over time.

For checking the presence of the variables: rate of crime against women and GDP in India Augmented Dickey-Fuller Test and Phillips-Perron test have been carried out for three models as follows:

$$Y_t = Y_{t-1} + u_t \quad (3a)$$

$$Y_t = \beta_1 + Y_{t-1} + u_t \quad (3b)$$

$$Y_t = \beta_1 + \beta_2 t + Y_{t-1} + u_t \quad (3c)$$

The first step of the analysis is to investigate the time series properties of the variables. If the data under analysis are non-stationary, the results of regression analysis obtained in a traditional manner would not be reliable. For this purpose we use ADF and Phillips-Perron test estimators are used to check the stationary process of the data series. The results of the test are reported in Table -3.

**Table-3: Unit root test results for Rate of crime against women and GDP in India**

Model	Augmented Dickey-Fuller Test				Phillips-Perron test			
	ln(Rate of crime against women)		ln(GDP)		ln(Rate of crime against women)		ln(GDP)	
	Level	1 <sup>st</sup> Diff	Level	1 <sup>st</sup> Diff	Level	1 <sup>st</sup> Diff	Level	1 <sup>st</sup> Diff
$Y_t = Y_{t-1} + u_t$	2.124 (0.990)	-7.102 (0.000)	12.249 (1.000)	-5.219 (0.001)	2.194 (0.992)	-6.964 (0.000)	10.566 (1.000)	-5.022 (0.002)
$Y_t = \beta_1 + Y_{t-1} + u_t$	-3.033 (0.044)	-8.089 (0.000)	2.865 (1.000)	-3.570 (0.013)	-3.019 (0.045)	-8.693 (0.000)	3.031 (1.000)	-3.555 (0.014)
$Y_t = \beta_1 + \beta_2 t + Y_{t-1} + u_t$	-5.219 (0.001)	-7.748 (0.000)	-1.670 (0.737)	-4.613 (0.005)	-0.788 (0.364)	-8.258 (0.000)	-1.736 (0.707)	-4.593 (0.005)
Diagnostic Test Results								
	ln(Rate of crime against women)		ln(GDP)		ln(Rate of crime against women)		ln(GDP)	
	AIC		AIC		AIC		AIC	
	Level	1 <sup>st</sup> Diff	Level	1 <sup>st</sup> Diff	Level	1 <sup>st</sup> Diff	Level	1 <sup>st</sup> Diff
$Y_t = Y_{t-1} + u_t$	-1.066	-1.695	-4.901	-	-	-	-4.901	-4.502
				4.502	1.695	1.695		
$Y_t = \beta_1 + Y_{t-1} + u_t$	-1.353	-4.043	-4.989	-	-	-	-4.989	-4.793

				4.973	1.352	1.843		
$Y_t = \beta_1 + \beta_2 t + Y_{t-1} + u_t$	-1.784	-1.772	-5.079	-	-	-	-5.079	-4.798
				4.942	1.065	1.772		

**Source:** Authors' own calculation based on World Bank and NCRB

\* Probabilities are given in the parenthesis.

Table-3 shows the results of the Augmented Dickey-Fuller Test, Phillips-Perron test and AIC criterion of VAR Lag Order Selection Criteria for two variables: GDP and rate of crime against women in India. This table reveals that the chosen variables of our study are stationary at first difference and are non-stationary at level. Both the Augmented Dickey-Fuller test and the Phillips-Perron test confirm this phenomenon. The results of Augmented Dickey-Fuller test for Rate of Crime Against Women shows in the no-trend model the value of t statistic 2.124 with probability 0.990 falls to -7.102 with probability 0.000 after 1st difference the AIC criterion also falls from 3.856 to -3.964 meaning the rejection of the null hypothesis that the model has a unit root. Similarly, all models show rejection of null hypotheses having unit root after the 1st difference.

#### 4.4. Johansen Co-integration test and VAR Lag Order Selection Criteria results

Johansen Co-integration test is done to check whether the time series variables: Rate of crime against women and GDP in India are cointegrated or not.

Johansen Co-integration test is a procedure for testing co-integration of time series. This test permits more than one co-integrating relationship so is more generally applicable than the Engle-Granger test which is based on the ADF test for unit roots in the residuals from the single co-integrating relationship. Results of the test are given in table 4.

**Table-4: Johansen Co-integration Test results for rate of crime against women in India**

Rank	Eigen value	Trace Statistic	Probability**	Max-Eigen Statistic	Probability**
None (r = 0)	0.378	16.822	0.082	12.801	0.192
At most 1 ( r ≤ 1)*	0.138	4.021	0.045	4.021	0.045

**Source:** Authors' own calculation based on World Bank and NCRB data

**Note:** \* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table-4 suggests the existence of one co-integrating relation between the variables rate of crime against women and GDP in India, that is, both variables are I(1). This table is also indicating the rejection of the null hypothesis of having no co-integration for the variables GDP and rate of crime against women in India or the existence of at most 1 co-integration.

VAR Lag Order Selection Criteria are the three initial measures that are adapted for selecting the appropriate 'lag length' in the time series data on the variables: Rate of crime against women and GDP in India. The three criteria used are- Akaike info criterion, Schwarz

criterion and Hannan-Quinn criterion. The results are shown in table-5.

**Table-5: VAR Lag Order Selection Criteria for GDP and rate of crime against women in India**

Variables	Lag	Sequential modified LR test statistic	Final prediction error	AIC	SIC	HQIC
<b>Endogenous variables:</b> ln(GDP), ln(Rate of crime against crime)	0	NA	1.16e-05	-5.703	-5.127	-5.532
<b>Exogenous variables:</b> Constant ln(PG) ln(S) ln(SE) ln(ME) ln(MHTE) ln(FDI) ln(TOI)	0	NA	1.08E-05	-5.794	-5.026	-5.565
	1	28.039*	2.91E-06*	- 7.147*	- 6.187*	- 6.861*
	2	0.281	4.07E-06	-6.869	-5.717	-6.527

**Source:** Authors' own calculation based on NCRB data

**Note:** \* indicates lag order selected by the criterion

Table-5 suggests that the permissible maximum lag length for our analysis will be 1.

#### **4.5. The causal relation between economic growth and rate of crime against women**

The cointegrating equation gives long-run relationships between two variables but does not shed any light on short-run dynamics although its existence indicates that there must be some short term forces that are responsible for keeping the long-run relationship intact. Thus there is a need for constructing a more comprehensive model which combines short-run and long-run dynamics, known as Error Correction Model (ECM). In order to understand the short run and long run dynamics of the relationship between the rate of crime against women and population growth, we have used her ECM. The result of the ECM is reported in the table-6.

**Table-6: Vector Error Correction Model for analysing the linkage between rate of crime against women and economic growth in India**

Dependent Variable	Independent Variable	Coefficient	t-statistic	ECT	t-statistic	Control Variables	Coefficient	t-statistic
		Long Run Relation						
GDP per capita (constant 2010 US\$)	<b>Long Run Relation</b>					Population Growth	-0.2042*	-2.0911
	Crime Rate against Women	-1.0185*	-2.2727	-0.2207**	-2.1891	Saving	0.2180*	3.7242
						Social Sector expenditure	0.1189**	1.8307
						Manufacturing export	0.6471*	9.6583
	Constant	-3.3124	---	---	---	Medium and high technology export	0.3420	0.7535
	<b>Short Run Relation</b>					FDI inflows	0.0832*	1.7349
						Trade Openness	0.4337	0.9854
	D(LNCR W(-1))	-0.0254	-0.4058			Constant	-0.2919	-0.6541
						$R^2$	0.7539	
						$\bar{R}^2$	0.6810	
	D(LNCR W(-2))	-0.0015	-0.0389			Akaike AIC	-5.2111	
						Schwarz SC	-4.5821	

**Source:** Authors' own calculation based on World Bank and National Crime Records Bureau Data

**Note:** \*significant at 1% level, \*\* significant at 5 % level and \*\*\* significant at 10% level.

The result of the table suggests an error correction mechanism in the long-run between the rate of crime against women and economic growth in India adjusted for control variables

like-population growth, saving, social sector expenditure, manufacturing export, medium and high technology export, FDI inflows and trade openness. The error correction term is a negative and statistically significant implying tendency for endogenous variables to return to long-run equilibrium.

The insignificant values of the estimated coefficients suggest that we are unable to establish any short-run relationship between economic growth and the rate of crime against women.

The high value of  $R^2$  above 0.75, means the model is a statistically good fit. The negative and the significant value of the ECT suggest a long run meaningful equilibrium relationship between economic growth and rate of crime against women.

We also conduct block exogeneity Wald tests to understand the causality between economic growth and rate of crime against women in short-run.

**Table-7: VEC Granger Causality/Block Exogeneity Wald Tests result for rate of crime against women in India**

Null hypothesis: Non-casuality	$\chi^2$	df	Prob	Coefficient of ECM	t-statistic
$\Delta \ln GDP \Rightarrow \Delta \ln CRW$	0.1943	2	0.9074	-0.2207**	-2.1891
$\Delta \ln CRW \Rightarrow \Delta \ln GDP$	0.0643	2	0.9684		

*Source:* Authors' own calculation based on World Bank and National Crime Records Bureau Data

*Note:* \*significant at 1% level, \*\* significant at 5 % level and \*\*\* significant at 10% level.

The table reveals that the null hypothesis of no causal relationship between economic growth and the rate of crime against women in both directions is accepted in the short run. This result supports our earlier findings of table-6.

We next consider the identification of the existence of the long run relationship between the variables economic growth and rate of crime against women and also the direction of the relations. For this purpose we have used "Pairwise Granger Causality Test" and the test resulted is presented in table-8.

**Table-8: Pair wise Granger Causality Test for rate of crime against women in India**

Null Hypothesis	F-Statistic	Prob	Observations
$\ln(CRW)$ does not Granger Cause $\ln(GDP)$	20.0537*	0.0001	28
$\ln(GDP)$ does not Granger Cause $\ln(CRW)$	0.1563	0.696	

*Source:* Authors' own calculation based on World Bank and National Crime Records Bureau Data

*Note:* \*significant at 1% level, \*\* significant at 5 % level and \*\*\* significant at 10% level.

The table discloses a unidirectional relationship between economic growth and the rate of crime against women. The null hypothesis that the  $\ln(CRW)$  does not Granger Cause  $\ln(GDP)$  is rejected at 1 per cent level while the relationship  $\ln(GDP)$  does not Granger

*Cause In(CRW)* is accepted because of lack of evidence against it. Thus we can conclude from the table-8 that there is a long run meaningful unidirectional relationship between economic growth and the rate of crime against women.

### **5. Discussion and Concluding Remarks**

One of the most important findings here is that total crime rate shows a continuous rise from the period 1988-1993, after that from 1993-2003 it shows a falling trend. It again starts rising from 2003-2016. On the other hand, the trend line of the rate of crime against women is continuously rising from the period 1988-2016 indicating the rate of crime against women is continuously rising in India. Again the rate of crime against women influences GDP per capita negatively in the long-run. However, we do not find any short-run meaningful relationship between economic growth and the rate of crime against women. Thus to conclude, the study reveals that the rate of crime against women has a negative significant impact on GDP per capita. The existence of such linkages suggests that there is an urgent need to control the rate of crime against women to ensure non-interrupted economic growth. The result is quite obvious because any kind of social disturbances will have a strong negative impact on economic growth. Women are an integral part of society and any form of crime against her will destroy the base of any society and that will obviously affect the economic growth process. This result is alarming in the sense that if we want non-interrupted economic growth we have to take initiatives to control the rate of crime against women. Such initiatives not only reduce the rate of crime against women but also help in achieving the targeted high rate of economic growth. However, in this study, only one-way relationship between the rate of crime against women and GDP per capita is examined. The extensive research plan is to study the nexus between economic growth and the rate of crime against women. In fact, it is true that further research is necessary to investigate whether more fundamental economic and social changes are essential to enhance the autonomy and power of women in India to control the rate of crime against women as well as to promote economic growth.

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### **Conflict of Interest**

The authors declared that they have no conflict of interest.

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