Sex Ratio Imbalances and Crime Rates

This paper is part of a technical paper series covering interconnections between sex ratio and marriage squeeze; class and education; and crime rates

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Contents

Abstract

This paper analyzes the effect of adult sex ratio on violent crimes and crimes against women for 18 Indian states in the time period 1995–2014. Contrary to existing literature and speculation, we obtain a negative relationship between sex ratio and crime rates for both violent crimes and crimes against women, i.e, as the sex ratio rises to become more skewed in the favour of males, crime rates fall. A strong positive relationship is seen between crimes against women and the gap between male and female years of education.

Besides the regression analysis, a state level rank analysis of crimes and crime trends is also carried out. This analysis highlights the very specific nature of crimes and the very weak, and dual, relationship that crimes have with the adult sex ratio. Some states have excess adult males, and a low crime rate; others have deficit adult males and a low crime rate. The strongest support is obtained for the hypothesis that crime rates are best explained by factors other than the sex ratio. The theory of more men, more violence does not seem to hold, at least for India between 1995 and 2014.

Introduction

Around the world, there is heightened interest in crime against women and its determinants. This interest got a significant push when Hudson and den Boer (2002) published their alarmist findings that the sex ratio (number of adult males to number of adult females in a society) had a significant effect on both crimes against women, and violence, including wars. They focused on unmarried or unattached males (referred to as "bare branches" in China) as contributing to a deteriorating law and order situation whenever there are excess males in society.

While marriage is seen as a stabilizing factor on males, reducing the violence rates, men competing over fewer women could be a source of conflict and violence. As sex ratios rose in India in China in the last three or so decades, media and scholars began to speculate on the relationship of high sex ratios and gender crime. Reports of trafficking and abduction of women, forced marriage, bride-buying and sexual assault became increasingly linked to the excess of males in these societies.

However, there is equally strong research on the opposite contention, i.e, a *negative* linkage between adult sex ratio and crime rates. The reasoning behind this is that with high sex ratios, females due to their relative scarcity will be valued more, leading to greater protection and less violence. The flip side of this is greater surveillance over women and their confinement to primarily reproductive and domestic roles. Thus, although linkages work both ways, media attention and analysis has mainly focused on the positive linkage, as researchers investigate the consequences of rising sex ratios in many Asian societies.

A relevant factor, but ignored by many researchers, is that this relationship of crimes and adult sex ratio is too simplistic. Simply put, relationship, positive or negative, between sex ratio and crimes has to be viewed in the context of cultural and socio-economic factors–factors that cannot be appropriately included in a regression analysis due to paucity of data or its intangible nature. The reasons for crime are complex, as are the gender regimes and gender relations that might inhibit or exacerbate gender crimes.

This paper tests the hypothesis of the effect of a high sex ratio on two types of crimes–crimes against women and violent crimes–for 18 Indian states for the time period 1995-2014. The paper is divided as follows. Section 2 reviews the literature available on this subject. Section 3 describes the data and Section 4 presents any possible issues related to the data. Section 5 presents the results from our empirical analysis. Section 6 analyzes the raw data behind the relationship as well as state specific trends. Section 7 concludes.

2

Section

Sex Ratio and Crimes–
Existing Theory and Evidence

There is a paucity of literature on the effect of sex ratio on crimes. A possible reason (among others) is the relative scarcity of relevant data (Dreze and Khera, 2000). And when data are available, there is the problem of under-reporting, especially relevant for crimes against women, as pointed out by Watts and Zimmerman (2002).

In a seminal book "Too Many Women?" Guttentag and Secord (1983) hypothesise two types of power in social relations and in the marriage market—dyadic power and structural power. Dyadic power accrues to the sex which is in scarce supply, where-as structural power is related to the sex which is historically dominant, e.g, the type of society–patrilienal or matrilineal. In a society with fewer females, it would be in the best interest of the male to "treat her well or run the risk of losing her to another man" (p.28). Structural power, on the other hand can overwhelm dyadic power. Thus, a patriarchal society with high sex ratios (where dyadic power might be with the females) will result in a traditional society that values women for their traditional reproductive and domestic roles.

In other words, the structural power of the males may be used to limit the dyadic power of the females by confining them to domestic roles, and limiting their participation in the wider world. When both structural power and dyadic power is with males (low sex ratio societies), then the male will use "both powers to *maximize* their outcomes in relationships with women" and the female "lacking both forms of power has the poorest outcomes relating to the opposite sex" (p.27). In low sex ratio

societies, women lose bargaining power and obtain less investment in marriage from males resulting in instability and discord in marriages.

South and Trent (1988) tested Guttentag and Secord's hypothesis for 117 countries and found that "several of the expected relationships do emerge when the level of socioeconomic development is controlled". However, they also state that "it is somewhat paradoxical that the increased "valuation" of women that accompanies high sex ratios severely limits their life options" (1112).

A similar analysis conducted by South and Messner (1987) on criminal activity hypothesized that ex-ante, "the sex ratio (i.e, males per females, or the 'undersupply' of women) will be inversely related to levels of female victimization" (p.174). However, their regression analysis suggested that "the sex ratio at ages" 15 to 49 exhibits *no* significant relationship with relative female homicide victimization" (p.183) (emphasis added).

Barber (2000) analysed the effect of sex ratio on violent crimes (murders, assaults and rapes) for cross-national data of 70 countries in the year 1990 and found a *negative* relationship between the two, supporting Guttentag and Secord's (1983) theory. Their research also supported the hypothesis of parental investment theory that violent crime rates would rise as sex ratios fell, i.e, high sex ratio societies would have reduced levels of family disruption and conflict leading to less aggression and violence. On the other hand, low sex ratio societies would have higher family disruption and conflict and children raised in this environment are likely to display more anti-social behavior (ibid). After controlling for ecological variables like population density, urbanization, literacy, life expectancy, and geographical regions, they found that while sex ratio for 15–64 year age group is the most important predictor of all the three types of violent crimes across nations, sex ratio for 15–19 age group was significantly related for murder and assaults, but not for rapes. These correlations explain up to 20 per cent, or a fifth of the variance in the crime rates. In terms of geographical regions, violent crime rates in America and assault rates in Africa were higher than other parts of the world.

Theory seems to follow the empiricism that plagues the research on crimes and sex ratio. There is the influential, seemingly politically correct "hypothesis" with a lot of verbal support that a high sex ratio can lead to *more* crimes. It is a given fact that men are responsible for crime in general, in far greater proportions, than women (Table 1). At most times, men are the perpetrators of gender violence. So what happens when the sex ratio is skewed in favour of males? The discussion on the "dangers" of surplus men was brought into the limelight by two political scientists, Valerie Hudson and Andrea M den Boer in 2005. The authors raised the question of the effects of extreme gender inequality on national and international security, arguing that "high sex ratio societies simply have a different security calculus" (2002: 37). Given that the two worst countries in terms of sex ratio are China and India, the authors make two specific predictions.

They predict that China is likely to use its surplus males to "suppress violence at home and export it abroad through colonisation and war", while India, an ethnically heterogeneous society may find itself engaged in higher levels of intercommunity strife and conflict (2005: 202). Emphasising that their predictions cannot be precise, they maintain that significant numbers of unmarried men could

have an "unmistakable aggravating and amplifying effect" on general law and order (2002: 37).

In conformity with the "more males more violence" theory, Edlund et al. (2007) find a positive relationship between sex ratio (males to females) and violent and property crimes in China for provincial level data covering the period 1988–2004. They show that a 1 per cent increase (or one male per 100 females) in the sex ratio of the 16–25 year age group raised the violent and property crime rates by about 3 per cent, accounting for up to one-seventh of the overall rise in crime.

Edlund et al. conjecture that marriage is a stabilizing force and the skewed sex ratios may be upsetting the balance. Hence, they focus on violent and property crimes as "these are low-skill crimes with young perpetrators likely to have had their marriage market affected by the rise in the sex ratio". The crime rate is defined to be arrests per 10,000 population and the sex ratio (males to females) is calculated for the ages of 16 to 25 as "these are the most crime-prone ages, accounting for more than 70 per cent of the total number of criminal offenders since the mid–1980s". They control for provincial level per capita income, employment rate, secondary school enrolment rate, income inequality, urbanization and welfare expenditure. An important point made by the authors is that although "high sex ratios are not unique to China, but, unlike India, where population growth has buffered some of the impact, the shortage of brides is likely to be felt more acutely". Their results are that urbanization rate, employment rate and income inequality are all positively and statistically significant, besides adult sex ratio.

Zhang (2010), also, links the rising incidence of rape and sexual harassment in China to the scarcity of women. Messner and Sampson (1991) state that "cross-cultural evidence shows that the overwhelming majority of violent crime is perpetrated by young, unmarried, low-status males." South et al. (2012) examine whether domestic violence and control over women in India is worse in areas with a gender imbalance. Multivariate logistic regression models, using data from NFHS 2005-06, show "partial support for the hypothesized association between the community sex ratio and domestic violence". They argue that although the "dyadic power" of women is supposed to be higher when they are in scarce supply, Indian women in districts with high sex ratios experience more physical abuse and a higher degree of control than those in areas with better sex ratios. In terms of regional variation, women in the south and east were more likely to be victims of less severe intimate partner violence than women in the north.

Their research could be further extended to explore something that comes up repeatedly in ethnographic research–men in high sex ratio areas exercise greater surveillance over their wives and display a higher degree of suspicion if wives venture out to work. In some high sex ratio Indian states like Uttar Pradesh, subjecting the woman to constant childbearing is a common mode of exercising control. This would appear to support South and Trent's findings.

Kaur (2010) hypothesizes a relationship between the rise in "honour crimes" and bride shortages in the high sex ratio state of Haryana. Honour crimes, in the last decade and a half, have been inflicted upon couples and families who infringe upon traditional marriage norms. Based on qualitative evidence, Kaur argues that such norms are sought to be rigidly enforced by community organisations (Khap

Panchayats) as well as kin groups that seek to retain control over pools of marriageable women and prevent competition in the marriage market.

Philip Oldenburg (1992) also noticed a positive correlation between the incidence of murders and the population sex ratio, based on district-level data for Uttar Pradesh. He argued that sex ratios tend to be more masculine in areas that are more violence-prone and where muscle power is needed to protect and acquire property, i.e., more sons are needed in such places.

Dreze and Khera (2000) take Oldenburg's argument further by scrutinizing the link between crime rates and various indicators of modernization as well as the social composition of the population. They establish a positive relationship between overall sex ratio and murder rates (annual murders per million persons) for 319 Indian districts in 1981. Moreover, they state that "this correlation is very robust: no matter which other variables are included or excluded from the regression, we found that the female-male ratio remained highly significant, always with a negative sign."

Their control variables were literacy, poverty, urbanization, SC/ST population and relative under-five mortality. They acknowledge that the cross-sectional data takes a "static" view of crime which might not fully capture the dynamic nature of crime with changes in time periods. And this may be the reason behind the statistical insignificance of poverty and urbanization in their analysis.

Analogous to Dreze and Khera (2000), Chiapa and Viejo (2012) explore the socioeconomic and demographic correlates of homicide rates in Mexico using municipal level data for the year 2000, using the same control variables. They find that a decline in one male per hundred females will result in a decline of 0.4 homicides per 100,000 inhabitants, i.e, a positive and robust relationship of sex ratio with homicide rates. This is similar to the result from Edlund et al. (2007) of a decline of 0.3 in the violent and property crime rates as well as from Dreze and Khera of a decline of 0.16 in murder rates.

Chiapa and Viejo (2012) also regress homicide rates per 100,000 *males* on sex ratio and find the coefficient of sex ratio is to be indistinguishable from zero. This result is justified using the "incapacitation" effect, which implies a positive relationship between sex ratio and crime rates purely because "males are statistically more likely than females to commit, or be the victims of homicides". Therefore, they attribute the earlier positive significant result "to be the result of the "incapacitation" effect of predominantly male migration rather than due to a reduction in violence per male". The incapacitation effect has implications for analysis of crime rates. If males are more inclined to commit violent crimes and crimes against women (as shown in Section 3, we find this to be the case for India as well), then the scaling of crime and related variables should be done on a per male basis, rather than in per capita terms.

Mayer et al. (2008), at the 17th Biennial Conference of the Asian Studies Association of Australia, explore different hypotheses stated in the book by Hudson and den Boer, in relation to Indian states, and find that "many of the predicted relationships are too weak to pass the test of statistical significance". Although they found that the link between masculine sex ratios and rate of arrests for violation of Arms Act to be particularly strong, they did not find any relationship between sex ratio and incidence of kidnapping. They conclude that they did not feel that highly masculine sex ratios pose a threat to India's security.

Critiquing the "Bare Branches" hypothesis, Hesketh et al. (2011) argue that there is, as yet, little evidence for the hypothesis that low-status, unmarried males will band together to become a threat to social order on a wide scale in China. Their research shows that while such men do indeed have low self-esteem and are inclined to depression, there is no evidence that they are prone to aggression or violence.

In summary, it can be seen that there is literature, both conceptual and empirical, pointing towards a positive, negative or even insignificant relationship between sex ratio and crimes. While the researchers finding a positive linkage back up their results by the reason that unmarried males are more prone to commit crimes, the ones finding a negative linkage suggest that the low sex ratios lead to higher family disruption and consequently, more violence.

Our detailed results for India, presented in Sections 4 and 5, lead to one major result–crime rates are state specific, possibly specific to development (higher reporting) but not that specific to adult sex ratios. To the extent that sex ratios matter, they do so in a manner opposite to that conjectured by Hudson and den Boer, i.e, a greater presence of males leads to less crimes, not more.

Data Sources

In this paper, a statewide analysis is carried out for the effect of sex ratio on crimes, especially crimes against women. All variables are estimated for the 18 big states.[1] Data on crimes has been sourced from National Crime Records Bureau (NCRB) for the years 1995 to 2014. Crimes have been divided into 2 categories–crimes against women and violent crimes. Crimes against women include rape, dowry deaths, intent to outrage and assault on modesty of women, trafficking of girls, and cruelty by husband or his/her relatives. Violent crimes include murder, culpable homicide not amounting to murder and kidnapping and abduction.

There are two ways to make the crimes comparable across states–one, by taking per *capita* rates; two, by taking per *male* rates. Crimes per 100,000 population are, hereafter, referred to as crimes per capita and crimes per 100,000 male population for the age group of 15 to 59 (i.e, the labour force) are referred to as crimes per male. The years 1995 to 2014 have been divided into four 5-year groups: 1995–1999, 2000–2004, 2005–2009, and 2010–2014. The reason behind this grouping of data is to "smooth" the raw data and prevent inferences on the basis of outliers. Except for crimes per capita, all variables are calculated for the age group of 15 to 59, unless mentioned otherwise.

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1   The 18 states included in the analysis are Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. Chhattisgarh, Jharkhand and Uttarakhand are assumed to be a part of Madhya Pradesh, Bihar and Uttar Pradesh, i.e, pre-division states.

Independent Variables

Throughout this paper, the sex ratio is based on the international convention, i.e, males per 100 females. The adult sex ratio has been calculated for the ages 15 to 59. In addition, the incorporation of ages 15 onwards allows for the inclusion of juvenile crimes. Although we have mentioned in our earlier paper (Kaur, et al. forthcoming) that the Census is not a robust distribution for sex ratio, that caveat applies more for a narrow five year age group (e.g, 15–19, 20–24 etc.) rather than to a group as broad as 15–59 years.

For the years between 1995 and 2014, there are only two data points for the Census sex ratio (2001 and 2011). As the NSS data are available for the years 1983, 1993–1994, 1999–2000, 2004–2005, 2007–2009, 2009–2010 and 2011–2012, these are used to esti-mate the sex ratio for the intermediate years to establish the trend for the 15–59 adult sex ratio. The year 2011 has data for both Census and the NSS. Therefore, the sex ratio for these two data sources is compared for that year and then, the NSS data for 2011 and earlier years are scaled to the Census to ensure parity. Therefore, origi-nal data are available for 7 years spanning a period between 1991 and 2012.[2] The data, for years for which neither Census nor NSS data are available, is derived through interpolation. This same trend is imposed for years post 2011, i.e, 2012–2014.

It has been argued by some, especially Hudson and den Boer (2002), about the strong impact of unmarried males on crime rates. Therefore, the percentage of unmarried males in the age group of 20 to 39 is calculated using the Census data and our de-rived distribution.[3] Similar to the NSS data, the derived distribution is adjusted to the Census using the year 2011 (for which data is available for both) for parity. The intervening years are then interpolated.

To account for the intrinsic effects of states and to isolate the effect of sex ratio on crimes, control variables that directly affect crimes such as state GDP per capita, urbanization, consumption inequality, labour force participation rate (LFPR), male unemployment rate (%) and education have been included. While urbanization, LFPR, male unemployment rate and education are calculated from the NSS unem-ployment/ employment surveys, consumption inequality is from the NSS consump-tion surveys.[4]

Education is measured in years of education for the age group of 18 to 39, i.e, the age group which is liable to make fertility decisions. LFPR is defined as the proportion of the population that is economically active. Only urban females are considered for LFPR, as there is little variation for rural females. It is also difficult to accu-rately assess the rural female LFPR since even a small amount of work on the farm qualifies women to be "economically" active (Bhalla and Kaur, 2011). Inequality is measured as the Gini coefficient for consumption per capita. Consumption is then adjusted to 2004–2005 prices (base); hence, the calculation of inequality is based on *real* consumption.

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2   The 1991 census data is used for the trend prior to NSS 1999–2000 data.
3   The derived distribution is generated for a paper on the sex ratio imbalances and marriage markets and is available post 2005. See Kaur, et al. (forthcoming, UNFPA) for further details.
4   All data have been calculated for the years 1983, 1993–1994, 1999–2000, 2004–2005, 2007–2008, 2009–2010 and 2011–2012. For consumption inequality, the year 2007–2008 is excluded.

Choice of Dependent Variable

Drawing from Chiapa and Viejo's (2012) analysis, the preferred choice of the dependent variable is crimes per male than crimes per capita. This stems from the fact that males have a significantly higher tendency to commit crimes as compared to females, more commonly known as the "testosterone-driven" theory of crime (ibid).

Table 1 presents the age and sex profile of all criminals arrested in India in 2013. An extremely high 94 per cent of the total crimes are committed by males, which rises by one percentage point to 95 per cent for violent crimes. Crime against women surprisingly sees a lower percentage for males at 86. This is most likely due to the fact that many crimes against women are domestic or intimate crimes and might include female family members such as husband's mother or sister or intimate partners and therefore, the slightly higher incidence of women committing these crimes. Thus, it is apparent that males have a much higher empirical propensity to commit crimes as opposed to females.

Table 1: Age and Sex Profile of Criminals, 2013

Crime Head	Criminals (%)		Male Criminals by Age Group (%)				
	Male	Female	<18	18–30	30–45	45–60	> 60
Violent Crimes	95	5	1.8	51.9	33.7	11.7	0.9
Crimes Against Women	86	14	1.3	48.3	34.5	13.6	2.3
Total Crime	94	6	1.1	46.0	36.0	15.2	1.7

Source: National Crime Records Bureau, Crime in India 2013
Note: 1. Crimes here refers to IPC crimes.
2. The numbers may not added up to 100 due to rounding.

Empirical Evidence

Broadly, the two opposing arguments for the relationship between sex ratio and crime rates are as follows. As sex ratios rise (become more skewed in the favour of males), more males do not get married and therefore, are not able to derive the stability that comes from marriage, and thus, tend to channel the extra testosterone into more violence and crime. This results in a positive relationship between sex ratio and crime rates. This is the main argument put forth by Hudson and den Boer, in their paper and book.

Although popularly believed, this description of the relationship may not be accurate. Guttentag and Secord's (1983) provide the second opposite argument about the relationship between sex ratio and crimes, i.e, that when females are in shorter supply, men invest more in marriage and family, ensuring stability in society and this can lower levels of violent crimes.

Model Specification

Two types of crimes are analyzed—violent crimes and crimes against women. A fixed effects model is used, absorbing for both state and time effects. For the sake of completeness as well as comparability across existing literature, regressions are run for both crimes per capita and crimes per male for all the variables listed in Equation (1) below.

The general specification (Equation 1) is:

$$
\begin{aligned}
Crime\ Rate_{it} =\ & \alpha + \beta_1 Adult\ Sex\ Ratio_{it} + \beta_2 Log\ State\ GDP\ per\ capita_{it} \\
& + \beta_3 Urbanization_{it} + \beta_4 Real\ Gini\ Index_{it} + \beta_5 LFPR - Urban\ Female_{it} \\
& + \beta_6 Male\ Years\ of\ Education_{it} \\
& + \beta_7 Gap\ in\ Male\ and\ Female\ Years\ of\ Eduation_{it} \\
& + \beta_8 Unmarried\ Males, 20 - 39\ (\%)_{it} + \beta_9 Male\ Unemployment\ Rate_{it} \\
& + \gamma_i + \delta_t + \in_{it}
\end{aligned}
$$

where γ_i is for state fixed effects and is for time fixed effects.

Table 2a and 2b show the regression results for crimes against women and violent crimes, respectively. Each table presents the results for six separate specifications (models). Models 1, 2 and 3 are run for crimes per capita and 4, 5 and 6 for crimes per male. Models 1 and 4 present the basis regression of crime rates and sex ratio while Models 2 and 5 present the general specification. Models 3 and 6 present the limited form regression, based on variables that are significant from the general specification. Unless otherwise mentioned, analysis is based on the Model 6 of Tables 2a and 2b. Table 3 reports the regression results for the general specification model for all sub-categories of crimes against women per male.[5]

A robust and consistent *negative* trend is seen between sex ratio and crimes against women, its sub-categories[6] as well as violent crimes. All coefficients of the sex ratio are significant at 1 per cent level of significance and the sign of the coefficient is opposite to the thesis that extra males cause more crimes. According to the general specification model, besides sex ratio, education (male years and gap) and unmarried males are significant for crimes against women, and state GDP per capita and male unemployment rates for violent crimes.

The negative trend of sex ratio implies that as the sex ratio rises, the crimes against women and violent crimes fall. While "popular" empirical research points towards a positive trend, however, there are some papers that have documented a negative trend.

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5   The sub-categories are rape, dowry deaths, assault and insult against modesty of women, cruelty against women and rapes against SC. Rapes against SC is not included in overall crimes against women as they are already a part of total rapes.
6   Sex ratio is not significant for rapes against SC.

**Table 2a: Regression Analysis of Crimes Against Women and Sex Ratio**

Variables	Crimes Against Women					
	Per 100,000 Population			Per 100,000 Males (15-59)		
	(1)	(2)	(3)	(4)	(5)	(6)
Adult Sex Ratio (15–59)	–0.66***	–0.59***	–0.67***	–3.03***	–2.78***	–3.01***
(Log) State GDP per capita		7.61			41.56	
Urbanization (%)		–0.29			–0.98	
Real Gini Index		0.23			0.67	
LFPR (15–59)–Urban Female		0.03			–0.30	
Male Years of Education		–2.60	–1.86		–11.65**	–7.50
Gap in Male and Female Years of Education		9.08***	7.01***		25.26***	19.53**
Unmarried Males, 20–39 (%)		–1.18***	–0.96***		–3.79***	–3.00***
Male Unemployment Rate (%)		0.83			3.05	
Reference Period–1995–1999						
2000–04	2.23**	4.40**	4.76***	6.65*	14.21**	15.77***
2005–09	3.75***	11.46**	11.67***	9.40***	30.22**	35.73***
2010–14	8.06***	18.80***	20.54***	22.37***	49.94**	63.76***
Constant	83.87***	20.84	101.70***	363.98***	33.48	433.59***
State effects	Included	Included	Included	Included	Included	Included
Adjusted R-squared	0.776	0.833	0.836	0.790	0.842	0.839
Number of Observations	72	72	72	72	72	72

*$p < 0.1$, **$p < 0.05$, ***$p<0.01$ *Source: Authors' calculations*

Table 2b: Regression Analysis of Violent Crimes and Sex Ratio

Variables	Violent Crimes					
	Per 100,000 Population			Per 100,000 Males (15-59)		
	(1)	(2)	(3)	(4)	(5)	(6)
Adult Sex Ratio (15–59)	–0.47***	–0.41***	–0.43***	–2.19***	–2.07***	–2.07***
(Log) State GDP per capita		10.06**	9.73**		49.66***	55.28***
Urbanization (%)		0.05			0.58	
Real Gini Index		–0.24			–0.79	
LFPR (15–59)–Urban Female		–0.06			–0.42	
Male Years of Education		–1.49			–4.11	
Gap in Male and Female Years of Education		0.16			–1.68	
Unmarried Males, 20–39 (%)		–0.20			–0.69	
Male Unemployment Rate (%)		0.93**	0.61**		3.34**	2.42**
Reference Period–1995–1999						
2000–04	–0.37	–0.75	–2.02***	–2.30	–6.80	–11.29***
2005–09	–1.10**	–2.29	–5.24***	–6.23**	–20.51*	–30.06***
2010–14	0.75	–1.03	–6.09*	–1.22	–22.56	–40.69***
Constant	52.63***	–35.32	–50.12	241.76***	–214.91	–330.91*
State effects	Included	Included	Included	Included	Included	Included
Adjusted R-squared	0.853	0.878	0.877	0.771	0.832	0.829
Number of Observations	72	72	72	72	72	72

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$ *Source: Authors' calculations*

Figure 1: Added Variable Plots of Adult Sex Ratio and Gap in Male and Female Years of Education for the General Specification Model

coef = -2.9209001, (robust) se = .38456806, t = -7.6
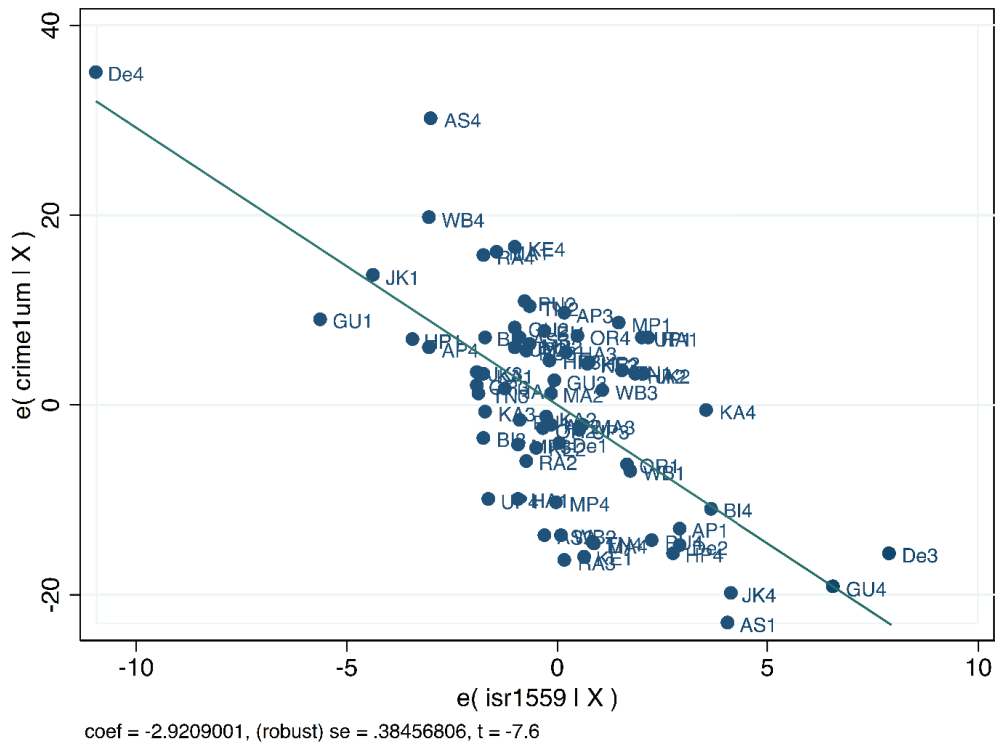
(a) Crimes Against Women–Adult Sex Ratio

coef = 17.67148, (robust) se = 8.5788345, t = 2.06

(b) Crimes Against Women–Education Gap

coef = -2.1631534, (robust) se = .68844005, t = -3.14
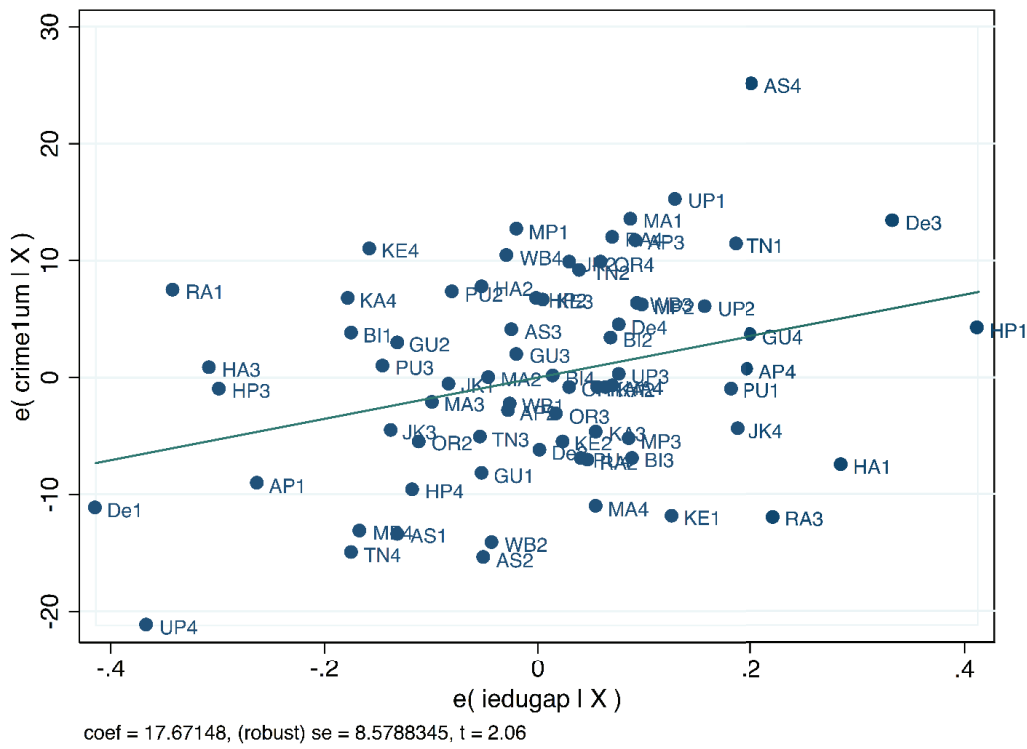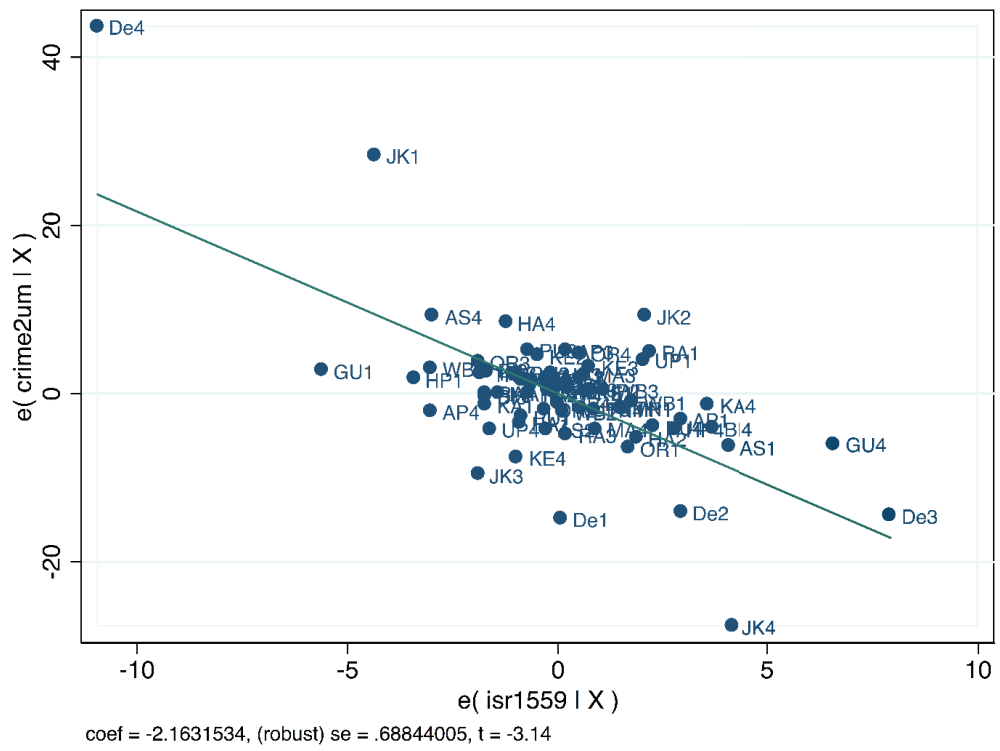
(c) Violent Crimes–Adult Sex Ratio

coef = -.55761896, (robust) se = 7.0509617, t = -.08
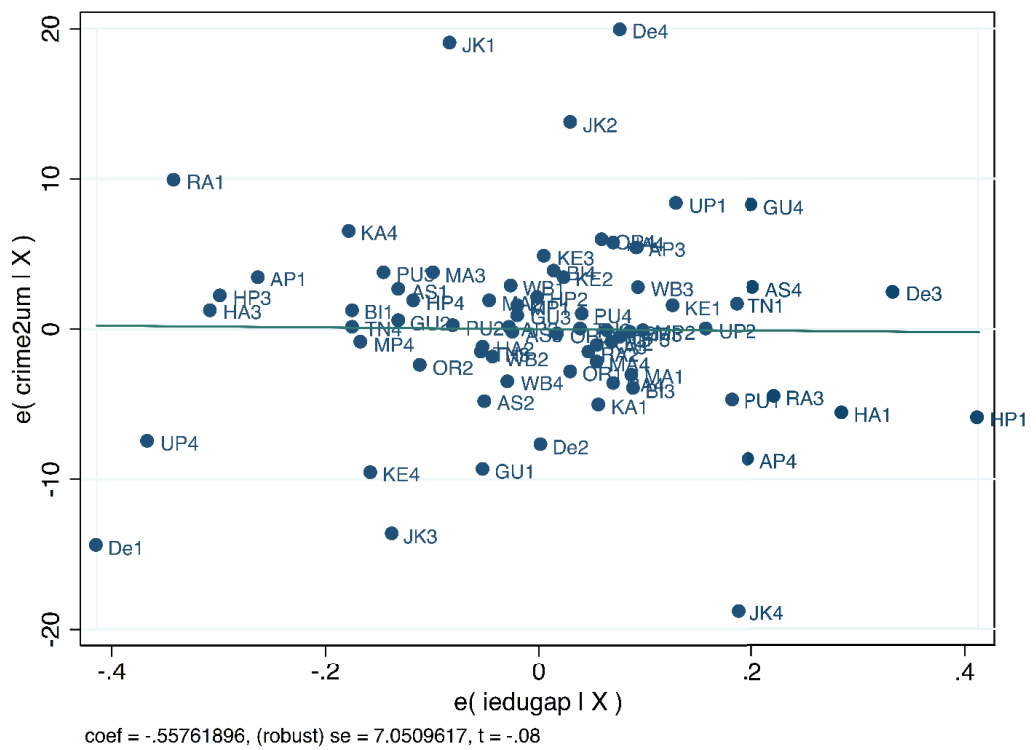
(d) Violent Crimes–Education Gap

Table 3: Regression Analysis of Individual Crimes against Women

| Variable	Crimes Against Women–Crime Per 15–59 100,000 Male					
	Rape	Dowry Deaths	Modesty of Women		Cruelty Against Women	Rape–SC
			Assault	Insult		
Adult Sex Ratio (15–59)	–0.40***	–0.04***	–0.80***	–0.30***	–1.23***	–0.01
(Log) State GDP per capita	3.95	0.34	13.89	9.29*	14.16	0.41
Urbanization (%)	–0.02	–0.07**	–0.38	–0.08	–0.43	–0.03**
Male Years of Education	–1.51	0.05	–5.97**	–1.05	–3.17	0.11
Gap in Male and Female Years of Education	0.63	0.54	2.96	1.54	19.58***	–0.01
Per cent Unmarried 20–39	–0.37*	–0.10**	–0.25	0.15	–3.21***	0.04**
Male Unemployment Rate (%)	0.43	–0.03	0.11	–0.29	2.82	–0.04
Adjusted R-squared	0.875	0.919	0.849	0.769	0.824	0.755
Number of Observations	72	72	72	72	72	72

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$*

Note: Each regression is run with the above variables, along with real Gini Index and LFPR for urban females (15–59). Time and state fxed effects are also included.

This suggests that the basis behind crimes may not be gender-specific, but rather specific to culture, type of law and order enforcement or may even be due to differences in reporting. There is a possibility that researchers may have been too hasty (and too simplistic) to attribute violence to "excess of men". Stated differently, the positive relationship could simply be a reflection of a spurious correlation.

The general specification (with crime per male as dependent variable) is run for the years 2001 and 2011 to see if the interpolation of Census data using NSS data affects our results in any way. The NSS data for 1999–2000 is used for the year 2001, so as to ensure raw data in all cases. For both crimes, the sex ratio is still significant with strong negative coefficient. For crimes against women, education gap and unmarried males are significant and the same sign as the final model. For violent crimes, however, the Gini coefficient is significant and unemployed males is not. However, as our main independent variables, i.e, sex ratio, still shows the same sign, we can say that the interpolation of the sex ratio using NSS data has not affected our results in any way. Graph 1a and 1c depict the added variable plot of sex ratio versus the general specification for crimes against women and violent crimes. A strong and robust negative relationship is evident.

Time Trends

While violent crimes do not see a specific trend as such in terms of time, there is one striking observation for the crimes against women. There is a doubling in the value of the coefficient between 2005–09 and 2010-14. The fact that no such trend is seen for violent crimes implies that this jump can be directly attributed to a rise in reporting of rapes, domestic abuse etc. between these two periods.

Figure 2 depicts the time trends for crimes against women per male and violent crimes per male for the four periods. While a strong rising trend can be seen for crimes against women, the violent crimes see a small fall before stabilizing around the 1995–1999 value in 2010–2014.

Figure 2: Time Trends in Crimes per Male
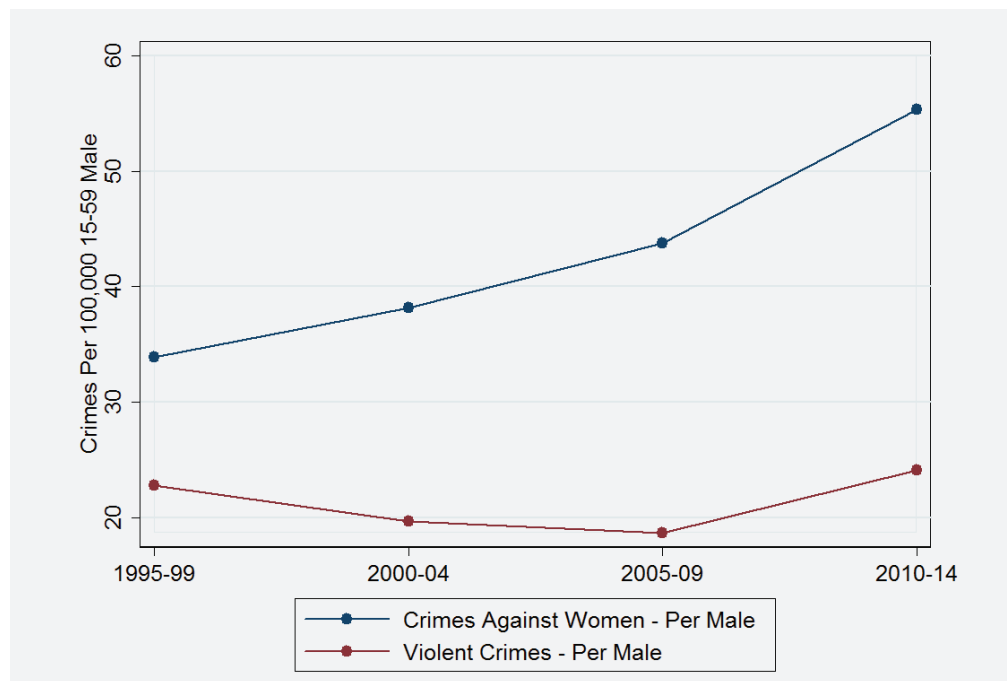
Source: National Crime Records Bureau.

Control Variables

The significance of education for crimes against women is intuitive as these crimes arise from the foundation that men and women are unequal and that "the women need to be taught a lesson". This fixes itself with the rise in both male and female education.

This is further evident in the strong positive coefficient of education gap in cruelty against women–a fall in the education gap by 1 year leads to a 19.5 point fall in cruelty against women. Therefore, a fall in the education gap between males and females leads to a fall in crime rates against women. For assault on women, a 1 year rise in male years of education leads to a 6 point fall in assault of women.

Interestingly, violent crimes have no link with education. Graph 1b and 1d show the added variable plot of education gap versus the general specification for crimes against women and violent crimes and it can be easily observed that there is a clear positive trend for crimes against women and no trend for violent crimes.

A positive relationship between crime rates and sex ratio is argued on the basis that marriage acts as a stabilizing factor for males. In other words, a rise in the number or per cent of unmarried males in the population would lead to higher crimes rates, specifically more violence. Our regression analysis shows that the per cent unmarried males is *strongly* significant with a negative coefficient for crimes against women! That is, if unmarried males rises by 1 percentage point, the crime rate will *fall* by 3 points. However, per cent unmarried males has no significant effect on assault or insult on the modesty of women. On the other hand, the per cent unmarried males is *insignificant* for violent crimes, with a negative sign.

Violent crimes are positively related to male unemployment rates and state GDP per capita, and *negatively* related to adult sex ratio. A rise in the male unemployment rate by 1 percentage point leads to a rise in violent crimes by 2.4 points. This is not seen for crimes against women, even in its sub-categories. The significance of state GDP per capita is probably related to higher reporting.

For urbanization, overall crimes against women and violent crimes see no effect. However, a marginal negative effect is seen for dowry deaths and rapes against Scheduled Caste. In reality, however, we see a completely different picture with more reporting of dowry deaths from urban areas! Again, that could simply be higher reporting as women and families have more access to legal recourse and information about laws against dowry, harassment, rapes. LFPR for urban females and real Gini index have no effect on either of the crimes or the sub-categories.

While the control variables and the time trends provide us a basic understanding of the determinants of crime rates, the idiosyncrasy in the trend of the sex ratio requires deeper investigation. An immediate conclusion is that the relationship between sex ratio and crime rates is purely state specific and factors (cultural and otherwise) specific to a state influence this linkage to a large extent.

5

Investigation of Trends in Sex Ratio

Although our analysis obtains a negative relationship between sex ratio and crime rates, none of the control variables are significant except for education. One reason for this result could be that most states tend to follow trends intrinsic to them. Before delving into the relationship of sex ratio and crimes, it is first important to understand the trend of crimes themselves. Therefore, we present the raw data of the crimes (Table 4)—average crimes[7] for each period as well as the crimes per male.

While the state with the maximum number of crimes against women per male is Delhi (which has earned it the title of infamous "rape capital" of India), the state with the lowest crimes per male is Bihar! Crimes against women unambiguously rise for all states; however, there are four states which see either a fall or constancy in crimes per male for two five-year periods 1995–1999 and 2010–2014; Himachal Pradesh, Madhya Pradesh and Tamil Nadu see a constancy; and Maharashtra sees a fall. This rise is seen for violent crimes as well, except for Jammu and Kashmir.

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7   Average crimes are presented here only for the sake of completeness, and cannot be used as the basis for any analysis as it does not account for state population sizes. Crimes per male is used as our base determinant as it captures the essence of our hypothesis.

There are three states–Assam, Delhi and Kerala–which are witness to a sharp rise in crimes per male, 2010–2014. It is likely that this is due to higher reporting due to the increased media attention around rapes and other crimes against women (especially because of the Nirbhaya case in 2012). Higher reporting is especially likely for Kerala, a state where there are high levels of female education and gender awareness. However, Assam and Delhi see a rise in violent crimes per male as well, whereas Kerala has the lowest violent crime rates. Jammu and Kashmir has seen a sharp fall in the violent crime rates–this may be due to the time period we are analyzing, i.e, Kargil war (1999–2000) and instability in the Kashmir region likely added to the high crime rate in the late 1990s.

Table 4: Raw data on Crimes against Women and Violent Crimes, 1995–2014

| State | Crimes against Women | | | | Violent Crimes | | | |
| | Average Crimes (in '00s) | | Crimes Per Male | | Average Crimes (in '00s) | | Crimes Per Male | |
	1995–99	2010–14	1995–99	2010–14	1995–99	2010–14	1995–99	2010–14
Andhra Pradesh	91	229	42	84	40	43	18	16
Assam	20	110	28	113	29	55	39	56
Bihar	26	55	11	14	63	73	26	18
Delhi	15	60	30	120	20	55	39	106
Gujarat	41	81	30	40	26	32	19	16
Haryana	23	57	42	67	13	29	25	34
Himachal Pradesh	7	10	42	42	3	4	18	16
Jammu & Kashmir	9	22	47	54	14	12	79	29
Karnataka	35	81	23	39	23	34	16	17
Kerala	36	104	41	105	7	7	8	7
Madhya Pradesh	109	141	48	48	35	46	15	16
Maharashtra	138	178	51	47	42	51	15	14
Orissa	35	89	33	67	16	33	14	25
Punjab	8	29	12	30	11	20	17	20
Rajasthan	87	201	64	102	46	56	34	28
Tamil Nadu	39	46	19	19	30	38	15	16
Uttar Pradesh	108	174	23	28	130	150	28	24
West Bengal	59	264	25	85	35	74	15	24
India	946	2114	34	55	635	921	23	24

Source: National Crime Records Bureau.

Note: 1. Crimes per male is the crimes per 100,000 male in the age group of 15–59.

2. Change in per male is ranked for the change in the per male crime rate between 1995–99 and 2010–14.

There are two states for which we would have expected high crimes against women rates consistent with their excess males sex ratio– Punjab and Uttar Pradesh. But these states have consistently seen a low crime rate as compared to other states and the all-India average. However, Uttar Pradesh is much higher on the violent crimes front.

Rank Analysis

The raw data itself (Table 4) points to the idiosyncratic nature of state level crime. In an attempt to quantify these idiosyncrasies, a rank analysis is carried out. Equal weightage is given to both the levels of the crime rates as well as the changes. Three variables are ranked for the 18 states considered in this paper–one, the crime per male for two periods 1995–1999 and 2010–2014; two, change in crime per male for these two periods; three, change in the share of crime, relative to male[8] percentage of the population. Finally, a rank of ranks (called a Borda rank) is taken for these four variables. The rank ordering implies that a lower rank signifies that the state is "better" in terms of crime (lower crime).

The individual ranks and the ranks for the state for violent crimes and crimes against women are presented in Appendix 1. Tables 5a and 5b present a summary analysis of ranks for crimes against women and violent crimes. The states are grouped into 3 categories for crime on the basis of their rank–best (if rank of ranks is less than or equal to 6), middle (rank of ranks between 7 and 12), worst (rank of ranks greater than 13).

States are also grouped into four categories according to the sex ratio level (average for all four periods) and change between 1995–1999 and 2010–2014. The level is divided into two types–good (sex ratio <= 107) and bad (sex ratio > 107). The change is divided into two types–improving (change is negative) and worsening (change is positive). Using these, we obtain four classifications.

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8   Males of the age-group of 15 to 59 are considered.

Table 5a: Summary State Table—Crimes against Women

Crimes Against Women	Sex Ratio				Total
	Good and Improving	Good and Worsening	Bad and Improving	Bad and Worsening	
Best	1	2	1	2	6
Middle	1	2	2	1	6
Worst	2	0	4	0	6
Total	4	4	7	3	18

Table 5b: Summary State Table—Violent Crimes

Violent Crimes	Sex Ratio				Total
	Good and Improving	Good and Worsening	Bad and Improving	Bad and Worsening	
Best	2	2	1	1	6
Middle	1	2	2	1	6
Worst	1	0	4	1	6
Total	4	4	7	3	18

Summary Tables 5a and 5b (groups of states) show that there is no clear trend for *any* grouping of the sex ratio. Hence, it is essential that one analyses the cultural and socio-economic factors essential to each state to understand the "true" determinants of crime rates, and the possible association of the adult sex ratio with crime rates. Table 6 presents a state-wise summary of the results.

Good and Improving Sex Ratio: For states with a good and improving sex ratio it would appear that crimes against women should be low, going purely by the sex ratio. Tamil Nadu conforms to this theory–with a normal sex ratio, it does very well on crimes against women. Although Andhra Pradesh and Kerala both perform badly on crimes against women and well on violent crimes, Kerala does much worse and is at the extremes–*third worst* for crimes against women and *second best* in violent crime rates.

However, Kerala is the only state that has a sex ratio in favour of women (less than 100). Drawing from Guttentag-Secord, there is a possibility that due to the excess presence of females, they have no dyadic or structural power and therefore, could be mistreated on a larger scale. Moreover, gender roles remain traditional despite high levels of education, presaging likely familial conflict. Moreover, due to high out-migration of men to the Middle East, there is scarce supply of males in Kerala itself. Fewer males could imply fewer violent crimes, but surprisingly, not fewer crimes against women!

Table 6: State-wise Summary of Crimes and Sex Ratio

State	Crimes against Women	Violent Crimes	Sex Ratio		
			Average Level	Change	Category
Andhra Pradesh	Worst	Best	101	–6	Good and Improving
Kerala	Worst	Best	93	–5	
Orissa	Middle	Worst	102	–2	
Tamil Nadu	Best	Middle	100	–2	
Bihar	Best	Best	105	4	Good and Worsening
Gujarat	Best	Best	106	10	
Himachal Pradesh	Middle	Middle	101	4	
Karnataka	Middle	Middle	103	4	
Assam	Worst	Worst	109	–8	Bad and Improving
Delhi	Worst	Worst	121	–15	
Haryana	Middle	Worst	112	0	
Madhya Pradesh	Middle	Best	108	–2	
Rajasthan	Worst	Middle	109	–5	
Uttar Pradesh	Best	Middle	110	–6	
West Bengal	Worst	Worst	109	–7	
Jammu & Kashmir	Middle	Middle	111	6	Bad and Worsening
Maharashtra	Best	Best	109	1	
Punjab	Best	Worst	110	1	

Source: Authors' classifcation

Good and Worsening Sex Ratio: Bihar and Gujarat are states which show a consistent and stellar performance on both violent crimes and crimes against women and have a good but worsening sex ratio. Even Himachal Pradesh and Karnataka are in the top 2/3rd for both types of crimes. While much praise has been heard for the Gujarat Development model and results have been seen on ground, the stellar performance of Bihar should be investigated a bit more.

In terms of ranks, Bihar is the best state with the lowest crime rates against women and sees the second largest improvement in violent crime rates. While Bihar started off at rank 13 for violent crimes in 1995–1999 (Laloo Prasad as Chief Minister), it rises by four places to rank 9 by 2010–2014 (Nitish Kumar as Chief Minister). While the very good performance in crimes against women is surprising, the improvement in violent crimes rate is most likely because of the change in the political leadership. However, the rank 1 for crimes against women seems a little "suspect" and this could be a factor due to low reporting.

Bad but Improving Sex Ratio: Majority of the states (7 out of 18) have a bad but improving sex ratio. There are three states which perform poorly on both types of crimes—Assam, Delhi and West Bengal. While media may have hyped Delhi as the "rape capital" and "crime capital", data clearly shows that this is the reality—Delhi is the worst for violent crimes and is the third-worst state for crimes against women. Delhi drops from a high rank of 9 for crimes against women in 1995–1999

to rank 18 (the worst) by 2010–2014; even in the intervening periods 2000–2004 and 2005–2009, Delhi's rank is decent–8 and 10, respectively. Therefore, the sharp fall in the ranks in 2010-2014 can be clearly attributed to the rise in reporting post the Nirbhaya case.

As the epicenter for this case was Delhi, the effects are strongest here. The increased media attention, along with the improvements in the convenience for reporting such as female officers in each police station, have likely led to this change. A negative effect of the increased media attention has also been that it has probably given impetus to a brazen attitude amongst men due to the low conviction rates in crimes against women. Although efforts are being made for setting up of fast-track courts, there is still a long way to go. Clearly, there needs to be a sharp improvement in the law and order situation for Delhi.

West Bengal does badly on crimes against women (rank 13) as well as violent crimes (rank 14). Worse, it sees a stark deterioration in crimes between the two periods for both types of crimes–from rank 6 to 14 for crimes against women and rank 4 to 11 for violent crimes for the period 1995–1999 and 2010–2014. The reasons for this bad West Bengal performance need to be investigated further.

> Uttar Pradesh, the state with bad sex ratios and presumably poor law and order situation, does extremely well on crimes against women (rank 3) and violent crimes (rank 7). It would be preliminary and hasty to say that this can be purely attributed to improvement in law and order. For crimes against women, Uttar Pradesh has always done well–5th in 1995-1999 for crimes per male which rises to 3rd in 2010-2014. This seems to be a clear case for under-reporting of crimes.

Bad and Worsening Sex Ratio: Despite having a bad and worsening sex ratio, Maharashtra performs exceedingly well on both types of crimes; Punjab ranks high, i.e, low for crimes against women. Maharashtra sees the largest improvement for crimes against women, ranking 1st for both change indicators. In terms of level, it improves from 17 in 1995-1999 to 8 in 2010-2014. On violent crimes, Maharashtra has always done well, staying in the top 1/3rd of the states.

Violence against Women–NFHS Survey Data

Our entire analysis, so far, has been based on *actual* crimes, as reported by the NCRB. However, as mentioned in Section 6, the reporting for any crimes against women is drastically low. Therefore, it is worth exploring individual level data to understand the frequency of occurrence of violence against women. National Family Health Survey (NFHS) conducted in 1998–1999 (Round 2) and 2005–2006 (Round 3) provide data on the varying levels of domestic violence–starting from basic control issues such as the women needs to take permission from the husband to go to the market or to meet her relatives to sexual violence. Bose et al. who also used NFHS data state "Multilevel logistic regression models show that a relative surplus of men in a community increases the likelihood of physical abuse by husbands even after adjusting for various other individual, household, and geographic characteristics. Further evidence of control over women when there is a sex ratio imbalance is provided by

the increased odds of husbands distrusting wives with money." (Bose et al. 2013:53). They argue that a more masculinized society means that married women will be at greater risk both from intimate partner violence and controlling behavior by husbands. However, the paper is looking at district level data with results that show weak significance.

Table 7 presents the percentage of women who experienced control issues or less severe physical violence (such as beating, slapping etc.). Data for severe physical violence are available only for the 2005–2006 survey. While the definition of control issues and beating (or less severe physical violence) varies a little between the two surveys, they are broadly comparable. All figures in the table are percentage of women.

Table 7: Percentage of Women Who Face Some Sort of Violence, 1998–99, 2005–06

State	NFHS 2 (1998-99)		NFHS 3 (2005-06)		
	Control Issues	Beating	Control Issues	Beating*	Severe
Andhra Pradesh	87.8	23.2	22.5	34.7	12.4
Assam	88.0	15.5	21.5	36.7	9.2
Bihar	81.2	26.6	73.1	56.1	17.0
Gujarat	51.7	10.1	64.3	25.3	9.5
Haryana	80.4	13.2	35.2	25.5	7.1
Himachal Pradesh	72.2	5.8	40.1	5.8	2.4
Jammu & Kashmir	92.8	22.0	61.4	11.5	4.3
Karnataka	67.7	21.5	35.2	19.4	7.7
Kerala	64.5	10.2	22.8	15.3	4.1
Madhya Pradesh	83.4	21.2	51.2	43.9	12.2
Maharashtra	70.3	18.1	41.2	30.5	8.4
Orissa	85.8	28.9	46.3	33.0	15.0
Punjab	74.8	13.7	39.8	24.4	7.7
Rajasthan	84.8	10.9	58.4	40.1	12.2
Tamil Nadu	44.9	40.4	20.5	41.3	20.3
Uttar Pradesh	88.5	22.4	36.9	41.2	15.5
West Bengal	87.0	17.6	51.6	32.7	11.0
Delhi	66.8	14.1	39.8	16.1	3.4
India	77.4	21.0	43.1	34.9	11.9

Notes: Beating refers to Less Severe Violence in 2005–06 NFHS survey.

Following are the questions asked in each survey:

1. NFHS 1998–99: *Control Issues* (Permission needed to go to market, Permission needed to visit relatives or friends); *Beating* (Has been beaten since age 15).

2. NFHS 2005–06: *Control Issues*(Husband jealous if talking with other men, Husband accuses her of unfaithfulness, Does not permit her to meet her girl friends, Husband tries to limit her contact with family, Husband insists on knowing where she is, Husband doesn't trust her with money); *Less Severe Physical Violence* (Spouse ever pushed, shook or threw something, Spouse ever slapped, Spouse ever punched with fist or something harmful, Spouse ever kicked or dragged, Spouse ever twisted her arm or pull her hair); *Severe Physical Violence* (Spouse ever tried to strangle or burn, Spouse ever threatened or attacked with knife/gun or other weapon).

The table shows that despite a broader coverage of control issues, there is a sharp *reduction* in percentage of women who experience the same at an all-India level between 1998–1999 and 2005–2006. It would require more exploration to understand this sharp reduction over a period of five years. In spite of the fall, at least 4 in 10 women have been exposed to or continued to be exposed to some sort of control issues. On the other hand, women experiencing less severe physical violence (pushing, punching, slapping etc.) has risen from 21 to 35 per cent.

> This implies that 1 in 3 women have faced physical violence. However, most of this goes unreported–it is only severe physical violence such as attempting to murder that may get reported. This emphasizes that there is a long way to changing the mentality of men towards women–from viewing women as objects or possessions to equals. In terms of severe physical violence, at least 1 in 10 women have experienced it at an all-India level.

At a state level analysis, Gujarat is seen to be the only state which sees a rise in control issues although it had a lower level than most other states during the NFHS 2 period. All other states see a fall, with Andhra Pradesh and Assam experiencing the largest fall. In terms of less severe physical violence, the situation seems far more unfortunate–only 3 states see little or no rise (Jammu and Kashmir, Himachal Pradesh and Karnataka).

A ranking of the sum of the women experiencing control issues and less severe physical violence shows that the worst five states are Bihar, Rajasthan, Madhya Pradesh, Gujarat and West Bengal. While Bihar and Gujarat have a good but worsening sex ratio, they have the lowest crime rates (in the top 6)! On the other hand, the best five states are Kerala, Himachal Pradesh, Karnataka, Delhi and Andhra Pradesh. The outlier here seems to be Delhi–there is a possibility that although domestic violence may be low, physical violence outside the house is high. Interestingly, Tamil Nadu has the highest level of severe physical violence and Himachal Pradesh the lowest.

This exploration was done to comprehend the extent of domestic violence in India as crime rates are not enough to understand the situation fully.

Conclusions

This paper explores the relationship between sex ratio and crime rates. Analysis of two types of crimes are presented—crimes against women and violent crimes. A fixed effects regression is run, controlling for time and state effects. The control variables are state GDP per capita, urbanization, real Gini index, LFPR for urban females, male years of education, gap between male and female years of education, per cent unmarried males and male unemployment rates. An important finding was the significant rise in reporting, as deduced from the large jump in the coefficient of the time periods 2005–2009 to 2010–2014.

Contrary to the more well-quoted literature on this relationship, we estimate a *negative* linkage between sex ratio and crimes, i.e, as the sex ratio rises to become more skewed in the favour of males, the crime rates fall. Besides sex ratio, the gap between male and female years of education and per cent unmarried males was particularly significant for crimes against women. As the gap rises, the crimes against women rise, which makes intuitive sense. But what does not make "intuitive" sense is that per cent unmarried males was negatively significant implying that a rise in unmarried males will lead to a lowering of crimes against women. For violent crimes, state GDP per capita was significant and positive, possibly indicating a rise in reporting due to better law and order in richer states. Male unemployment rates, too, was positive and significant. However, as there appeared to be more to the sex ratio-crime than just statistical significance, an in-depth rank analysis was carried and individual state specific trends explored.

Bihar and Uttar Pradesh do surprisingly well. While some part of Bihar's success could be attributed to a change in political leadership, a majority of both Bihar's and Uttar Pradesh's low crime rates may be due to low reporting. The state that does badly is Delhi, the capital of India. A significant rise is seen for both crimes against women and violent crimes in the period 2010–14, again possibly due to higher reporting. West Bengal, too, performs poorly and has seen a fall in performance over the years. Kerala, on the other hand, follows a similar trend, despite having a female friendly sex ratio. An important conclusion from this rank analysis is that there is much to be attributed to specific state and cultural factors.

There has been a lot of speculation and curiosity regarding the possible impact of high sex ratios on crime in general and gender crime in particular. Arguments have been offered on both sides—high sex ratios leading to higher crime rates and vice versa, with marriage and family being considered as intervening variables. But as the paper shows, the findings do not confirm any causal relationship between the two main variables.

Appendix 1:
Rank Analysis for Crimes Against Women and Violent Crimes

State	Rank – Crimes Against Women					Rank – Violent Crimes				
	Level – Per Male		Change in Crime		Rank of Ranks	Level – Per Male		Change in Crime		Rank of Ranks
	1995-1999	2010-2014	Per Male	Share – Male (%)		1995-1999	2010-2014	Per Male	Share – Male (%)	
Andhra Pradesh	12	13	14	16	14	10	5	6	7	6
Assam	7	17	17	17	16	17	17	17	16	17
Bihar	1	1	5	4	1	13	9	2	2	4
Delhi	9	18	18	14	18	16	18	18	18	18
Gujarat	8	6	8	6	5	11	4	5	5	3
Haryana	14	11	11	10	11	12	16	15	14	16
Himachal Pradesh	13	7	2	7	7	9	7	8	9	8
Jammu & Kashmir	15	10	7	8	10	18	15	1	4	12
Karnataka	4	5	9	11	7	7	8	11	10	11
Kerala	11	16	16	15	16	1	1	9	11	2
Madhya Pradesh	16	9	3	2	9	5	3	10	8	4
Maharashtra	17	8	1	1	4	6	2	7	6	1
Orissa	10	12	12	13	12	2	13	16	15	14
Punjab	2	4	10	12	5	8	10	13	12	13
Rajasthan	18	15	13	9	14	15	14	3	3	10
Tamil Nadu	3	2	4	5	2	3	6	12	13	9
Uttar Pradesh	5	3	6	3	3	14	12	4	1	7
West Bengal	6	14	15	18	13	4	11	14	17	14

Source: National Crime Records Bureau; Authors' calculations

Notes: 1. Crimes per male is the crimes per 100,000 male in the age group of 15-59.

2. Change in per male is ranked for the change in the per male crime rate between 1995-99 and 2010-14.

3. Change in Crime Share - Male (%) is the change in the crime share (as a per cent of total crimes), relative to the percentage of male population in the age group of 15-59 in that state.

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