

## *The Co-existence of Biased Sex Ratio and Crime against Women in India: Examining the Causality*

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### ABSTRACT

Preference for a son has deep historical roots in India and is evident in its highly skewed sex ratios. The country has recently been on the news often for heinous rape incidences. It registered a 27 percent annual growth rate in crime against women in 2013. The economic theory indicates that the scarcity of girls should make the girls dearer to society, but the reality is the opposite in India. It creates the puzzle that, despite scarcity, India still does not value their women. Instead, the statistics show that crime against women is increasing faster than the overall crime. Therefore, it becomes interesting to explore the puzzle and to examine whether this coincidence of pro-male biased sex ratios and higher crime on women bears any empirical relationship in the case of India. The paper uses data from Census and National Crime Records Bureau for the analysis. The district-year panel analysis found a significant negative relation between sex ratios and crime against women. It is found that an increase in 1 female in the population of 1000 males, that is, a 1 unit increase in the youth sex ratio in favor of females, will decrease the crime against women by 0.53 percent, keeping other things the same. Further, it is also found that the impact of sex ratios is highest on domestic violence, followed by kidnapping compared to other crimes against women.

*Keywords:* Crime Against Women; Son Preference; Biased Sex Ratio; Missing Girls.

### INTRODUCTION

Indian families historically prefer sons and do not hesitate to use various methods to fulfil their desire for sons. With the prevalence of son preference and adoption of different techniques to get the desired composition of children, it is no wonder that highly skewed sex ratios prevail in terms of child sex ratio and adult sex ratio in India. While the adult sex ratio has shown a rising trend recently, the child sex ratio<sup>1</sup> has dropped further and reached the lowest at 914 in the last census 2011, from 983 in 1951 (Census, 1951-2011). The youth sex ratio has declined from 990 in 1961 to the lowest at 895 in 2001 and recently increased to 908 (in 2011).

India recently has been in the news for heinous rape incidences. It registered 27 percent, the highest annual growth rate in crime against women in 2013 from the previous two decades, whereas the average annual growth of total crime was 10.9 percent in the same year (NCRB and India, 1995-2013). From 1995 to 2014, the growth rate of crime against women is greater than

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<sup>1</sup> In India, sex ratio is measured as number of females per 1000 males.

other crimes (except crimes against women) and total crime in most years, except 1999 and 2002. The share of crime against women in total crime has increased from 5.4 percent in 1996 to 11 percent in 2013. The most recent crime data from NCRB (2016) reports on average 39 crimes against women in every hour in India, which was 21 incidences in an hour in 2007.

On the night of December 16, 2012, the gang rape of a paramedical student, Nirbhaya (named by media) in Delhi shocked the nation with the brutality of the incident. Since then, particularly rape incidences have attracted a dramatic rise in media coverage. Regular news on rape incidences makes us think that rape is growing disproportionately in India than other crimes. However, one can also argue that it may not be an increase in incidences but rather an increase in reporting. Rising media attention and increasingly concerned authorities have made it easier for rape victims to seek justice today than in earlier times. However, apart from rape, other crimes against women have not received much attention so far. To explore the rising trend of crime against women (CRW) in detail (such as how different crimes have increased/decreased over and which crime mainly contributes to the overall increase in CRW), it is necessary to examine the crime-head-wise incidences under CRW. The share of domestic violence in total CRW has increased from 30 percent in 1995 to 46 percent during 2009-2012 and recently declined to 40 percent. Molestation has the second-highest share in total CRW, around 20-25 percent on average, followed by kidnapping around 15-18 percent share recently. Rape accounts for 11 percent of incidences in total crime against women from 2007 to 2013, after a decline from 14 percent share in 1995. Further, rape only accounts for 8 percent average annual growth rate from 1995 to 2013, whereas domestic violence by in-laws accounts for the highest average growth rate of 17 percent, followed by kidnapping (15 percent), sexual harassment (9 percent), and molestation (9 percent).

Intuitively, domestic violence is the category that may have serious under-reporting issues, as women often do not want to report against their family members out of fear and/or compassion. It is also difficult for the victims to report such crimes when the accused and the victim live in the same household. Instead, for other types of CRW, the reporting would be easier than domestic violence.

In India, the co-existence of skewed sex ratio in favor of men and increasing crime against women is puzzling given that when it seems logical (by the economic theory) that scarcity should increase the value of girls in society, surprisingly, instead they are increasingly treated with

violence and harassment in their daily life either by family members or by strangers. It is also a puzzle from the perspective of Indian society, as, given the lack of women to marry in some states, they have to buy a bride from other states, and sometimes multiple brothers get married to one girl to continue family lines; still, we do not value women in our society. Thus, it is important to examine whether this coincidence of male-biased sex ratios and a higher crime against women bear any empirical relationship in the case of India. Therefore, the questions of interest in this paper are:

- Do biased sex ratios hold a relationship with the higher crime rates against women in India?
- Is the past preference for sons responsible for the increase in the crime rate against women today?
- Studies have already shown that a higher number of single men can increase crime in general, property crime, and violence. Therefore, do biased sex ratios impact crime against women and total crime differently?

There is no shortage of studies on the preference for sons and the effect of sex ratios on the overall crime rate, but few have examined its effect on crime against women and/or how the effects are different between crimes against women and other crimes. Further, to my knowledge, there is no attempt until recently to question the enigma of the co-existing scarcity of women and increasing violence against women in India. Thus, this paper attempts to fill these gaps in the existing literature. I explain the contribution of this paper in more detail at the end of the literature review.

The paper provides a theoretical background to this research and intuitively explains the causal pathway regarding the coincidence of biased sex ratio and increasing crime against women. A brief survey of existing literature is followed by a discussion on data, the research's empirical framework is outlined, and the results from the district-year panel analysis as well as potential policy implications are discussed.

### **THEORETICAL BACKGROUND**

If potential parents do not make use of any tools to influence their gender preference for children, the gender of a newborn child is a random phenomenon by nature. Family planning methods are adopted in order to have at least one or two sons. Therefore, the child-bearing decision is

influenced by a preference for sons and preferred composition of children and family size. Parents who already have a boy child may not desire/decide to have another child, whereas the parents who do not have at least one son wished for another child, and this desire may continue until they have a boy child.

With the advent of modern technology, in the 1980s, the identification of the sex of the fetus became easy for couples. This contributed to increasing sex-selective abortions of female fetuses and resulted in an increasingly skewed sex ratio at birth in India. To control sex-selective abortions, the Government of India amended the Pre-conception and Pre-natal Diagnostic Techniques (PCPNDT) Act<sup>2</sup> in 2002-03, making sex detection of a fetus a punishable offence. A high infant mortality rate among girls also indicates that a girl child gets less post-natal care and probably faces more discrimination and thus higher life risks compared to a boy child at early ages.

Despite the amendment of PCPNDT Act, 8 million female fetuses have been aborted between 2001 and 2011 in India due to a lack of enforcement measures (Pandey, 2011). The population control policies, such as two child norms, provide further incentives for boys than girls; if only two children, then the ideal family is at least one son if not two.

Preferences for boys create an imbalanced sex ratio among children and result in a dismal adult sex ratio in the future. The skewed child sex ratio implies fewer matches between men and women and more marriage squeezes in the future (Guilmoto, 2012). Therefore, historically existing preference for sons may have consequences of a rising shortfall of supply of women as a partner and an increase in the number of single surplus men. It seems reasonable to think that shortages of girls in the marriage market will make them dearer to Indian society and family. The paradox of increasing violence against women can partly be explained by culture, customs, and the historically perceived value of women in the Indian family.

The correlation between skewed sex ratio and violence against women can be intuitively explained from two channels: (i) increasing frustration among surplus men due to lack of opportunities and (ii) the increasing vulnerability of women.

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<sup>2</sup> The PCPNDT Act was enacted in 1994 and it was amended and effectively implemented in 2003.

### ***Surplus men and increasing violence***

The Office of the Registrar General, Census of India, stated that the number of surplus males aged 15-35 was 7 million in 1991 and reached 17 million in 2011. In total, India has 37 million excess men (Census, 2011). When society has a scarcity of women, there will be increased competition between men in the marriage market (Guttentag and Secord, 1983). Men become competitive in acquiring higher education, better jobs, and thus higher resources to make themselves more attractive in the marriage market. Studies on countries with a low female to male ratio showed that the majority of the surplus men belong to the lower strata of the economy as higher competition in the marriage market favors the richer and higher educated males in high-paid jobs (Hudson and Boer, 2002).

Thus, men with lower resources will have a higher risk of remaining single, without any prospect of family-making. These surplus men in Asia are different from single American men, who have options to be in a short-term relationship, but the Asian surplus men lack getting any partner or being in a relationship with a woman. The Indian surplus men also suffer from similar deprivation and lack of opportunities, are often ridiculed by family and/or society, and get less importance in property division. These generate (sexual) frustration and can act out in violent behavior (against women). With little chance to have a relationship with a woman, the sexual frustration of single Indian men may cause insensitivity towards women, and the patriarchal mindset has dominated their violent behavior towards women to exercise the power relations on the perceived weaker section of society.

### ***Fewer women and increasing vulnerability***

The other channel comes from the lower number of females in the population compared to males. The continuous shortage of marriageable women may cause a widening age gap among couples.<sup>3</sup> Increasingly men will be matched with younger women than earlier. Women, who marry at early ages, tend to be less educated, less involved in the labor market, have children earlier, and have less bargaining power in the family (Jensen and Thornton, 2003). These young brides are more vulnerable and usually face higher abuse from family members.

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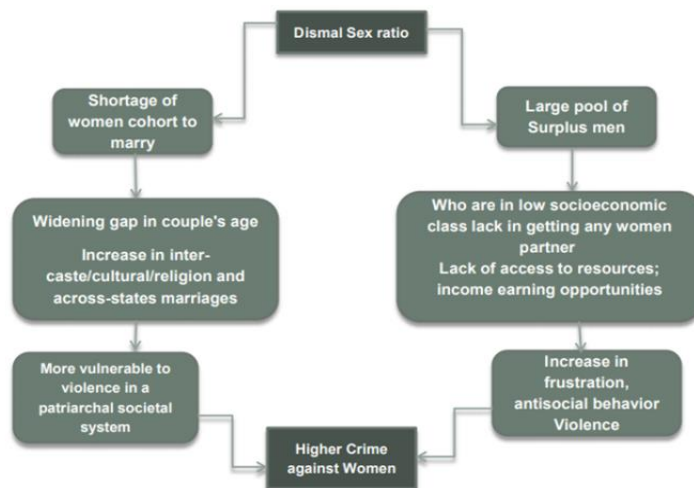
<sup>3</sup> Couple's age gap= Husband's age - Wife's age

India's patriarchal society emphasizes the need for marriage for sons to exercise the power relations of being the primary bread-earner in the family, controlling the household resources, and producing sons to transfer the property according to the son-specific family lines. Therefore, in locations where female cohorts are much lower in number, the solution is to buy brides from poorer and/or lower-caste families and distant places. A BBC report, "India's 'Bride Buying' Country," documented girls from low-income families of Jharkhand, Odisha, Assam, and West Bengal being bought as brides in northern states Haryana and Uttar Pradesh due to the skewed sex ratios (Agal, 2006). The shortages of local brides, therefore, break the age-old customary norms and increasingly accept the inter-caste, inter-religion, inter-state and inter-regional marriages due to intense scarcity (Blanchet, 2005; Davin, 2005; Davin, 2007; Kaur, 2004; Kaur, 2008; Kaur, 2010; Kaur, 2012; Kaur, 2013; Ahlawat, 2009; Chaudhry and Mohan, 2011; Kumar, 2012; Kukreja and Kumar, 2013; Srinivasan, 2017).

Cross marriages bring the brides from either long-distance or different cultural backgrounds; therefore, these girls need more effort and time to adjust to the non-familiar culture, customs, and location. These brides have less bargaining power within the marriage and are more likely to face higher discrimination and violence due to the lack of support from the husband's family members and the neighborhood (Yang and Lu, 2010).

Based on the discussion so far, I build a schematic diagram (Chart 1) that shows two possible channels to explain the hypothesis, 'more single young men in society may increase crime against women and thus, explains the question intuitively.

Chart 1: Two pathways explain the puzzle



## LITERATURE REVIEW

Studies have investigated causes behind dismal sex ratios (Guilmoto and Attane, 2007; Pande and Astone, 2007; Angrist, 2002; Klasen and Wink, 2003; Singariya, 2012; Chakraborty and Sinha, 2006; Sen, 1992; Sen, 1990; Tucker and Van Hook, 2013; Premi, 2001), especially pro-male biased sex ratios, and its direct consequences such as marriage squeeze (Guilmoto, 2012; Park and Cho, 1995; Guttentag and Secord, 1983; South and Trent, 1988; Jiang, Feldman and Li, 2004) and generating surplus men, who are named as *bare branches* (Hudson and Boer, 2002; Hudson and Den Boer, 2004; Tucker et al., 2005) in literature.

Multiple studies supported the hypothesis that more men in the population can increase violence (Hudson and Boer, 2002 and also among others, Hudson and Den Boer, 2004; Messner and Sampson, 1991; Hesketh, Lu, and Xing, 2011; Edlund et al., 2007; Steffensmeier and Allan, 1996). Further, studies also indicate that an increasing percentage of violent crime is committed by young, unmarried, and low-status males (Messner and Sampson, 1991; Oldenburg, 1992).

Using Indian data of 1980-1982, Dreze and Khera (2000) found a strong correlation between murder rates and sex ratio after controlling for urbanization, poverty, and literacy rate. They found that the districts with higher female to male ratios have lower murder rates and emphasized that patriarchal societies are likely to be more violent. Hudson and Boer (2002) re-estimated the same relationship and found a similar correlation between sex ratio and homicide rates in the late 1990s.

Using Interpol data for 70 countries, Barber (2000) has shown evidence for the alternative hypothesis that countries with fewer males than females may have more incidences of violent crimes, rape, and assaults. He explained that societies with fewer males are likely to have more family conflicts, and therefore higher aggression within families and thus higher violent crimes. However, another paper by Barber (2003) found that the rate of violent crimes against persons increased with male to female ratio (15-44 years age-group) in Britain and Scotland and stated that it occurred “because men are much more likely to commit all types of violent crimes than women are.”

Edlund et al. (2007) found positive correlations between surplus men and crime levels in China. The paper found 0.01 increase in sex ratio in favor of men raises violence and property



crime rate by 6 percent and that the increasing number of unmarried young males accounts for as much as one-third of the overall increase in crime.

Oldenburg (1992) has argued that in areas with a high level of violence, preference for sons is higher as sons are valued as a protection against violence and exercise of power (in reference to Northern states of India). He also found that murder rates are high in low sex ratio (F: M) districts of Uttar Pradesh. Messner and Sampson (1991) examined race-specific data on robbery and homicide rates for a sample of 153 American cities and finds positive effects of (M: F) sex ratio on violent crime only when controlling for family disruption. Another paper by Edlund, Li, Yi, and Zhang (2013) found that the elasticity of crime with respect to the youth sex ratio (age-group of 16 to 25 years) is 3.4, and also that sex ratio can account for one-seventh of the rise in crime.

Bose, Trent, and South (2013) highlighted that “...men will exercise extraordinarily strict control over women’s behaviour when women’s relationship options are plentiful, and men’s own options are limited” and also found that in Indian communities where the sex ratio is biased in favor of male, women have a higher likelihood to face distrust and intimate partner violence, after controlling for individual, household and geographic characteristics. Other papers, such as Zhang (2010) and Hesketh et al. (2011), explored the relationship between higher rape and sexual harassment incidences and scarcity of women in China and provided evidence in favor of the relationship.

Literature shows the relation between sex ratios and the overall crime rate, property crime, and other violent crime, but works on the relationship between sex ratios and crime against women, in particular, is scarce. In India’s case, examining the relationship and measuring the impact of biased sex ratio on crime against women become relevant with growing safety and security concerns for women in Indian society. Prakash and Vadlamannati (2014) examined the association between skewed sex ratio and shortage of girls with their illegal trafficking in India. They found that a 100 unit increase in child sex ratio is associated with a 0.635 percent increase in illegal trafficking of girls.

This paper explores the relationship between skewed sex ratios favoring males and crime against women in order to address the lack in the existing literature. Another recent paper by Amaral and Bhalotra (2017) shows that a higher number of surplus males at the age group of 20-



24 years increases crime against women and finds that an imbalanced sex ratio explains a plus-minus 21 percent increase in crime against women. This paper uses a broader definition of young males (age-group of 15-24 years) and examines the impact of surplus young males on crime against women to explain the puzzle of the co-existence of a scarcity of women and increasing violence on them. It gives an intuitive explanation of channels that have linked pro-male biased sex ratios with higher crime against women and provides empirical evidence for this driving mechanism. In addition, it also explores whether the prevalence of preference for sons in the past that imbalanced the child sex ratio would have any impact on crime against women today. This presents a dynamic causal relationship that how past preference for sons can create a violent society for daughters in the years ahead. It also examines the difference between the impact of biased sex ratios on crime against women and other crimes. Further, the impact of sex ratios on women's safety across regions and different crime-heads is also estimated to provide policy directions in priority areas.

### **DATA**

This paper examines the relation between the imbalanced sex ratios and the crime situation, especially crime against women in 395 districts of 35 states and union territories (UTs) of India from 1995 to 2013. A district is an administrative division of a state or union territory. Due to multilevel changes in administrative boundaries and names of the districts over the years, it becomes difficult to obtain consistent data on districts for long periods. In the presence of this issue, I could obtain reliable data on only 395 districts out of 640 districts reported in 2011<sup>4</sup>.

The dependent variable for this analysis is crime against women (CRW). The crime data are taken from the National Crime Records Bureau of India (NCRB). NCRB collects crime data under different crime-heads as defined by the Indian Penal Code (IPC) and publishes this data at national, state, and district levels every year. The crime data represents the total incidences reported formally as first information reports at the police stations. Crime against women primarily includes the incidences reported under different crime-heads, such as rape, kidnapping, molestation, sexual harassment, dowry deaths, cruelty by husband and husband's family members, and importation of girls. The total number of incidents under CRW is the summation of incidents reported under these

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<sup>4</sup> Details of districts data can be available from author upon request.

seven categories of crime committed against women. Total crime includes all types of crimes defined under IPC. Other crime includes all except the criminal incidents against women.

The main explanatory variable for this analysis is sex ratios, which is defined in the Census as the number of females per 1000 males. The Census data on population across different age groups are considered to calculate different sex ratios required for the analysis. The Census of India publishes the population data every ten years. For this analysis, data from five Censuses (1971, 1981, 1991, 2001, and 2011) are used. The data for other variables, such as urban and literate population, are taken from district-level Censuses.

### EMPIRICAL STRATEGY

The analysis considers a district-year panel of 395 districts for 19 years from 1995 to 2013. The relationship between youth sex ratio and crime against women can be examined using a simple linear equation as:

$$CRW_{it} = \alpha_i + \theta_t + \beta YSR_{it} + \gamma X_{it} + \varepsilon_{it} \quad \dots (1)$$

The dependent variable is the log of crime incidents against women  $CRW_{it}$  in district  $i$  in year  $t$ . Due to a large variation in crime incidents across districts, CRW is constructed by taking a log of crime incidents which would help in data smoothening. However, to consider the zero values in the data into log transformation, the value of crime incidences is scaled up by adding 10 units for all before taking log. I believe that this linear alteration would not make any changes in the estimated results.

In equation (1), the main explanatory variable is youth sex ratio ( $YSR_{it}$ ) in district  $i$  in year  $t$ . YSR is the ratio of female to male, more precisely number of females per 1000 males in the age-group and 15-24 years. I consider this age group to construct YSR as literature has shown that the single young males at this age group are more prone to be involved in criminal activities (Graham and Bowling, 1995; Edlund et al., 2007; among others). In India, the age-wise data on arrested people for committing different crimes reveals that, on average, around 45 to 60 percent of people arrested on suspicion are below 30 years of age (NCRB and India, 1995-2013). To construct YSR, the number of males and females in the age group of 15-24 years are taken from census 1991, 2001, and 2011. The middle-year population, such as from 1995-2000, 2002-2010 are linearly projected using growth rate in population between two consecutive census years, and the data for

2012 and 2013 is linearly extrapolated using the same growth rate from census 2001 and 2011. For example, data from 2002 to 2010 is projected from the previous year population multiplied with the annual growth rate calculated from Censuses 2001 and 2011<sup>5</sup>.

I employ a panel estimation method including both district fixed effects  $\alpha_i$  and year fixed effects  $\theta_t$  that control for district-specific and year-specific unobserved heterogeneity, respectively. The control variables used in the estimations are urbanization rate, literacy rate, and per capita income. These variables may have impacts on crime and/or on the unobserved factors of crime. The correlation between per capita income and literacy rate is found 0.66, and testing with VIF (also tolerance indicator) confirms multicollinearity. By estimating the equation with literacy rate and per capita income one at a time and comparing the  $R^2$ s, I decided to keep the literacy rate instead of per capita income. The estimation also uses the female population as a control variable to normalize crime against women with the female population.

The estimation of equation (1) using Ordinary Least Squares (OLS) method will be an issue as YSR has potential endogeneity and can produce biased estimation results. Therefore, I will use instrumental variables for YSR and estimate the equation using the Two-Stage Least square (TSLS) method. A potential instrument for YSR could be Child Sex Ratio with 15 years of lag ( $CSR_{it-15}$ ). The first stage equation in the TSLS estimation is:

$$YSR_{it} = A_i + C_t + B CSR_{it-15} + D X_{it} + \epsilon_{it} \quad \dots(2)$$

In the first stage equation, the dependent variable YSR, the main explanatory variable, which is the instrument,  $CSR_{it-15}$  and also other control variables (same as equation (1)) are used. The  $CSR_{it-15}$  is constructed from the census data considering the children at the age group of 0-4 years in districts  $i$  with 15 years lag. For this, census data for the years 1971, 1981, and 1991 are considered. The lagged CSR for middle years is computed by linear projection and extrapolation for 1980 to 1998.

The validity of the instrument requires two conditions to satisfy: (i) the instrument must be exogenous that is  $Cov(CSR_{-15}, \epsilon)$  should be equal to zero, and (ii) the instrument must be

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<sup>5</sup> Annual growth rate is calculated by dividing the decadal growth with 10. And decadal growth rate (DG) let say between 2001 to 2011,  $DG_{2001-2011} = \frac{P_{2011} - P_{2001}}{P_{2001}}$ .

correlated with the endogenous explanatory variable, that is  $Cov(CSR_{-15}, YSR)$  should not be zero.

The first condition cannot be proved as  $\varepsilon$  is unobserved. In this case, we can assume that it is unlikely that CSR with 15 years of lag that is CSR in (t-15) years is correlated with unobservable factors of crime against women in year (t). It seems plausible to think that the current crime rate could not pollute the determinants of the juvenile sex ratio before 15 years. However, districts with a prevalence of higher crime rates may have male-biased child sex ratios. Parents in such districts may have a higher preference for boy children; on the one hand, sons are considered as tools of protection against violence and can provide higher safety to the family when grown up, and on the other hand, they may also fear that a girl child is not safe in such crime-prone localities. These perceptions due to higher contemporaneous crime rates in the districts may result in a biased child sex ratio in favor of males. Therefore, considering the externalities due to contemporaneous crime rates on child sex ratio, rape incidences with 15 years lag are included as a control variable in the estimation. In addition, it may happen that districts where the patriarchal mindset prevails have been aggravated further, and thus CRW in such districts are historically higher than CRW in others. I employ district-specific linear time trends to control the time invariant unobserved factors in the districts that influence CRW. Further, in all estimations, standard errors are clustered at district levels, as the districts of a state can have some common characteristics that influence the crime of the locations. Also, in the estimations, districts and year-fixed effects are used to control for district and time-specific characteristics. After employing the above treatments, it seems unlikely that people decided to have more boys compared to girls considering future crime directly, rather it seems possible that an area with higher patriarchal practices in the past may commit more crime today because of surplus young men it produced in the society.

The second condition can be proved by the non-zero correlation coefficient of CSR in the first-stage equation. Child sex ratio is a primary determinant of the future youth sex ratio and eventually adult sex ratio. Therefore, these sex ratios are supposed to be correlated. The correlation coefficient between YSR and  $CSR_{-15}$  is found 0.376.

The second stage equation is (1), where the explanatory endogenous variable YSR takes the estimated values from the first stage equation (2).

Another objective of the paper is to examine whether there is any difference between the effects of sex ratios on crime against women and other crimes. The effects of sex ratios on crimes can be compared between the estimated effects on crime against women, other crimes (excluding crime against women from total crime), and total crimes using the same estimation strategy. For this purpose, I estimate separate regressions for other crimes and total crimes.

### RESULTS

The average crime incidence against women in districts during 1995-2013 is 329, and the highest crime incidents against women are as large as 12853, reported in Delhi in the year 2013. The second highest incidence of crime against women is 7363 and is reported in 24 Pargana district of West Bengal in 2011. Excluding these two districts from the total, the mean crime incidents during 1995-2013 are 312, and the maximum reported incidence is 4614. The average total crime incidents in districts is 4014 in a year and the maximum incidence reported is as large as 80184 (again in Delhi in 2013). The old data only takes into account the reported rape incidences under crime against women. For other crimes against women, the data does not provide gender disaggregated numbers but includes overall crime incidents under a crime-head, such as providing total kidnapping data instead of the kidnapping of females, males, and children separately. Therefore, for historical data, I only consider rape incidences with 15 years lag that is data from 1980 to 1998. The total crime with 15 years lag includes data from 1980 to 1998, and on average, it is 3531 incidences, and the highest incidences (64882) is reported in Delhi in 1998. The highest rape incidences (544) is reported in Delhi in 1997, and the second-highest rape incidences (191) is reported in the Moradabad district of Uttar Pradesh in the year 1987 (during the period of 1980-1998).

The NCRB data on crime against women in India reveals that Delhi has the highest incidence of crime against women. The second position is held by 24 Pargana (North and South aggregated data) of West Bengal from 1995 to 2013. Not only that, five other districts of the state of West Bengal rank among the top ten districts with very high incidences of crime against women. Maintaining consistent positions among the top 10 highest crime locations over the years, West Bengal also has the highest incidences of domestic violence (cruelty by husband or in-laws); around one-fifth of such cases in the country happens in this state. West Bengal presents a stark irony as this state is considered to have a more intellectual and progressive mindset but even so

has higher violence against women within the household. The state also registers a higher number of female trafficking cases. A newspaper editorial by Singh (2017) highlighted that the overall conviction rate for crime against women in India stands at 18.9 percent, whereas in West Bengal, the conviction rate is the lowest in the country at 3.3 percent.

The average YSR in districts during 1995-2013 is 910 females out of 1000 males, and the lowest is 215 females in 1000 males in Daman, and the maximum is 1243 females out of 1000 males in the Almora district of Uttarakhand. The CSR data with 15 years lag from 1980 to 1998 has an average of 958 girls out of 1000 boys, and the minimum and maximum are 628 and 1139 females respectively out of 1000 males in Darbhanga district of Bihar and lower Subansiri district of Arunachal Pradesh.

In both censuses of 2001 and 2011, the two lowest YSRs (15-24 years age group) are registered in the two union territories; Daman and Dadra & Nagar Haveli. A report in a prime newspaper of India in 2011 has explained that the very biased sex ratio in Daman and Dadra & Nagar Haveli in favor of males is caused due to higher migration in the areas and most of the migrants are male laborers, which has increased the population but disbalanced the sex ratio. The population has increased by 53 percent and 55 percent in Daman and Dadra & Nagar Haveli, respectively, from 2001 to 2011. Apart from that, preference for boy children and the rise in single-child families have emphasized the biases in these two union territories (Bhatt, 2011). According to the 2011 Census, the bottom five states with the lowest youth sex ratio are Daman, Dadra & Nagar Haveli, Chandigarh, Delhi, and Haryana.

The primary factors contributing to a biased child sex ratio are a preference for a son, discriminatory behavior toward the girl child, and practices like sex-selective abortions, female foeticide, and infanticide. Districts with very low child sex ratios are situated in Punjab, Haryana, Madhya Pradesh, Gujarat, Uttar Pradesh, Rajasthan, and Maharashtra.

As per the last five census data on India, the CSR of India has continuously declined during 1971 - 2011, that is during this period the number of girl children in the age group of 0 to 4 years has diverged continuously from the number of boys in the same age-group. Studies have extensively discussed the causes of this divergence; such “as a kinship pattern (Agnihotri, 1997; Dyson and Moore, 1983; Miller, 1997; Miller, 1981) or neglect of the girl child (Bardhan, 1974;

Gupta, 1987; Mayer, 1999; Visaria, 1969) are mainly due to the social value attached to women because of their economic utility” (Saha and Paul, 2017).

***The relationship between the sex ratios and crime against women***

The OLS results<sup>6</sup> are suspected of providing a biased estimator due to potential endogeneity in the main explanatory variable YSR. Therefore, YSR is instrumented by CSR with 15 years of lag, and the TSLS method is used for estimations. YSR data used in the analysis is from 1995 to 2013, and its instrument, CSR with 15 years lag ( $CSR_{-15}$ ) is considered from 1980 to 1998. The TSLS results are presented in *Table 1*.

*Table 1: Impact of youth sex ratio on crime against women*

Dependent Variable: ln(Crime against Women)	Without Controls	With Controls	District Trend and w Controls
<b>TSLS results:</b>			
YSR	-0.00492** (0.00226)	-0.00535** (0.00219)	-0.00536** (0.00220)
Urbanization Rate		-0.000107 (0.00221)	-0.000187 (0.00219)
Literacy Rate		-0.00548* (0.00327)	-0.00537* (0.00324)
ln(Female Population)		0.520*** (0.173)	0.501*** (0.172)
Rape with 15 years lag		-0.00111 (0.00119)	-0.00115 (0.00120)
Constant	10.67*** (2.219)	4.056 (3.645)	2.554 (2.730)
N	7358	7358	7358
R-sqr	0.912	0.913	0.913
Year FE:	Yes	Yes	Yes
District FE:	Yes	Yes	No
District Trend:	No	No	Yes
First Stage Regressions - Dependent Variable: YSR			
CSR with 15 years lag	0.1723*** (0.0350)	0.1750*** (0.0133)	0.1726*** (0.0134)

Standard errors clustered at district levels are shown in parentheses.

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

In the first result column, the estimation does not use any control variables, and the second column presents results with control variables. The control variables used in this analysis are

<sup>6</sup> The OLS regression results using CRW as dependent variable and YSR as main explanatory variable along with other control variables are not shown in the paper due to space limitation, but these results are available from author upon request.



urbanization rate, literacy rate, log of the female population, and rape incidences with 15 years lag. Districts with historically higher (lower) crime rates against women may be more (less) son biased, and thus, have more (less) skewed sex ratios in favor of males. In order to consider this possibility, the estimation includes the reported rape incidences in the districts with 15 years lags ( $Rape_{-15}$ ) as a control variable. The ( $Rape_{-15}$ ) data, therefore, includes information for districts from 1980 to 1998. Due to the unavailability of old rape data for some districts in some years, 147 observations are dropped from estimations to equate observations to compare the results in three models. The year fixed, and district fixed effects are used to analyse the first and second columns' estimations to capture the time-specific and location-specific factors. There can be cases that CRW in some districts is higher than CRW in others, and also districts may have some time trend that can affect the crimes of the location. It would be difficult to examine the time series data of 395 districts because the nature and trend of crime rates against women can be similar in some of the districts. Accounting for that, I also perform estimation including district-specific linear time trends, and results are shown in the third column of *Table 1*. The standard errors are clustered at district levels for all the estimations.

The results in *Table 1* indicate that YSR has a significant and negative relation with CRW in all three estimations. The coefficients can be interpreted as an increase in one female per 1000 males, that is 1 unit increase in youth sex ratio in favor of females will reduce the crime rate against women by around 0.49 percent when estimated with year and district fixed effects but without any control variables. After adding control variables in the estimation, I find that a 1 unit increase in YSR in favor of females can decrease CRW by 0.53 percent. Both these coefficients are statistically significant at the 5 percent level. Adding district trends, the results remain robust in size and significance. Among the control variables, urbanization rate, literacy rate, and past rape incidences have negative relations with CRW, whereas the log of the female population has a positive relation with CRW.

*Table 2* shows the reduced form results. Similar to the earlier estimations shown in *Table 1*, three strategies are used, except here, the main explanatory variable is the instrument itself ( $CSR_{-15}$ ) instead of YSR. The first, second, and third result columns show the estimations without controls, control variables, and district trend (without district fixed effects). The ( $CSR_{-15}$ ) coefficients are negative and statistically significant in all cases. The results can be interpreted as

an increase in one girl child in 1000 boys in the past, that is 1 unit increase in child sex ratio in favor of girls 15 years before could significantly reduce the current crime rate against women by around 0.093 percent, keeping all other things same.

Table 2: Impact of child sex ratio on crime against women

Dependent Variable: ln(Crime against Women)	Without Controls	With Controls	District Trend and w Controls
<b>Reduced form results:</b>			
CSR with 15 years lag	-0.000847** (0.000399)	-0.000936** (0.000375)	-0.000931** (0.000376)
Urbanization Rate		0.00166 (0.00204)	0.00164 (0.00201)
Literacy Rate		-0.00264 (0.00246)	-0.00256 (0.00244)
ln(Female Population)		0.500*** (0.145)	0.476*** (0.144)
Rape with 15 years lag		-0.00188* (0.00107)	-0.00193* (0.00108)
Constant	6.705*** (0.408)	-0.101 (2.131)	-101.5*** (7.303)
N	7358	7358	7358
R-sqr	0.915	0.917	0.917
Year FE:	Yes	Yes	Yes
District FE:	Yes	Yes	No
District Trend:	No	No	Yes

Standard errors clustered at district levels are shown in parentheses.

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

Earlier, I have discussed that Delhi and 24 Paragana (West Bengal) have historically very high incidences of CRW compared to other districts, and these two districts are outliers in the sample of 395 districts. Therefore, I drop these two districts and re-estimated the results<sup>7</sup>. Even after dropping these two outliers, the results remain significant, but the impact size increases by a small amount. An increase in YSR by 1 unit will reduce CRW by 0.54 percent, ceteris paribus. The

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<sup>7</sup> These results are not included in the paper, this can be available from the author upon request.

reduced form regression also remains robust; an increase in the past CSR by 1 unit causes a reduction in current CRW by 0.095 percent on average, keeping other things the same.

**Comparison of relationships of crime against women, total crime and other crime with sex ratio**

Another objective of this paper is to compare the relationships of sex ratios with CRW, other crime (CRO), and total crime (CRT) so as to examine how different sex ratios can impact different types of crime. Other crimes represent the overall crime except for CRW. In the case of estimations with dependent variables CRO and CRT, I use log of total reported crime with 15 years lag instead of  $Rape_{-15}$ . These results are presented in Table 3. The results with control variables can be interpreted as an increase in 1 female in 1000 males; that is, a 1 unit increase in YSR causes a 0.53 percent reduction in CRW, a 0.50 percent reduction in CRO, and a 0.46 percent reduction in CRO CRT on average, ceteris paribus. After adding district-specific linear time trends in the estimations, I find that the impacts of YSR on CRW and CRT become the same in magnitude, and the impact on CRO becomes larger. More specifically, a 1 unit increase in YSR, on average, reduces CRW and CRT by 0.51 percent and CRO by 0.54 percent, keeping other variables constant.

Table 3: Relationship of sex ratios with different crime categories

Dependent Variable:	Crime against women (CRW)	Other crime except CRW	Total crime reported
<b>Panel A:</b>			
TOLS regression: YSR	-0.00514** (0.00229)	-0.00451** (0.00194)	-0.00414** (0.00185)
Reduced form: $CSR_{-15}$	-0.000869** (0.000398)	-0.000762** (0.000299)	-0.000700** (0.000291)
N	7232	7232	7232
Controls	No	No	No
District FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
District Trend	No	No	No
<b>Panel B:</b>			
TOLS regression: YSR	-0.00565** (0.00221)	-0.00497** (0.00205)	-0.00458** (0.00194)
Reduced form: $CSR_{-15}$	-0.000965*** (0.000372)	-0.000837*** (0.000301)	-0.000772*** (0.000290)
N	7232	7232	7232
Controls	Yes	Yes	Yes
District FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
District Trend	No	No	No
<b>Panel C:</b>			
TOLS regression: YSR	-0.00511* (0.00295)	-0.00545** (0.00234)	-0.00511** (0.00222)
Reduced form: $CSR_{-15}$	-0.000959** (0.000374)	-0.000819*** (0.000299)	-0.000756*** (0.000288)
N	7232	7232	7232
Controls	Yes	Yes	Yes
District FE	No	No	No
Year FE	Yes	Yes	Yes
District Trend	Yes	Yes	Yes

SEs clustered at district levels are given in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

The reduced form regression results with control variables and fixed effects indicate that a 1 unit increase in past CSR can cause a reduction in current crime rates, such as CRW by 0.096 percent, CRO by 0.084 percent, and CRT by 0.077 percent. Therefore, the impact of past CSR on current crime against women is the highest, and the impact is found lowest on total crime. Adding district trend, the impact of 1 unit increase in past CSR can reduce CRW, CRO, and CRT by 0.096 percent, 0.082 percent, and 0.076 percent, respectively. From all these estimation results, it can be said that the impact of biased sex ratios on crime against women is higher compared to the impact of the same on other crimes apart from CRW.

Further, I divide the data as per the YSR quintiles in order to examine the impact of sex ratios across their intensity of biasedness on crime against women. The quintiles are calculated over the youth sex ratio values of districts over time, and a district can be in different quintiles in a different year. The TSLS estimations in quintiles<sup>8</sup> indicate that in districts with the most biased YSR, the impact of YSR on crime rate is highly significant but lower in size compared to districts where YSR is moderately biased. In the lowest YSR districts, an increase in YSR by 1 unit causes a significant reduction in CRW by 0.4 percent. From the quintile-wise analysis, I can infer that in districts with very biased YSR (lower than 890 females per 1000 males), an increase in women can reduce crime against women. As the availability of women increases as partners, the number of single men will reduce, and that can reduce CRW. In other words, in already very biased YSR districts, people will value women if the number of women increases, so violence towards them may reduce. But, starting from the third quintile (above 890 females per 1000 males), the impact of YSR on crime becomes positive; that is, an increase in the number of females may increase the crime against women. The overall inference from the quintile-wise analysis is that in places where females are very low in numbers compared to males, crime against women can be reduced by reducing the number of single men and/or increasing the number of women. However, in districts where YSR is more than 890 females in 1000 males, an increase in females may not significantly impact the crime against women.

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<sup>8</sup> The results are not included in the paper but can be available from the author upon request.

### *The region-wise analysis of the relationship between sex ratios and crime against women*

The states of India can be categorized into six regions in terms of geographical location in the country. The regions are as follows: Northern, Southern, Central, Western, Eastern, and North-Eastern Regions. The results of the region-wise analysis<sup>9</sup> reveal that in the Western region, biased sex ratio in favor of males may impact crime against women substantially and significantly. Improvement in YSR by one unit can cause a 1.3 percent reduction in crime against women on average, but such improvement in sex ratios would not significantly change other and total crime in the western part of the country. In India's Northern and Southern regions, the biased sex ratio has a negative but insignificant impact on CRW, with a larger impact in the Southern part compared to the Northern. The past CSR with 15 years lag has a negative and highly significant impact on both CRO and CRT by around 3 to 3.5 percent in the Northern region, keeping other things the same. It means that in the Northern region, patriarchal values, and prevalence of son preference from the past are significantly detrimental to society by increasing other crimes or crimes in general. However, the past prevalence of son preference does not significantly cause an increase in today's crime against women in Northern India. In other regions, such as Eastern and Central India, the biased sex ratios in favor of males have positive but insignificant relation with violence against women, other and total crimes. In the North-Eastern region, the past CSR with 15 years lag has significant and negative relations with both CRO and CRT, keeping other things the same.

The comparison of impacts of sex ratios on crime between six regions indicates that biased sex ratio has the most significant effect on women's lives in the Western part than in any other regions of India, and improvement in sex ratios in favor of females may significantly reduce crime against women in the Western region. In the Northern states, biased sex ratios have the most significant relation with other crime and total crime rather than a crime against women, and policies towards improving sex ratios in favor of females may significantly reduce violence rate, in general, in this region. Both Western and Northern regions include states and districts with more pro-male biased sex ratios, and also crime rates are higher in the districts of these two regions.

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<sup>9</sup> The results are not included in the paper but can be available from the author upon request.

### ***Crime-head wise analysis:***

This section examines the impact of imbalances in sex ratios on different types of crime under the category of crime against women. Among 395 districts during 1995-2013, the average annual rape incidences are 37, kidnapping is 43, molestation is 78, and the average of sexual harassment incidences is 21. Among these crimes, the annual average of domestic violence incidences is 141, which is as high as four times of average rape incidences, twice of molestation, and seven times of sexual harassment incidences per year. While Delhi has the highest rape and kidnapping incidences, 24 Parganas has the highest domestic violence occurrences. Delhi has always been among the top three districts in all crime-heads of CRW, followed by 24 Parganas.

*Table 4* shows the relationship of sex ratios with different crime-heads under CRW. Domestic violence has the highest share in CRW, and its growth rate is much higher than other crime incidents against women. The estimated results show that YSR has the highest impact on domestic violence compared to other crime-heads. Improvement in YSR by 1 unit in favor of females can significantly reduce the rate of domestic violence by 0.8 percent on average, *ceteris paribus*. And, an increase of 1 female per 1000 young males may cause a significant reduction in the kidnapping of girls (women) by 0.74 percent on average, keeping other things the same. Not only that, even if the past child sex ratio has increased by 1 unit in favor of girls, it would cause a significant decline in both domestic violence and kidnapping by 0.12 percent. For other crime-heads under crime against women, the estimated coefficients are not statistically significant. Skewed sex ratio may have a negative impact on dowry deaths; more specifically, one unit improvement in YSR due to an increase in females can cause a 0.2 percent decrease in deaths due to unmet dowry demands, keeping other things the same. The past CSR may also have a negative impact on dowry deaths, but such effects are small in size and statistically insignificant. The biased sex ratios, both YSR and  $CSR_{-15}$  do not have a negative and statistically significant impact on rape incidences. The sexual harassment incidences may also reduce due to improvement in sex ratio; however, molestation may not show a decline due to improvement in sex ratios in favor of females.

Table 4: Crime-head wise analysis: Impact of sex ratios

Dependent Variable: Crime-head:	TSLs:			Reduced Form:		
	Main explanatory variable -			Main explanatory variable -		
	YSR	YSR	YSR	CSR <sub>-15</sub>	CSR <sub>-15</sub>	CSR <sub>-15</sub>
Rape	0.000362 (0.00199)	0.000139 (0.00188)	0.000214 (0.00188)	0.0000588 (0.000326)	0.0000240 (0.000324)	0.0000365 (0.000322)
N	7409	7279	7279	7409	7279	7279
Kidnapping	-0.00881*** (0.00298)	-0.00736*** (0.00271)	-0.00738*** (0.00276)	-0.00142*** (0.000491)	-0.00125*** (0.000480)	-0.00124** (0.000485)
N	7339	7208	7208	7339	7208	7208
Domestic Violence	-0.00845** (0.00388)	-0.00785** (0.00354)	-0.00778** (0.00357)	-0.00130** (0.000512)	-0.00128** (0.000525)	-0.00125** (0.000527)
N	7282	7151	7151	7282	7151	7151
Molestation	0.000524 (0.00388)	0.000115 (0.00354)	0.000107 (0.00357)	0.0000780 (0.000512)	0.0000183 (0.000525)	0.0000164 (0.000527)
N	7303	7172	7172	7303	7172	7172
Sexual Harassment	-0.000118 (0.00322)	-0.000797 (0.00305)	-0.000879 (0.00309)	-0.0000166 (0.000455)	-0.000121 (0.000464)	-0.000132 (0.000464)
N	7042	6913	6913	7042	6913	6913
Dowry Death	-0.00187 (0.00230)	-0.00207 (0.00204)	-0.00205 (0.00207)	-0.000288 (0.000374)	-0.000338 (0.000350)	-0.000331 (0.000351)
N	7197	7067	7067	7197	7067	7067
Controls	No	Yes	Yes	No	Yes	Yes
District FE	Yes	Yes	No	Yes	Yes	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
District Trend	No	No	Yes	No	No	Yes

Standard errors clustered at district levels are in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Careful examination of data reveals that there are some outliers in the incidences of crime. For example, the maximum rape incidences are registered as 1636, whereas only 4 and only 12 districts have reported rape more than 600 and 500 respectively in a year. Similarly, domestic violence has an extreme value at 5640, whereas only 15, 81, and 332 observations have reported incidences of domestic violence in a year above 2000, 1000, and 500, respectively. Such extreme values may skew the results up to some extent. To examine the robustness of the crime-head wise estimations, I re-estimate the results (not shown here but available on request from the author) after dropping these extreme (outliers) observations from the analysis, and find that the results remain robust, though the size of the impact increases in some cases. For domestic violence, exclusion of 81 observations, that is, observations with values above 1000, increases the impact of YSR: an increase in YSR by 1 unit reduces domestic violence by 0.9 percent on average (not shown in the table). And after the exclusion of 332 observations that have reported domestic



violence cases above 500, an improvement in YSR by one unit may significantly reduce violence against women within the household by 1 percent, *ceteris paribus*.

Overall, the crime-head analysis provides evidence towards significant and higher crime-reducing impacts of sex ratios on particularly domestic violence and kidnapping of girls: that is of around 0.8 percent reduction in these two crime-heads due to one unit improvement in YSR in favor of females. But the impact of pro-male biased sex ratios on the rest of the crime-heads, especially sexual crimes, such as rape, molestation, and sexual harassment, remains lower in magnitude and statistically insignificant. Therefore, these results provide significant evidence towards the channel of ‘scarcity of women and increasing vulnerability and not statistically significant evidence for the channel of ‘surplus single men and increasing violence due to sexual frustration.’ As the results support the channel of ‘scarcity of women and increasing vulnerability’ then it can be expected that acute shortage of women as partners in the districts with very skewed sex ratios in favor of males may lead to more non-traditional marriages, that is increasing acceptance towards inter-caste, inter-religious and also inter-state marriages. In such locations, it can also be expected that an increasing number of males are getting married to younger brides than earlier due to a shortage in marriage cohorts. Though at this point, I do not have district-wise data on marriage statistics over the years, the national level or nationally representative survey data can give us some idea about the marriage trends over the years. The marriage statistics can be checked from Census 1991, 2001, and 2011 and some related data from the nationally representative survey, NFHS-3 (2005-06) and NFHS-4 (2015-16).

The census data shows the percentage of individuals already married in the total number of individuals across age groups. Even at the early age of 10-14 years, around 4.5 percent of girls in 1991 and around 2.5 percent of girls in 2001 and 2011 are already married. In 1991, at the age group of 15-19 years, around 35 percent of girls were already married, whereas only around 10 percent of boys at the same age were married. Though the percentage of married girls has declined over the last two censuses, in 2001 and 2011, still the percentage is very high, such as around 20 percent girls get married within 15 to 19 years of age whereas only 5 percent boys among total boys at the same age got married according to Census 2011. According to UNICEF (2018), even in 2018, roughly 47 percent of girls get married before their 18<sup>th</sup> birthday, and around 18 percent of girls get married before 15 years of age. In the states of Bihar and Rajasthan, the prevalence of

child marriage among girls is as high as above 60 percent. The 2018 UNICEF report estimated the prevalence of child marriage in India as 27 percent. The NFHS data also show that around 13 percent of girls get married before age 15, and around 38-40 percent of girls get married before the age of 18. It is also important to mention that in India, the legal age of marriage for girls is 18 years (21 years of age for boys), by the Prohibition of Child Marriage Act. The information from three different sources supports the wide prevalence of child marriages among Indian girls, even today.

In the third (2005-06) and fourth (2015-16) rounds of NFHS data, the information on inter-caste and inter-religious marriages show that both these types of marriages have increased from NFHS-3 to NFHS-4. The percentage of inter-caste marriages increased from around 10 percent in 2005-06 to 12.6 percent in 2015-16. Though the percentage of inter-religious marriages is low compared to inter-caste marriages, it has also increased over ten years. In addition, a report on human trafficking in 2013 by the UN Office of Drugs and Crime (UNODC) has shown concern about increasing trafficking of young girls to meet the shortages of brides in states with acute male-biased sex ratios, such as Haryana, Punjab, and Uttar Pradesh. The report cites a survey of 92 villages in Haryana, which shows that around 90 percent of married women had been bought from poor villages in other states.

The NFHS-3 and NFHS-4 have information on the age gap (husband's age - wife's age) between couples and show that the percentage of marriages within age gap of 1, 2, and 3-5 years have increased from 2005-06 to 2015-16, but for age gap of 6-10 and more than ten years has decreased from NFHS-3 to NFHS-4. Though the percentage of marriages in higher age-gap has not increased, it can be the case that in more progressive states with increasing female labor-force participation, women in such states get married late and have partners of similar age. Thus, the age-gap widening is not abundant in these states. Nevertheless, in states where acute pro-male biased sex ratios are prevalent, a higher percentage of males may get married to younger girls due to shortage. In national data, progressive and patriarchal states' statistics may balance each other. To examine the age-gap trend among couples at district levels, more detailed data would be required.

Overall, the statistics on Indian marriages from different sources provide evidence that shortages of a female cohort to marry impact the marriage market of India in the forms of

increasing inter-caste, inter-religious and inter-state marriages, and leads to child marriage in various parts of the country. Females, who marry at early ages and even before adulthood, tend to remain less educated, less involved in the labor market, begin having children earlier, have less bargaining power in the family, and be more vulnerable to abuse from family members. In addition, cross marriages bring the brides to a not-so-familiar cultural setup; therefore, these girls need more effort and time to adjust to culture, customs, and location and are more likely to face higher discrimination and violence due to lack of support from in-laws family and the unknown neighborhood.

### **DISCUSSION AND POLICY IMPLICATIONS**

As a result of widely adopted sex-selective family planning in the prevalence of preference for sons along with patriarchal norms, India has increasingly biased sex ratios in favor of males. With this, the co-existence of growing criminal activities and particularly an increase in crime against women (compared to other crimes) generates the paradox that despite the scarcity of women, their value in society does not advance but creates an increasingly unsafe society for women. In this paper, I examine this coincidence of biased sex ratio in favor of males and higher incidences of violence against women. Using panel data on population from census and crime data from NCRB for 395 districts of India from 1995 to 2013, I estimate the relationship between sex ratios and crime against women.

The results from the analysis indicate a significant negative impact of pro-male biased sex ratios (YSR and lagged CSR) on crime against women; that is, while sex ratios increase in favor of females, the crime rate against women may decline. However, it is essential to mention that a higher crime rate can be attributed to various factors. It is not justified to say that only gender imbalances in the population have caused it; instead, it is partly responsible for increasing crime incidents against women. In this analysis, I have controlled for urbanization, literacy rate, past crimes, and female population, but some other factors contribute to lower or higher crime, such as poor law and order in some districts than others. Due to data unavailability for districts over the years, other relevant variables remain omitted from this analysis.

The main results reveal a negative and significant relation between sex ratios and crime against women. An increase in YSR by 1 unit (or 1 female per 1000 males) can reduce crime

against women by 0.53 percent on average, *ceteris paribus*. This estimated impact is statistically significant at a 5 percent level. Further, it is also estimated that an improvement in the past CSR (with 15 years lag) by 1 unit would have significantly reduced recent crime against women by 0.093 percent. India, being the second-highest populated country globally, the size of the impact is not trivial. It demands a proactive role of authorities to correct the imbalances in demographic numbers and create a safer society for all, particularly for women.

Comparing the effects of imbalanced sex ratios on crime against women, any other crime except CRW and crime in total, I found that the impact on crime against women is higher than the impact on other crimes. Therefore, it indicates that surplus males can cause a more violent society, but the situation will worsen for women compared to men. However, using district-specific linear time trends, the impact of the youth sex ratio was highest on other crimes. The region-wise analysis shows that the impact of sex ratios on CRW in the western part is highest among the six regions of India. Crime against women can be significantly (at 5 percent level) reduced by 1.3 percent in the western region only through correcting YSR by 1 unit. In addition, if past CSR (with 15 years lag) would increase by only 1 unit, it could cause a 0.5 percent reduction in the current crime rate against women on average in the western part of the country. The most orthodox states of India belong to the northern part. The result shows negative impacts of both YSR and ( $CSR_{-15}$ ) on CRW in the northern and southern regions, but these results are statistically insignificant. However, in the northern region, the biased past child sex ratio significantly impacts both other and total crime.

Surprisingly, the eastern region does not show a negative relation between sex ratios and CRW. Though this region shows very high rates in all types of crime incidences against women, the estimated result indicates that this high crime rate is not significantly related to the sex ratios in the region. The sex ratios in the eastern region are not as biased as the sex ratios in India's northern and western regions. Among the eastern states, especially in West Bengal, many districts show very high incidences of crime against women in the analysis years. However, these districts do not record very imbalanced sex ratios. It is ambiguous in the case of West Bengal, as on the one hand, the state is considered a more progressive state in terms of women empowerment, and probably that causes higher reporting of violence against women. In contrast, on the other hand, the statistics show higher rates of domestic violence which indicate the presence of patriarchal power relations within the household setup in the state.

In addition, the detailed crime-head-wise analysis provides evidence that it is not rape incidences that have the highest growth, but domestic violence has the highest increase over the analysis period. It is also found that the impact of sex ratios is the highest on domestic violence, followed by kidnapping compared to other CRW. An increase in YSR and past  $CSR_{-15}$  by 1 unit would reduce domestic violence incidences by 0.78 and 0.13 percent on average, respectively. These results are statistically significant at a 5 percent level. Similarly, the kidnapping of girls can be reduced by 0.74 and 0.12 percent due to improvements in YSR and  $CSR_{-15}$  by 1 unit, respectively.

It can be explained that imbalances in the ratio of females to males can distort peace and even safety within the household due to the power relations of males with female family members. The lower number of females on average compared to males in the household may emphasize the dominance of male members and can result in more physical and mental violence towards females in the family. The negative relation and non-trivial size of the impact of sex ratio on dowry death also reinforce the belief that more males can create a more patriarchal society, and the norms of patriarchy will be adopted vigorously in such a society. Without the fulfillment of such norms, a dowry system can cause extreme violence towards women, even death.

Therefore, the crime-head-wise findings provide evidence towards the channel that a lower ratio of female to male leads to increase women's vulnerability within the household due to increasing intercultural, inter-caste, inter-religion, and inter-region marriages. However, neither rape nor molestation holds a negative and significant relationship with current YSR and/or past CSR. The impact of an imbalanced sex ratio on sexual harassment is much smaller in size and insignificant compared to the same on domestic violence, kidnapping, and dowry death, though holds a negative relation. Therefore, we can say that the surplus men can cause a more violent society in general, but the frustrations of surplus men do not channel into sexual violence towards women and extreme crimes like rape.

The evidence of this significant negative impact of sex ratios on crime against women directs a specific area for policy implication that women's safety and security situations can improve partly by correcting the sex ratio imbalances. Though sex-selective abortions have been controlled up to some extent by the amendment of PCPNDT act, it has not stopped entirely, and an underground market still exists to provide such illegal services. In addition, sex-selective family

planning depending on the gender of the firstborn child(ren) continues to a varying extent across India, at a higher rate in northern and western parts of India. The use of past CSR in relation to CRW also implies that the preference for sons from the past results in an increasingly unsafe society for women today. If the practices of fulfilling the desire for sons continue, it will worsen the situation and give us a more dangerous society for women.

The imbalances in sex ratio against females have many negative consequences, the household level decisions of having a boy(s) instead of girl(s) affect the whole nation on an aggregate level with an increasingly violent society. It becomes essential for the government and authorities to adopt a more proactive role to balance the number of females with males in the coming generations. This task becomes problematic in the case of India due to its population size as the second highest in the world. Government initiatives towards restricting population growth and promoting smaller families may actually go against the initiatives towards balancing sex ratios. Population control policies can influence the couples to become strictly adherent towards a preference for a son, and thus if only two children they can have, they would likely have at least a son. Therefore, it is of utmost necessity to vigorously implement the PCPNDT Act, and strict regulation should be implemented on sex-determination procedures and thus stop sex-selective abortions. In addition, civil society, non-governmental organisations, and media can play a crucial role through advocacy, mass campaign, and awareness-raising programmes on the importance of girls and the drawbacks of having surplus men. It is required to change people's mindsets and attitudes towards girls and highlight women's success stories. These campaigns may positively influence the views that only see sons as worthy in carrying forward family name and reputation.

Other initiatives that can raise the importance of girl children in society are equally important. The equal right of inheritance in parents' property irrespective of the gender of the offspring, strict dowry prohibition laws, and better policies towards old-age security, improvement in pension schemes will be helpful to reduce parents' dependence, particularly on sons. Apart from these, women's empowerment through better access to education and job opportunities may improve women's financial situation. They can have more say in marriage, child-bearing, and other important life decisions and can take care of their own parents even after being married. The government authorities should undertake a rigorous policy and legal framework to stop child marriage. Government bodies may also provide incentives to parents for the birth of girl children,

providing child-care funds to poor parents at the birth of girl child, scholarships for girls' education, etcetera. These can be helpful to share the so-called burden of bringing up a girl child and can be valuable in their empowerment. The reduction in preference for sons and thus discrimination against girls need continuous and multiple initiatives in the long term to see fruitful results in terms of sex ratio. In countries like India, where population pressure is a problem in itself, a very high share of males in comparison to females can only add to the problem by resulting in an increasingly unsafe society for all. If policies would not improve sex ratios in favor of females; it not only challenges the safety of women in the society but may also heighten the gender gap in areas like education, income, labor market; reduce labor force participation; restrict choices and opportunities of jobs for women; reduce earning and bargaining power of women in the family and society.

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