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Skewed Sex Ratios and Criminal Victimization in India

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Abstract

Although substantial research has explored the causes of India's excessively masculine population sex ratio, few studies have examined the consequences of this surplus of males. We merge individual-level data from the 2004–2005 India Human Development Survey with data from the 2001 India population census to examine the association between the district-level male-to-female sex ratio at ages 15 to 39 and self-reports of victimization by theft, breaking and entering, and assault. Multilevel logistic regression analyses reveal positive and statistically significant albeit substantively modest effects of the district-level sex ratio on all three victimization risks. We also find that higher male-to-female sex ratios are associated with the perception that young unmarried women in the local community are frequently harassed. Household-level indicators of family structure, socioeconomic status, and caste, as well as areal indicators of women's empowerment and collective efficacy, also emerge as significant predictors of self-reported criminal victimization and the perceived harassment of young women. The implications of these findings for India's growing sex ratio imbalance are discussed.

Keywords

Sex ratio; India; Crime; Victimization; Sexual harassment

Introduction

The population of India has long exhibited a surplus of males and an attendant deficit of females (Agnihotri 2000; Dyson 2001; Guillot 2002). Among young children, the male-to-female sex ratio has actually become more masculine (Garg and Nath 2008; Guilmoto 2008), with the 2011 India census showing a growing numerical deficit of female children over the prior decade (Census of India 2011; Roy and Chattopadhyay 2012).[1] A substantial

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[1]In Indian demography, the sex ratio is traditionally expressed as the number of females per males. Unless otherwise noted, we adopt the convention for measuring the sex ratio that is used the most elsewhere in the world: the number of males per females.

body of research has documented levels, trends, and group differences in India's population sex ratio, and has explored the proximate and distal causes of India's "missing women" (Agnihotri 2000; Chakraborty and Kim 2010; Sen 1992). However, comparatively little research has explored the consequences of distorted population sex ratios for other aspects of society—in India or elsewhere (Dyson 2012; Hesketh and Xing 2006).

One potentially problematic repercussion of an excessively masculine population sex ratio is a higher rate of crime and violence. Given pronounced gender differences in criminal behavior, one would expect that populations with a relative surplus of men—and especially young men—would exhibit high rates of criminal offending and victimization. Yet, perhaps surprisingly, prior studies of the effects of the sex ratio on crime, both in India and elsewhere, have generated somewhat inconsistent findings regarding this association. The purpose of this article is to examine the possible impact of the sex ratio on self-reports of criminal victimization. With its large imbalance in the numbers of women and men, in tandem with rising concern over ostensible increases in violent crime, India constitutes a timely and opportune context for exploring this association. We use data from the 2004–2005 India Human Development Survey (IHDS), to which we have appended district-level age-specific sex ratios computed from the 2001 India census. In evaluating the effect of the district sex ratio on the risk of criminal victimization, we include numerous statistical controls at both the household and district levels.

Background and Hypotheses

As in China and some other Asian countries (Croll 2000; Das Gupta et al. 2003), in many parts of India, men outnumber women; for much of the country, this sex ratio imbalance has shown few signs of abating over recent decades (Agnihotri 2000; Garg and Nath 2008; Griffiths et al. 2000; Guilmoto 2007; 2012; Mayer 1999). With an overall male-to-female sex ratio of 106.4, women are moderately underrepresented in India's total population. Of greater concern, however, is the growing numerical deficit of young girls. Guilmoto (2008) reported an all-India increase in the childhood (ages 0 to 4) sex ratio from 98 boys per 100 girls in 1971 to over 107 boys per 100 girls in 2001. By 2011, there were 109.4 boys per 100 girls (ages 0 to 6) recorded in the India census (Census of India 2011). Moreover, the current male-to-female sex ratio at birth is about 111, well outside the normal range (Haub 2011). To be sure, there are some signs of improvement: a few states with historically high male-to-female sex ratios, such as Punjab and Haryana, have demonstrated recent reductions in both the overall sex ratio and the child sex ratio. Still, the numerical deficit of young girls is both pronounced and deteriorating in much of the country. Scholars and policymakers alike have long viewed with alarm the "missing" girls and women of India reflected in these figures (Bandyopadhyay 2003; Bhat and Sharma 2006; George 2002; Klasen and Wink 2002; 2003; Sen 1992).

Most research on India's sex ratio imbalance has been devoted to describing levels and trends in male surplus and female shortage while also attempting to identify the proximate and distal causes of this imbalanced sex ratio. For the country as a whole, the most proximate causes of imbalances in the adult sex ratio are, of course, imbalanced sex ratios at birth and during childhood in prior years. Sex ratio imbalances at birth and in childhood

create sex ratio imbalances in adulthood as cohorts age. In turn, a male-dominated sex ratio at birth is at least partially the result of a long-standing preference for sons over daughters (Clark 2000; Das Gupta et al. 2003; Pande and Astone 2007) combined more recently with the widespread adoption of sex-selective abortion technology (Arnold et al. 2002; Bhat and Zavier 2003; George 2002; Hvistendahl 2011; Jha et al. 2006; Patel et al. 2013). During the early childhood years, excess female mortality is acute (Oster 2009) and is largely a consequence of sex differences in nutrition and immunization (Boorah 2004; Mishra et al. 2004; Oster 2009; Pande 2003). Variation in the sex ratio across India's subnational regions may be generated further by sex differences in internal migration (Kaur 2004). At a distal level, high male-to-female sex ratios at birth and during childhood are rooted in a patriarchal culture that extols the economic and familial contributions of boys and men over the contributions of girls and women (Das Gupta 1987; Malhotra et al. 1995).

The ramifications of India's numerical preponderance of men and attendant deficit of women for criminal offending and victimization have received little attention. Given well-documented and likely near-universal gender differences in the commission of most types of criminal offenses (South and Messner 2000; Steffensmeier and Allan 1996), it stands to reason that populations characterized by a numerical surfeit of men would exhibit higher than average rates of crime. All else equal, in societies and communities in which a high-offending group is overrepresented, we should expect to find higher rates of crime and violence. We refer to this expectation as the "supply of offenders" hypothesis. In contrast, social contexts characterized by comparatively low male-to-female sex ratios should exhibit relatively low rates of crime (Hudson and Den Boer 2002, 2004). A numerical abundance of men in the prime offending ages (e.g., teenagers and young adults) is likely to be a particularly important determinant of overall crime rates.

Moreover, a high male-to-female sex ratio generates a marriage squeeze that delays or inhibits marriage among men (Lloyd and South 1996; Tuljapurkar et al. 1995). Unmarried men tend to have higher rates of offending than married men, and marriage has been shown (at least in some countries) to deter men's criminal offending (King et al. 2007; Sampson et al. 2006). A deficit of potential wives may also incentivize men to engage in crime in order to attract a spouse (Edlund et al. 2013). Thus, a masculine population sex ratio not only indicates a copious supply of potential criminal offenders but also skews the marital status composition of the male population toward the most crime-prone group: the unmarried.

A theoretical perspective with particular relevance for the association between the sex ratio and the victimization of women comes from Guttentag and Secord's (1983) treatise on *Too Many Women? The Sex Ratio Question*. Guttentag and Secord argued that when women are numerically scarce (and men are in relative abundance), they will be treated with deference and respect. Women's roles as wives and mothers will be adulated; and consequently, women will be protected from the dangers posed by the larger society. Although women's extrafamilial roles will be constrained, their scarcity will impel men to safeguard and defend them with unusual vigor. Moreover, in order to attract potential mates, men will be especially reticent to harass or otherwise assail women than would be the case in contexts where women are numerically abundant, and hence men's marriage opportunities are plentiful. In essence, then, the Guttentag and Secord (1983) thesis predicts that when men

are in relative oversupply (and thus women are numerically scarce), women will be less likely to be victimized than in less "favorable" sex-ratio contexts. This hypothesis stands in stark contrast to the "supply of offenders" hypothesis advanced earlier, which posits that women will be more likely to be harassed when men are abundant and women are relatively scarce.

Guttentag and Secord's (1983) theory may be particularly germane to the possible impact of the population sex ratio on women's experience of sexual harassment in public places, often referred to in India as "eve-teasing." In India and some other parts of Asia, eve-teasing is a term used to describe a form of public sexual harassment considered distinct from, and less serious than, molestation. Historically, it has been traced back to mid-nineteenth century reports of British and Indian men engaging in behaviors that were considered an outrage to the modesty of women in public spaces (Anagol-McGinn 1994). Typically, eve-teasing refers to verbal jeering and/or obscene gestures made toward women, often by small groups of men, frequently in the form of whistles, songs, or catcalls. It may also include physical (e.g., touching, pinching) or psychological (e.g., following, chasing, blocking a path) harassment that is intended to generate fear or attract the attention of a woman (Mohan and Priyadarshini 1995). Although most Indian women have been subject to this form of sexual harassment at some point in their lives, some observers feel that it is behavior that can be overlooked or ignored because, in their view, it is largely harmless (Baxi 2000; Jamshedji-Neogi and Sharma 2003). However, feminist scholars and activists vigorously dispute this characterization, arguing that the cultural norms and understandings of eve-teasing legitimize and escalate more serious forms of sexual abuse by positioning women in the public sphere as provocative and therefore deserving of harassment (Baxi 2000).

Prior Research

Despite strong theoretical grounds for positing an association between the population sex ratio on the one hand, and rates of criminal offending and victimization on the other hand, the literature is in fact rather inconsistent in this regard. Cross-national studies of homicide (the crime most comparably measured across countries) usually find null (e.g., Barber 2006; Messner et al. 2010; 2011) or even perplexingly negative effects (e.g., Antonaccio and Tittle 2007; Barber 2000, 2009; Messner et al. 2002) of the male-to-female sex ratio. In a meta-analysis of studies in this genre, Nivette (2011) found that the population sex ratio falls among the weakest and least-consistent predictors of national homicide rates (see also Pratt and Cullen 2005). Perhaps the failure to observe the expected positive association between the population sex ratio and crime rates in comparative studies is due to the relatively small amount of cross-national variation in the sex ratio or to unobserved confounding factors.

In a cross-national test of Guttentag and Secord's (1983) theory, South and Messner (1987) found that the male-to-female sex ratio is unrelated to gender differences in rates of homicide victimization, but it is negatively associated with the rate of female property offending and positively associated with the percentage of rape cases solved by the police (used as an indicator of women's protection by the criminal justice system). Thus, South and Messner's (1987) findings provide mixed support for the Guttentag and Secord (1983) thesis.

Studies comparing communities or geographic areas within a single country likewise have suggested that the association between the sex ratio and crime rates may not be straightforward. In a sample of U.S. metropolitan areas, Messner and Blau (1987) found the expected positive association between the male-to-female sex ratio and homicide and rape rates, but not robbery rates. However, O'Brien (1991) failed to observe this association for rape rates. Messner and Sampson (1991) found that in a sample of 153 American cities, the positive effect of the sex ratio on violent crime rates was suppressed by its effect on family disruption. Although Messner and Sampson (1991) failed to observe the anticipated association at the bivariate level, the expected positive effects of the sex ratio on homicide and robbery rates emerged once they controlled an indicator of family disruption (percentage of families headed by women).

A few studies have also examined the possible impact of imbalanced sex ratios in China, a country that, like India, has been experiencing a growing numerical preponderance of males (Goodkind 2004). Trent and South (2012) found that Chinese women who reside in a community with a relative oversupply of men are more likely than other women to report having been forced to have sexual intercourse—a finding consistent with a "supply of offenders" hypothesis but seemingly inconsistent with the Guttentag and Secord (1983) thesis. Edlund et al. (2013) found that China's increasingly masculine sex ratio was partially responsible for increases in arrest rates for property and violent crimes between 1988 and 2004. Some of the effect appears to operate through China's marriage squeeze and the accompanying reduction in men's marriage propensities (Edlund et al. 2013). Our analysis potentially improves on that by Edlund et al. (2013) by using self-reported victimization rates rather than official arrest rates, thus overcoming the problem that any association between the sex ratio and arrest rates is driven by the differential reporting of crimes to police or by police effort in making arrests.

Of particular relevance for the current analysis are the few studies of the association between the population sex ratio and crime in India. Oldenburg (1992) found a strong and inverse statistical relationship between the female-to-male sex ratio (indicating a relative surfeit of women and undersupply of men) and the homicide rate across Indian districts during the early 1980s. Other studies have also observed such an association (Dreze and Khera 2000; Hudson and Den Boer 2002; Mayer et al. 2008). Contrary to most interpretations of this relationship, Oldenburg suggested that this correlation reflects not the supply of potential offenders but rather an effect of violence on the sex ratio. Oldenberg argued that there is a "need for sons to uphold, with violence, a family's power *vis-à-vis* neighbors" (1992:2658), and thus that Indian families will have an especially pronounced (and actualized) preference for sons over daughters in areas characterized by high levels of violence. However, this interpretation has been challenged on both methodological and theoretical grounds. Mitra (1993) argued that Oldenburg's interpretation ignores the role of sex-specific migration and other cultural determinants of son preference (see also Kaur 2004). Dreze and Khera (2000), in an instrumental variable analysis, found no evidence that homicide rates predict sex ratio imbalances. However, like Oldenberg (1992), Dreze and Khera (2000) also questioned the "supply of offender" interpretation of this association. Rather, they suggested that the positive correlation between male-to-female sex ratios and

homicide rates may not be causal in nature but rather may reflect their joint association with community patriarchy; patriarchal communities may foster, partly via son preference (Clark 2000), a surplus of boys and men and may also generate a male-dominated subculture that rewards criminal and/or violent behavior. We attempt to evaluate this interpretation by controlling for district-level indicators of women's empowerment when assessing the association between the sex ratio and criminal victimization.

For the most part the areal or community sex ratio in India appears only weakly related to crimes other than homicide, although the acknowledged unreliability of official crime statistics renders conclusions tentative (Mukherjee et al. 2001). Mayer et al. (2008) reported weak associations across Indian states between the sex ratio and both arrests for gang participation and crimes of violence against women. Somewhat similarly, Mukherjee et al. (2001) found a moderate inverse association between the female-to-male sex ratio and (female) dowry deaths but generally weak associations between the sex ratio and other crimes against women, including rape, kidnapping, and sexual harassment. In light of these often inconsistent findings regarding the association between the population sex ratio and crime rates in India, along with continued concern over the social consequences of India's "missing women," we believe that the issue warrants reexamination. Our analysis goes beyond the few prior studies of this issue in India by using self-reports of criminal victimization rather than official statistics, by merging census data with high-quality survey data, and by incorporating numerous controls for an array of potential confounders at both the individual and community levels.

Data and Methods

Data for this study come from two sources: the India Human Development Survey (IHDS) and the 2001 India population census. The IHDS is a multipurpose, nationally representative survey of 41,554 households interviewed in 2004 and 2005 (Desai et al. 2009). Surveyed households are distributed across 382 of India's 602 districts. The administration of the IHDS consisted of two one-hour interviews in each household, with separate questionnaire modules administered to the household head and to an ever-married woman between the ages of 15 and 49 (N = 33,510). Questionnaire items covered issues related to marriage, fertility, gender relations, health, education, employment, and criminal victimization, among other topics. The IHDS was organized by researchers at the University of Maryland and the National Council of Applied Economic Research in India.

From the 2001 India census, we extract district-level population counts by sex and single years of age. Using the IHDS district codes, we then attach these age/sex distributions to the household records of the IHDS. India population censuses are considered to be of high quality; net undercount rates estimated via post-enumeration survey are quite low. More importantly for the accurate computation of sex ratios, the sex difference in undercount appears negligible (Census of India 2008). Districts have long been used to study the causes (e.g., Agnihotri 2000) and consequences (e.g., Dreze and Khera 2000) of variation in India's sex ratio. India's districts are both administrative and statistical units that are thought to circumscribe the relevant social contexts for a wide range of behaviors (e.g., Desai and Andrist 2010; Malhotra et al. 1995).

Dependent Variables

IHDS household heads were asked the following three questions in the module on local crime: (1) During the last twelve months, was anything stolen that belonged to you or to someone in your household?; (2) During the last twelve months, did anyone break into your home or illegally get into your home?; (3) During the last twelve months, did anyone attack or threaten you or someone in your household? We label these three items "theft," "breaking and entering," and "assault," respectively. For each item, the two possible response categories are "yes" and "no." The fourth dependent variable is somewhat less directly related to criminal victimization, but we include it in this analysis because of its specific relevance for assessing the Guttentag and Secord (1983) thesis. The IHDS asked the ever-married women respondents, "How often are unmarried girls harassed in your village/neighborhood?"[2] The three possible response categories were "rarely/never," "sometimes," and "often." Because of the relative rarity of the latter response, we collapse the second and third categories, contrasting responses of rarely/never with responses of sometimes or often.

Although these self-reports of victimization may not reflect the occurrence of actual crimes, they are likely superior to statistics derived from crimes reported to the police, particularly in a social context where police are often mistrusted. The IHDS asked respondents how much confidence they have in the police. Fewer than one-quarter of IHDS household heads responded "a great deal," almost one-half responded "only some," and over one-quarter responded "hardly any." Given this high level of police mistrust, it seems likely that many crimes are not reported to the police, and thus that official crime statistics, especially for offenses less serious than homicide, are unreliable.

Independent Variables

Our focal independent variable is the district-level male-to-female sex ratio, which we measure here as the number of men ages 15 to 39 per 100 women ages 15 to 39. We estimate the sex ratio at ages 15 to 39 in 2005 by using the sex ratio for the age group 11 to 34 as recorded in the 2001 census. We delimit the sex ratio to ages 15 to 39 because this age range encompasses the prime criminal offending ages. However, robustness checks suggest that our results are, for the most part, insensitive to the specific age range imposed.[3] To limit the influence of the few districts with extreme sex ratios, we bottom-code values of the sex ratio below 50 to that value, and we top-code values of the sex ratio above 150 to that value.

Inferring a causal effect of the sex ratio on criminal victimization is challenging because both variables could be caused by similar antecedent characteristics. Accordingly, we include numerous control variables at both the individual (or household) levels and the district level. Because larger households include more at-risk individuals, we include a continuous measure of household size. We also include a dummy variable for whether the household includes a teenager or young adult between the ages of 15 and 21 because

[2]This question was also asked of the household heads, but the women respondents are likely better positioned to report accurately about the frequency of harassment of young girls.

[3]We also estimated models using the age range 15 to 29, with similar results. However, using the sex ratio for the total population—with no age constraints—generated much weaker and often nonsignificant associations. We tested for nonlinear effects of the sex ratio by including polynomial terms but found no evidence of statistically significant departures from linearity.

household members in this age group may be at especially high risk of victimization by theft and assault.

Household education level is captured by the highest level of education (years of schooling) attained by the most-educated adult. Household income is the total amount of money earned from all sources by all household members (in 1,000s of rupees). Homeownership is a dummy variable scored positive for owners.

To capture possible religious differences in victimization risk, we include separate dummy variables for Hindus and Muslims, with all other religious categories serving as the reference. To capture possible caste differences in criminal victimization, we include separate dummy variables for members of scheduled castes, scheduled tribes, and other backward castes (OBCs), with other castes serving as the reference category.

Most of the district-level control variables are computed by aggregating IHDS sample characteristics to the district level. We include the percentage of the population that resides in an officially defined urban area and the mean household income. To test Dreze and Khera's (2000) suggestion that the association between the sex ratio and crime may be driven by their common association with a patriarchal social structure, we include measures of several dimensions of arguably patriarchy's opposite: women's empowerment. Women's empowerment is a complex, multidimensional concept that has been measured in a variety of ways (Kabeer 1999; Malhotra and Mather 1997; Malhotra and Schuler 2005; Mason 1986, 2005). Our measurement strategy follows the work of several scholars (Mason and Smith 2000; Morgan et al. 2002; Schuler and Hashemi 1994; Schuler et al. 1997, 2010) but particularly the recent work of Desai and Andrist (2010), who also used the IHDS. As an indicator of women's control over family resources, we include the proportion of women who have their names on the home title or rental papers. As an indicator of women's access to resources, we include the proportion of women who report that they have their own cash on hand to spend on household items. As an indicator of participation in household decisions, we use the mean of the number of the following four areas in which women say they have at least some say: (1) whether to buy an expensive item, such as a television of refrigerator; (2) how many children to have; (3) what to do if a child is sick; and (4) whom children should marry. As an indicator of women's constrained freedom of movement (a reverse measure of empowerment), we include the district-level proportion of women who report that they need permission from their husband or other family member to visit the home of relatives or friends. To capture gender bias toward youth, we include the proportion of women who think that boys should receive more education than girls rather than both genders receiving the same or girls receiving more education.

We also include a crude indicator of community collective efficacy. Higher levels of collective efficacy have been linked frequently to lower rates of crime and violence in U.S. communities (e.g., Ahern et al. 2013; Sampson et al. 1997). Communities characterized by stronger social ties and interpersonal trust are thought to be better equipped to monitor potential offenders and prevent criminal behavior. IHDS respondents were asked the following: "In some communities, when there is a water supply problem, people bond together to solve the problem. In other communities, people take care of their own families

individually. What is your community like?" The two possible responses are "bond together to solve problem" and "each family solves individually." Our measure of collective efficacy is the district-level proportion of respondents who say that in their community, people bond together to solve the problem. Although this measure does not capture the full multidimensionality of the concept of collective efficacy (Sampson 2006), it is similar to an indicator frequently used in U.S.-based studies asking respondents whether members of their community would unite to fight the closing of a local fire station (e.g., Sampson et al. 1997).

Districts characterized by unusually masculine sex ratios might also be characterized by high rates of in-migration, which have been linked theoretically, if not empirically (Debnath and Roy 2013), to higher crime rates. Accordingly, the models control for the lifetime in-migration rate—that is, the percentage of district residents who were born outside of their 2001 district of residence. This variable is computed from the 2001 India census.

Finally, to help capture the influence of residual confounders, we control for geographic region. We classify Indian states and union territories into the following four regions: North (Chandigarh, Chhattisgarh, Delhi, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Punjab, Rajasthan, Uttaranchal, and Uttar Pradesh); Northeast (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura); East (Bihar, Jharkhand, Orissa, and West Bengal); and South (Andhra Pradesh, Dadra and Nagar Haveli, Daman and Diu, Goa, Karnataka, Kerala, Maharashtra, Pondicherry, and Tamil Nadu).

Analytical Strategy

Because all four dependent variables are dichotomous, and because the individual-level observations are nested within districts, we evaluate the effect of the sex ratio and the control variables on the risk of criminal victimization by estimating multilevel, random intercept logistic regression models (Guo and Zhao 2000). Multilevel models adjust for the clustering of observations within higher-order units (here, districts) and ensure that the standard errors of the regression coefficients are based on the proper degrees of freedom.[4] Models are estimated using Stata's *xtmelogit* procedure (StataCorp 2005).

Results

Table 1 presents descriptive statistics for all variables used in the analysis. Criminal victimization is a fairly rare experience in India. Fewer than 4 % of household heads report that someone in their household was a victim of theft during the prior year, only 1 % report that someone illegally entered their home, and only 2.5 % report that a household member was assaulted. About 18 % of the IHDS women respondents report that unmarried girls in their village or neighborhood are harassed sometimes or more frequently.

It is, of course, difficult to compare the percentage of households that report being victimized to victimization rates for other countries because of differences in the definition or perception of criminal incidents, differences in denominators (e.g., households versus

[4]Although region could be considered a third level of aggregation, for simplicity, we treat it as a Level-2 variable.

individuals), and differences in numerators (e.g., the IHDS does not record multiple incidents per household or individual). However, if we assume that these percentages at least roughly correspond to victimization rates (and multiply the percentages by 10 to generate "rates" per 1,000 households), it would appear that theft and breaking/entering are less common in India than in the United States but that assault is more common. The Indian rates of theft, breaking/entering, and assault are estimated to be 39.0, 10.0, and 25.0, respectively (Table 1). In the United States in 2005, the victimization rate for theft per 1,000 households was 116.3, the rate for household burglary per 1,000 households was 29.6, and the rate for assault per 1,000 population age 12 and older was 17.8 (U.S. Department of Justice 2011).

Turning to the independent variables, the mean district male-to-female sex ratio of over 108 shows that, on average, the surveyed households are exposed to a surplus of men ages 15 to 39.[5] However, the standard deviation reveals substantial variation around this mean. The descriptive statistics for the individual-level covariates indicate that the typical household contained about five members and that almost one-half of the households included a teenage or young adult (ages 15 to 21). On average, the most highly educated household member completed between seven and eight years of schooling. Mean household income is about 54,000 rupees, and almost 90 % of households reported owning their home. Over 80 % of the respondents are Hindu, with Muslims and members of other religions constituting 11 % and 8 % of the sample, respectively. Almost 40 % of households are members of OBCs, 20 % belong to a scheduled caste, 8 % belong to a scheduled tribe, and about 32 % belong to some other caste.

The descriptive statistics for the district-level control variables indicate that the population in the district inhabited by the typical household is about one-third urban with a mean household income of almost 54,000 rupees. In the typical district, only about 16 % of married women have their name on homeownership or rental papers, but 83 % report having their own money for household expenditures. Of the four decisions making up the measure of household participation, women in the typical district report having at least some say in three. About three-quarters of women report needing permission from other family members to visit relatives, and 11 % think that boys should receive more education than girls. In the typical district, slightly more than one-half of respondents (58 %) report that community members would bond together to solve a water supply problem. About 14 % of the population of the typical district was born outside the district. Most of the IHDS households reside in the North and South, with lesser representation in the East and, especially, the Northeast.

Table 2 presents the fixed effects from the multilevel logistic regression models. As shown in Model 1, the sex ratio is positively and significantly associated with the likelihood that a household member has been a victim of theft in the prior year. Consistent with the "supply of offenders" hypothesis, the greater the relative supply of men in the district, the more likely a household member is to have had something stolen from them. Yet, although the

[5]The sample size varies across the dependent variables because of differential (albeit small) amounts of missing data and because the harassment of young girls item was taken from the sample of ever-married women. We present descriptive statistics on the independent variables for the largest sample (N = 41,404), but statistics for the other samples are quite comparable (results not shown).

association is statistically significant, it is rather modest in magnitude. In India, the child sex ratio (boys per 100 girls ages 0 to 6) rose from 103.9 in 1981 to 109.4 in 2011, resulting in an increase of 5.5 points (Indiastat 2011). Drawing on the coefficient for the district sex ratio in Model 1 of Table 2, an increase in the male-to-female sex ratio of 5.5 points would increase the odds of being a victim of theft by 8 % [= ($e^{[.014][5.5]} - 1$) × 100].

A few of the other independent variables are also significantly associated with the likelihood that a household member has been victimized by theft. At a borderline significance level ($p < .10$), the number of household members is positively associated with household theft victimization. Of the district-level explanatory variables, both the proportion of women with access to cash and the proportion who believe that boys should receive more education than girls are inversely associated with theft victimization. Counterintuitively, the district-level proportion of respondents who say that people in their community would bond together to solve water problems—our measure of collective efficacy—is positively and significantly (at a borderline level) associated with theft victimization. Net of other influences, theft victimization is significantly higher in the East than in the North. That the coefficient for the sex ratio is statistically significant even after we control for these district-level characteristics is inconsistent with the conjecture that the association between male surplus and crime is driven by a common association with patriarchal gender roles, at least as we measure them here.

Model 2 of Table 2 presents the results of a parallel analysis for the risk of victimization by breaking and entering. As was the case for theft victimization, the association between the sex ratio and the odds of victimization from breaking and entering is positive and significant but modest in strength. Applying the simulation described earlier, an increase in the male-to-female sex ratio of 5.5 points would raise the odds of victimization from unlawful household entry by about 12 % [= ($e^{[.020][5.5]} - 1$) × 100].

Although none of the household-level covariates is significantly associated with the risk of victimization from breaking and entering, several district-level controls emerge as significant. Four of the indicators of women's (or girls') empowerment exert significant effects, but the direction of these effects presents a mixed picture. The measures of women's access to resources (proportion having cash on hand) and household decision-making (mean number of decisions in which women have some say) are significantly and inversely associated with unlawful entry, but so is the proportion of women who favor boys' over girls' education (a reverse indicator of women's status). And, the district-level proportion of married women with their names on house papers is positively associated with the risk of victimization from breaking and entering. Net of other influences, the risk of victimization from breaking and entering is significantly higher in the East and Northeast than in the North.

The findings for assault victimization are presented in Model 3 of Table 2. The coefficient for the sex ratio is again positive and statistically significant. Net of the effects of the other predictors, an increase in the male-to-female sex ratio of 5.5 points would raise the odds of assault victimization by about 11 % [= ($e^{[.019][5.5]} - 1$) × 100]. Among the household-level covariates, both household size and the presence of a teenager/young adult are positively

and significantly associated with the likelihood that a household member has been attacked or threatened in the past year. Household education and income are significantly and inversely associated with the risk of assault victimization. Members of scheduled castes are more likely than members of "other castes" (the reference category) to report that a household member was assaulted in the past year. Among the district-level controls, the proportion of women who need permission to visit relatives and residence in the East are positively associated with assault risk; community collective efficacy is inversely associated with the risk of assault victimization, although this association is of borderline significance.

Model 4 of Table 2 presents the fixed effects for the models of the likelihood that the IHDS women respondents report that unmarried girls in the local community are harassed sometimes or often (versus rarely or never). Here again, the coefficient for the sex ratio is positive and statistically significant. According to the results in Model 4, an increase in the male-to-female sex ratio of 5.5 points would raise the odds of unmarried girls being (reportedly) harassed by more than 20 % [= $(e^{[.035][5.5]} - 1) \times 100$].

Several other explanatory variables, both at the household and district levels, are associated with the probability that respondents perceive frequent harassment of unmarried girls in their community. Household education is inversely associated with perceived harassment. Muslim households perceive more harassment than households of "other" religions, and members of scheduled castes and scheduled tribes are more likely than members of other castes (or no caste) to report that unmarried girls in the community are harassed.

Of the district-level predictors, the indicators of women's empowerment again exhibit contradictory effects. The proportion of married women in the district who have access to cash is inversely related to the reported harassment of girls, but the proportion of women with their names on house papers is positively associated with perceived harassment; coefficients for the other empowerment indicators are nonsignificant. Higher levels of collective efficacy are strongly associated with lower levels of perceived harassment of unmarried girls. Girls are perceived to be harassed more frequently in non-Northern regions than in the North.

The significant positive association between the male-to-female sex ratio and the perception that unmarried girls in the local community are harassed runs counter to the Guttentag and Secord (1983) hypothesis that when women are numerically scarce, they will be treated with deference and respect. Rather, this finding—like the results for household victimization from theft, breaking and entering, and assault—is more consistent with the hypothesis that a numerical abundance of men signals a copious supply of potential offenders (and harassers). That these associations withstand numerous controls for both household and district-level characteristics enhances (although, of course, cannot prove) our inference that these are indeed causal effects and not the spurious product of confounding influences (cf. Dreze and Khera 2000).

To better illustrate the strength of the association between the sex ratio and victimization risks, Table 3 presents predicted annual probabilities of criminal victimization and at least occasional harassment of unmarried girls by selected values of the district-level male-to-

female sex ratio at ages 15 to 39. These probabilities are derived from regression models using the variables shown in Table 2, while holding all other covariates constant at their respective means. These probabilities underscore that although the district sex ratio may be a statistically significant predictor of the sex ratio, it is not an overwhelmingly potent one.

For example, 2.5 % of households in a district characterized by 80 men per 100 women ages 15 to 39 (a value about 2 standard deviations below the mean) would be expected to be victimized by theft, compared with 5.3 % of households in a district with a sex ratio of 130 (a value about 2 standard deviations above the mean). Comparing less extreme sex ratios, the annual probability of being victimized by theft increases by only one-half percentage point as one moves from a sex ratio of 100 to a sex ratio of 110 (.5 = [.039 − .034] × 100)—a distance a little less than 1 standard deviation. Even smaller absolute differences are observed for breaking/entering and assault victimization. However, these are annual probabilities that when cumulated over time lead to larger, albeit still modest, differences. Assuming independent risks over time, the likelihood of being victimized by theft over a 10-year period is 5 percentage points greater in a district with a sex ratio of 110 (where 39 % of households would be victimized) than in a district with a sex ratio of 100 (where 34 % of households would be victimized). For breaking/entering and assault victimization, these differences are 1 and 4 percentage points, respectively.

The simulated percentage of women who perceive that unmarried girls in the community are harassed at least sometimes differs by more than 10 percentage points between districts with a sex ratio of 80 and districts with a sex ratio of 130, but increases by only 2 percentage points— from 17 % to 19 %—as the district sex ratio goes from 100 to 110. Thus, although the ostensibly looming increase in India's male-to-female sex ratio seems unlikely to usher in a crime wave, the effect of the sex ratio on criminal victimization may be large enough to materially influence the safety and overall quality of life of India's population.

Discussion and Conclusion

Demographic characteristics and criminal behavior are intertwined in multiple ways at both the micro and macro levels (South and Messner 2000). One population characteristic that is likely linked to aggregate crime rates is the sex ratio. In India, which has experienced a long-standing and likely worsening numerical deficit of girls, exploring the association between population sex composition and criminal victimization takes on special urgency. Prior studies of the impact of imbalanced sex ratios on crime, both in India and elsewhere, have generated somewhat equivocal findings. We address this issue here by linking self-reports of criminal victimization in the India Human Development Survey with community-level sex ratios derived from the India census.

Judging by these self-reports, criminal victimization in India is rare, with fewer than 4 % of household heads reporting being victims of theft, breaking and entering, or assault in the prior year. In addition, relatively few IHDS respondents seem to view the harassment of unmarried girls in the local community as a frequent problem, although, of course, the young women themselves may have a much different opinion. Our findings suggest that a numerical abundance of males in the local area modestly but significantly increases the

likelihood that members of Indian households are victimized by theft, breaking and entering, and assault, and also increases the probability that young women in the community are perceived to be harassed. These associations withstand controls for several individual and areal predictors of criminal victimization.

Although projecting trends in criminal behavior is a risky undertaking, these results imply that in India, victimization rates are likely to increase along with the looming masculinization of the adult sex ratio. To be sure, the observed associations between the sex ratio and criminal victimization risks are fairly modest; projected changes in the adult sex ratio are apt to increase annual odds of victimization risks by about 8 % to 12 %, depending on the type of crime. At the same time, however, these seemingly small increases in *annual* risks may translate into at least moderate *lifetime* increases in victimization risk. As in China (Edlund et al. 2013), Indian authorities may wish to anticipate at least a slight rise in crime as a consequence of projected increases in the male-to-female adult sex ratio.

With regard to the victimization of women, we find no support for the hypothesis, derived from Guttentag and Secord (1983), that men are less likely to harass women when women are relatively few in number. Rather, as with the other offenses, our results suggest that a numerical abundance of men—and an attendant shortage of women—tends to increase women's risk of being harassed in public spaces, often referred to as eve-teasing. Of course, the gendered dynamics described by Guttentag and Secord (1983) could conceivably temper the effects of offender supply, but even if so, these dynamics appear insufficiently powerful or extensive to override the aggregate criminogenic risks created by a numerical surplus of males.

Our analysis reveals several other individual and areal correlates of criminal victimization in India. For example, assault victimization and (perceived) female harassment are less frequent among more-educated households but more common among members of scheduled castes. All four outcomes tend to be less common in the North than in some, although not necessarily all, other regions. The indicators of women's empowerment are inconsistently associated with the victimization outcomes, with some indicators suggesting that empowerment is associated with less crime and harassment (e.g., the negative effects of the district proportion of women with access to cash on theft, breaking and entering, and female harassment) and other indicators suggesting that women's empowerment is associated with more crime (e.g., the positive effects of the proportion of women with their names on house papers on breaking and entering and female harassment). The positive association between some indicators of women's empowerment and female harassment may indicate that in districts where women are relatively empowered, they are also more likely to travel alone in public places and thus be at greater risk of experiencing sexual harassment. These seemingly inconsistent findings likely highlight the inherent multidimensionality of women's empowerment and the complexities involved in its measurement (Kabeer 1999; Malhotra and Mather 1997; Malhotra and Schuler 2005; Mason 1986, 2005). The measure of collective efficacy is also inconsistently related to the outcomes: it is inversely associated with female harassment, as hypothesized, but positively associated with theft victimization (although only at a borderline significance level). Worth noting in this regard is that the district-level sex ratio and region of residence are the only explanatory variables that are

significantly associated with all four victimization outcomes. At the same time, the sex ratio is neither the sole nor always the most important predictor of criminal victimization.

Our study is, of course, not without limitations. Self-reports of criminal victimization, although holding some distinct advantages over official crime statistics, may be prone to recall errors and households are likely to vary in what is considered to be a criminal victimization. With regard to the perceived harassment of unmarried girls in the local community, some of the associations observed here may reflect differences in the definition of particular acts as “harassment” and the attendant tolerance for such behavior. Moreover, the IHDS lacks reports on some serious crimes—sexual assault, for example—that would be particularly germane for testing the Guttentag and Secord (1983) thesis. Future research might benefit from exploring associations between the sex ratio and additional self-reports of victimization. And despite the limitations of crime measures based on crimes reported to the police or arrest rates, future research might profit by exploring further the associations between the population sex ratio and official crime rates.

Although our models include a reasonably wide range of controls for possible confounders, including several measures of women’s empowerment, a causal effect of a male surplus remains difficult to prove with observational data. Determining whether the observed associations between the district sex ratio and the outcome variables have been purged of their common association with a culture of patriarchy or other potential confounders is an important task for future research. It is also possible that different results would be obtained if the sex ratio (and the other areal predictors) were measured at a different level of geography—for example, at the neighborhood level. Perhaps the inconsistent effects of the measures of women’s empowerment and the measure of collective efficacy are partially attributable to this feature of the research design.

Despite these limitations, our findings present at least suggestive evidence that the population male-to-female sex ratio is a significant if somewhat modest predictor of criminal victimization in India. Our results provide greater support for this theoretically intuitive association than is typically observed in either cross-national studies or in studies that compare subareas of the United States or India. Our findings are, however, at least broadly consistent with Edlund et al.’s (2013) recent study of the effect of skewed sex ratios on crime in China. Future research in this area might profitably extend our analysis to other countries, such as Vietnam and South Korea, that have also been experiencing pronounced changes in their relative numbers of women and men (Guilmoto 2009), and comparative studies may prove especially useful. Our findings from the Indian context suggest that other countries may also experience at least slight increases in crime as a consequence of increasingly masculine population sex ratios.

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Table 1

Descriptive statistics for variables used in analysis of criminal victimization in India: India Human Development Survey, 2004–2005

Variable	Mean	SD	*N*
Dependent Variables			
Theft victimization in past year (1 = yes)	0.039	0.193	41,402
Breaking and entering victimization in past year (1 = yes)	0.010	0.100	41,404
Assault victimization in past year (1 = yes)	0.025	0.156	41,401
Harassment of unmarried girls (1 = sometimes/often)	0.184	0.387	32,643
Independent Variables			
District male-to-female sex ratio ages 15–39	108.577	11.098	41,404
Household Characteristics			
No. of household members	5.193	2.488	41,404
Household has member ages 15–21	0.463	0.499	41,404
Household education	7.555	5.088	41,404
Household income (1,000s of rupees)	53.887	83.248	41,404
Homeownership	0.890	0.312	41,404
Religion			
Hindu	0.807	0.395	41,404
Muslim	0.115	0.319	41,404
Other religion	0.078	0.268	41,404
Caste			
Scheduled caste	0.200	0.400	41,404
Scheduled tribe	0.083	0.276	41,404
Other backward caste	0.392	0.488	41,404
Other caste/no caste	0.324	0.468	41,404
Other district-level characteristics			
Proportion urban	0.356	0.362	41,404
Mean household income	53.888	24.705	41,404
Proportion women with names on house papers	0.162	0.174	41,404
Proportion women with access to cash	0.828	0.167	41,404
Women’s participation in household decisions	3.213	0.806	41,404
Proportion women needing permission to visit family	0.752	0.199	41,404
Proportion women preferring boys receive more education than girls	0.109	0.111	41,404
Collective efficacy	0.576	0.253	41,404
In-migration rate	13.652	9.444	41,404
Region			
North	0.453	0.498	41,404
South	0.335	0.472	41,404
East	0.164	0.370	41,404
Northeast	0.048	0.215	41,404

Table 2

Multilevel logistic regression analysis of criminal victimization: India Human Development Survey, 2004–2005

	Model 1 Theft			Model 2 Breaking and Entering		
Independent Variables	***b***	**SE**	e^x	***b***	**SE**	e^x
District Male-to-Female Sex Ratio Ages 15–39	0.014*	0.006	1.014	0.020*	0.008	1.020
Household Characteristics						
No. of household members	0.019†	0.011	1.019	0.005	0.022	1.005
Household has member ages 15–21	0.065	0.056	1.067	0.164	0.104	1.178
Household education	0.007	0.006	1.007	−0.018	0.012	0.982
Household income (1,000s of rupees)	−0.000	0.000	1.000	−0.001	0.001	0.999
Homeownership	0.065	0.101	1.067	0.116	0.185	1.123
Religion						
Other religion (ref.)						
Hindu	−0.142	0.130	0.868	0.039	0.239	1.040
Muslim	−0.100	0.154	0.905	−0.115	0.290	0.891
Caste						
Other caste/no caste (ref.)						
Scheduled caste	0.050	0.085	1.051	0.112	0.157	1.119
Scheduled tribe	−0.003	0.132	0.997	−0.253	0.244	0.776
Other backward caste	−0.017	0.074	0.983	0.143	0.134	1.154
Other District-Level Characteristics						
Proportion urban	0.278	0.190	1.320	0.062	0.269	1.064
Mean household income	−0.003	0.003	0.997	−0.001	0.005	0.999
Proportion women with names on house papers	−0.078	0.420	0.925	1.105*	0.532	3.019
Proportion women with access to cash	−1.807**	0.395	0.164	−1.672**	0.527	0.188
Women's participation in household decisions	−0.091	0.075	0.913	−0.330**	0.098	0.719
Proportion women needing permission to visit family	0.270	0.335	1.310	0.627	0.461	1.872
Proportion women preferring boys receive more education than girls	−0.917*	0.370	0.400	−2.382**	0.736	0.092
Collective efficacy	0.416†	0.247	1.516	−0.116	0.337	0.890

Independent Variables	Model 1 Theft			Model 2 Breaking and Entering		
	b	SE	e^x	*b*	SE	e^x
In-migration rate	−0.004	0.008	0.996	0.010	0.011	1.010
Region						
North (ref.)						
South	−0.234	0.163	0.791	0.038	0.217	1.039
East	1.329**	0.171	3.777	0.848**	0.233	2.335
Northeast	−0.009	0.313	0.991	0.892*	0.385	2.440
Constant	−4.082**			−5.629**		
N	41,402			41,404		
Log-Likelihood	–5,824.971			–2,170.726		
District Male-to-Female Sex Ratio Ages 15–39	0.019*	0.010	1.019	0.035**	0.010	1.036
Household Characteristics						
No. of household members	0.031*	0.014	1.031	0.002	0.008	1.002
Household has member age 15–21	0.140*	0.070	1.150	0.037	0.035	1.038
Household education	−0.025**	0.008	0.975	−0.012**	0.004	0.988
Household income (1,000s of rupees)	−0.002*	0.001	0.998	−0.000	0.000	1.000
Homeownership	−0.116	0.131	0.890	−0.041	0.059	0.960
Religion						
Other religion (ref.)						
Hindu	−0.028	0.178	0.972	0.059	0.092	1.061
Muslim	−0.141	0.210	0.868	0.243*	0.107	1.275
Caste						
Other caste/no caste (ref.)						
Scheduled caste	0.271*	0.112	1.311	0.188**	0.055	1.207
Scheduled tribe	0.087	0.162	1.091	0.159†	0.083	1.172
Other backward caste	0.140	0.098	1.150	0.049	0.047	1.050
Other District-Level Characteristics						
Proportion urban	−0.446	0.306	0.640	0.177	0.291	1.194
Mean household income	−0.007	0.005	0.993	−0.007	0.005	0.993

Independent Variables	Model 1 Theft			Model 2 Breaking and Entering		
	b	**SE**	***e*^x^**	***b***	**SE**	***e*^x^**
Proportion women with names on house papers	−0.238	0.648	0.788	2.501**	0.621	12.195
Proportion women with access to cash	−0.365	0.637	0.694	−1.683*	0.660	0.186
Women's participation in household decisions	−0.022	0.116	0.978	0.046	0.125	1.047
Proportion women needing permission to visit family	1.236*	0.523	3.442	0.048	0.508	1.049
Proportion women preferring boys receive more education than girls	−0.875	0.576	0.417	0.095	0.284	1.100
Collective efficacy	−0.703†	0.381	0.495	−1.881**	0.382	0.152
In-migration rate	−0.010	0.013	0.990	−0.007	0.013	0.993
Region						
North (ref.)						
South	−0.045	0.249	0.956	1.109**	0.250	3.031
East	1.132**	0.268	3.102	0.571†	0.294	1.770
Northeast	0.645	0.468	1.906	3.130**	0.456	22.874
Constant	−6.329**			−4.444**		
N	41,401			32,643		
Log-Likelihood	−3,921.270			−11,504.455		

Note: All models include a random intercept for district (n = 382).

† $p < .10$;

* $p < .05$;

** $p < .01$

Table 3

Predicted annual probabilities of criminal victimization and perceived harassment of unmarried girls by selected values of the Indian district male-to-female sex ratio at ages 15 to 39

	Sex Ratio					
Type of Victimization	**80**	**90**	**100**	**110**	**120**	**130**
Theft	.025	.029	.034	.039	.046	.053
Breaking and Entering	.006	.008	.009	.010	.012	.014
Assault	.016	.019	.022	.025	.029	.034
Harassment of Unmarried Girls	.130	.148	.167	.188	.211	.235

Note: Predicted probabilities derived from regression models shown in Table 2, holding all other variables constant at the sample mean.