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Don't Cross the Line: Bounding the Causal Effect of Hypergamy Violation on Domestic Violence in India*

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Abstract

We empirically examine whether violation of hypergamy - which occurs when the wife's economic status equals or exceeds that of her husband's - causally affects domestic violence using microdata from India. Identifying the causal effect of hypergamy violation on domestic violence, however, is challenging due to unmeasured confounding and reverse causality. To overcome these difficulties, we utilize a nonparametric bounds approach. Employing this approach, we find strong evidence that violation of hypergamy leads to a significant increase in domestic violence. Further, we provide suggestive evidence that this result arises because violation of hypergamy is likely to undermine patriarchal beliefs and norms about gender roles, and also because it is likely to increase men's likelihood of using domestic violence as an instrument to sabotage their wives' labor market prospects. Our findings suggest that policies that seek to empower women and promote gender equality might paradoxically increase women's exposure to domestic violence.

JEL: J12, J16, O12, O15
Keywords: Domestic Violence, Hypergamy, India, Partial Identification, Women.

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1 Introduction

Domestic violence is a global social problem of epidemic proportions. It affects one in three women in their lifetime and is the most common form of violence in women's lives in both developing and developed countries (WHO, 2013). Women who suffer domestic violence experience serious health problems including injury, depression, post-traumatic stress disorder, etc. (Campbell, 2002; Coker et al., 2002; Ackerson and Subramanian, 2008). The costs of domestic violence to an economy in terms of victim's suffering, medical bills, lost productivity, judicial expenditures and the lost productivity from the incarcerated offender is also vast. According to Fearon and Hoeffler (2014), intimate-partner violence costs the world around 5.2% of global GDP, which is more than 25 times the total cost from conflicts (deaths from wars and terrorism, refugee-related costs and economic damage).

Given the massive adverse socioeconomic consequences of domestic violence, it is crucial for policy makers to design policies and interventions that would be effective in reducing the extent of domestic violence. For creation of such policies, however, understanding the contributing causes of domestic violence is of first order importance. In this paper, we empirically examine a potentially important but unexplored contributing cause of domestic violence: violation of *hypergamy*.

Hypergamy occurs when in a marital relationship the husband's economic status systematically exceeds that of his wife. It is a fundamental tenet of patriarchy (Therborn, 2004). Violation of hypergamy – which occurs when the wife's economic status equals or exceeds that of her husband's – undermines traditional patriarchal beliefs and norms about gender roles and dominant conceptions of masculinity such as "man should earn more than his wife" or "man should be the primary breadwinner in the household" (Macmillan and Gartner, 1999; Bertrand et al., 2015; Baland and Ziparo, 2017; Bernard et al., 2020). This could lead to stress, tension, and often severe domestic violence as a form of male backlash (Jewkes, 2002; Kaukinen, 2004; Atkinson et al., 2005; Vyas and Watts, 2009; Weitzman, 2014).[1]

Additionally, violation of hypergamy could also increase domestic violence for instrumental rea-

[1] This line of argument is closely related to Akerlof and Kranton's (2000) seminal work on how social identity influences economic outcomes. Akerlof and Kranton (2000) propose that every individual belongs to some social category and these social categories are associated with different prescribed behaviors. If individuals deviate from the prescribed behavior of the social category to which they belong, that could be inherently costly since violating prescriptions may devalue others' social identity. In our case, the social groups are man and woman, and these groups are associated with specific behavioral prescriptions.

sons. The instrumental theories of domestic violence (Eswaran and Malhotra, 2011; Anderberg and Rainer, 2013) suggest that if domestic violence is used by the men as an instrument either to extract financial resources from their wives or to sabotage their labor market prospects,[2] then domestic violence is likely to increase with women's economic status relative to their husbands (women's relative economic status) since an increase in women's relative economic status is likely to increase the financial resources at their disposal and/or their likelihood of labor market participation. Since hypergamy violation is ultimately an outcome of improvement of women's relative economic status, women who violate hypergamy could be more exposed to domestic violence than their counterparts.

In contrast to the above lines of argument, however, theories of intrahousehold bargaining (Tauchen et al., 1991; Farmer and Tiefenthaler, 1996) suggest violation of hypergamy could reduce domestic violence. This is because these theories assume that women receive transfers from their husbands in compensation for violence. As women's relative economic status increases (which is what happens in case of hypergamy violation), the price of violence likewise increases as she requires a larger transfer for the same level of violence. Knowing this, men should lower the level of violence within the relationship (or the relationship will end). Thus, theoretically speaking, whether violation of hypergamy increases or decreases domestic violence is *a priori* ambiguous.

To examine how violation of hypergamy affects women's exposure to domestic violence, we use micro-level survey data from India. The survey, called the National Family Health Survey of India (NFHS) 2015-16, is an extremely rich source of information on domestic violence, health, education, labor market indicators, etc. In particular, the survey provides information on women's exposure to four types of domestic violence: less severe physical violence, severe physical violence, sexual violence and emotional violence. Based on this information, we construct our outcome variables. We construct our variable of interest (or treatment variable), violation of hypergamy, utilizing information on educational attainment of women and their husbands as observed in the survey.

Identifying the causal effect of violation of hypergamy on women's exposure to domestic violence is not straightforward because marriage type – whether the marriage is hypergamous (marriage in which hypergamy is not violated) or non-hypergamous (marriage in which hypergamy is violated) – is not randomly determined among the population. Even after controlling for characteristics

[2] Men might want to sabotage their wives' labor market prospects may be because they feel jealous/insecure at the prospect of their wives interacting with other males at workplace (Eswaran and Malhotra, 2011).

that can be observed in the data, there may remain important unobserved factors that could be correlated with marriage type and also directly influence women's exposure to domestic violence. Examples of such unobserved variables include level of patriarchy at women's natal and husbands' home (or home of in-laws), unobserved ability of women, women's health conditions, etc. In addition to unobserved variables, reverse causality (i.e., domestic violence could impact the likelihood of hypergamy violation) could also be a potential factor complicating causal identification.

To circumvent the identification issues, we use a nonparametric partial identification approach (Manski, 1995; Manski and Pepper, 2000; Pepper, 2000).[3] Employing this approach, we provide sharp bounds on the average treatment effect (ATE) of hypergamy violation on women's exposure to domestic violence, when hypergamy violation is non-random. These bounds require weaker (nonparametric) assumptions than those typically employed in traditional instrumental variables (IV) based methods. However, as a consequence of having weaker identification assumptions, we obtain bounds rather than point estimates. Nonetheless, the bounds reveal exactly what can be learned under different assumptions concerning the nature of the selection process. Tamer (2010, p. 168) summarizes the advantages of this approach: "This partial identification approach favors the principle that inference—and conclusions and actions—based on empirical models with fewer suspect assumptions is more robust, hence more sensible and believable. Stronger assumptions will lead to more information about a parameter, but less credible inferences can be conducted."

Our results are compelling. Relying on transparent assumptions regarding the selection process, we find that the bounds on the ATE of hypergamy violation on women's exposure to domestic violence are strictly positive and statistically significant indicating that hypergamy violation increases the likelihood of a woman facing domestic violence. Specifically, we find that a woman who is in a non-hypergamous marriage is at least 14% more likely to face at least one type of domestic violence than a woman who is in a hypergamous marriage. Further, we provide suggestive evidence that this result arises because, compared to women who are in hypergamous marriage, women who are in non-hypergamous marriages are more likely to undermine traditional patriarchal beliefs and norms about gender roles, and also because the husbands of the women in non-hypergamous marriages are more likely to use domestic violence as an instrument to thwart their wives' labor market prospects

[3] For notable extensions and applications of this approach, see Kreider and Pepper (2007, 2008), Gundersen and Kreider (2008, 2009), Molinari (2008, 2010), Kreider and Hill (2009), de Haan (2011), Gundersen et al. (2012), Kreider et al. (2012), Millimet and Roy (2015), and Cygan-Rehm et al. (2017).

than the husbands of the women in hypergamous marriages.

Our findings suggest that policies that seek to reduce domestic violence by empowering women or by promoting gender equality has the potential to backfire (i.e., instead of reducing women's exposure to domestic violence, such policies might paradoxically make them more vulnerable to domestic violence). While our results in no way suggest that such policies should be discarded, they do suggest that for effectively tackling the problem of domestic violence such policies must be complemented by well-designed interventions that aim at changing gender norms, 'enforceable' legislations that offer women legal protection from domestic violence, and removal of restrictions on women's access to divorce.[4]

1.1 Related Literature

Our work contributes to the growing body of empirical literature in economics on the potential determinants of violence against women by providing the first evidence of the causal effect of hypergamy violation on domestic violence. So far this literature has focused on a host of environmental determinants of domestic violence including macroeconomic and labour market conditions (Aizer, 2010; Tertilt and van den Berg, 2015; Anderberg et al. 2016; Li et al., 2020; Bhalotra et al., 2021; Guarnieri and Rainer, 2021; Tur-Prats, 2021), culture and social norms (Tur-Prats, 2019; González & Rodriguez-Planas, 2020; Alesina et al., 2021), human capital (Erten and Keskin, 2017; Papageorge et al., 2020), gender ratios (Amaral and Bhalotra, 2017), age at marriage (Roychowdhury and Dhamija, 2021), and divorce laws (Stevenson and Wolfers, 2006; García-Ramos, 2021). Further, the literature has focused on understanding behavioral motives for domestic violence (Tauchen et al., 1991; Card and Dahl, 2011), and instrumental violence to change the victim's behavior or to extract resources from the victim's family (Bloch and Rao, 2002; Eswaran and Malhotra, 2011; Anderberg and Rainer, 2013). Finally, some studies in this literature have examined the effect of government policies on the prevalence of domestic abuse including law enforcement policy (Iyengar, 2009; Aizer and Dal-Bo, 2009) and welfare/cash-transfers policy (Angelucci, 2008; Bobonis et al,

[4] Currently, India has the lowest rate of divorce in the world — only 13 out of 1,000 marriages in India, a mere 1 per cent, end in divorce (see https://www.indiatoday.in/education-today/gk-current-affairs/story/india-has-the-lowest-divorce-rate-in-the-world-1392407-2018-11-20).

2013; Hidrobo and Fernald, 2013; Dasgupta and Pacheco, 2018).[5][6]

Our study also contributes to the literature on economics of marriage and family. There is a growing body of studies within this literature suggesting that the decline in the traditional family remains disconcerting for many men in society due to prevalence of outdated gender norms. For example, a recent body of studies have documented some of the adverse effects associated with *hypogamy* or wives out-earning their husbands. Bertrand et al. (2015) show that the marriages where the wife is the primary breadwinner are less happy and less stable. In experimental data, Ratliff and Oishi (2013) find that men's self-esteem is lower when their partner succeeds. Using Danish data, Pierce et al. (2013) find that men who are out-earned by their wives experience higher sexual and mental illness. Bertrand (2019) shows that boys' gender norms, more than girls', appear to be positively influenced by the role model they find in their working mother, especially if she is also the primary breadwinner in the household; however, role model effect for boys associated with mother's work and relative economic power in the household is lessened in more gender conservative environments.

Finally, our work is related to studies in sociology and gender studies that examine the impact of relative shares of resources and relative status on domestic violence (see for e.g., Macmillan and Gartner, 1999; Atkinson et al., 2005; Weitzman, 2014 among a few others). These studies mostly find evidence that an increase in share of resource of women relative to their husbands makes them more vulnerable to domestic violence. While these studies are admirable, they are not causal since they do not address the problem of endogeneity that might arise in the relationship between women's relative status and domestic violence because of reverse causality and omitted variables such as prevalence of traditional gender norms in women's natal home/husbands' home that could be affecting both their relative status as well as their exposure to domestic violence.

The rest of the paper unfolds as follows. Section 2 discusses the background. The empirical strategy is presented in Section 3. In section 4 we discuss the dataset used. Results are presented

[5] For identification, these studies either use an instrumental variable-based strategy (e.g., Anderberg et al., 2016; Tur-Prats, 2019; Roychowdhury and Dhamija, 2021) or adopt a difference-in-differences or regression discontinuity design to exploit a natural experiment (e.g., Bobonis et al., 2013; Erten and Keskin, 2017; Garcia-Ramos, 2021), employ panel data methods (e.g., Amaral and Bhalotra, 2017). While all of these strategies are extremely appealing, they cannot be used in the present paper since we do not have access to a variable which is likely to satisfy the exclusion restriction or a relevant natural experiment or panel data.

[6] Note, not only has the effect of hypergamy (or the violation of it) on domestic violence remained unexplored so far, very few studies in economics have focused on hypergamy despite it being a feature of many developing and developed socieities. A noteworthy study that does take up this issue seriously in recent times is Almås et al. (2020).

in the section 5. The last section concludes.

2 Background

2.1 Marriage in India

In India, marriage has always been regarded an obligatory duty and 'Samskara' (sacrament) for women (Singh, 1992). Lone women are not much accepted and are often subject to insolence in the society. Among lone women, divorced or separated women are most unwanted sect in the society because according to Hindu ideology, marriage is a sacred relationship that is in vogue for procreation and continuation of family lineage only; it cannot be dissolved through divorce or any other means on personal grounds (Biswas and Mukhopadhyay, 2018). Although divorce is legal in modern India, it is still considered as a social taboo with a rate of approximately 1% (as opposed to around 50% in the developed world) (Jaising, 2018).[7] Despite the Indian economy witnessing several reforms and liberalization since the early 1990s, marriage has not lost its traditional significance in India. To date, the conception of parents regarding settlement of their off springs includes both economic as well as marital settlement. Following Indian culture, parents feel obligated to arrange marriage for their offsprings, particularly for their daughters, so that they can live with dignity since in the Indian society women's dignity and respect are determined by their marital status (Sharma et al., 2013; Biswas and Mukhopadhyay, 2018). In such a social environment, women's decision to remain single (unmarried, separated and divorcee) is codified as denial of their assigned duty of reproduction and transmitting the traditional social rules and values across generations. In sum, it can be argued that "entire life of Indian women is regulated by their marital status" (Biswas and Mukhopadhyay, 2018, p. 29).

After marriage, when an Indian woman leaves her natal home and moves to her husband's home (or home of in-laws), she is thought to belong to her husband's home and not her parent's. As noted by Kandiyoti (1988, p. 78), "girls are given away in marriage at a very young age into households headed by their husband's father. There, they are subordinate not only to all the men but also to the more senior women, especially their mother-in-law". This is completely in line with

[7] https://www.indiatoday.in/education-today/gk-current-affairs/story/india-has-the-lowest-divorce-rate-in-the-world-1392407-2018-11-20

the expectations of patriarchal culture which dominates the Indian society. When a woman moves in with the family of her husband, she is expected to do much of the housework. Women are taught to think of the husbands as gods and given tips on performing household chores and getting along with their mother-in-laws by doing everything they say (Sharma et al., 2013). New brides often must sit apart from the family in deference to her mother-in-law. If any misfortunes happen to befall her husband's family after her arrival, the new wife may be blamed as the bearer of bad luck. In fact, a famous ancient legal text and constitution of Hinduism known as the Laws of Manu or *Manusmriti* (Bühler, 1886, p. 195–196) clearly notes:

> "Him to whom her father may give her, or her brother with the father's permission, she shall obey as long as he lives, and when he is dead, she must not insult his memory.
>
> Though destitute of virtue, or seeking pleasure elsewhere, or devoid of good qualities, yet a husband must be constantly worshipped as god by a faithful wife."

It is interesting to note that, in India, there are several institutes where in preparation for their imminent marriage, girls enroll in short term courses on how to be the ideal Indian wife. Manju Institute of Values is one such institute in Bhopal in the state of Madhya Pradesh. In a text book used in Manju Institute of Values, as noted in Lancaster (2004), the following passage appears: "after marriage, the bride should not think she's going to her in-law family to throw her weight around. Instead, she's going there to serve the family and perform her duties, in order to turn that home into heaven...The mother-in-law and father-in-law are never wrong...The bride should do everything according to the wishes and orders of the mother-in-law and father-in-law." On getting along with her husband the textbook advises: "The wife should sleep after her husband and wake up before him....When he returns home welcome him with a smile, help him in taking off his shoes and socks, and ask him to sit down. Bring him water and biscuits, and with a smile, ask him about his day. A husband's happiness alone is your life's goal...Do not go out without your husband's permission anywhere." The harsh reality is that marriage in the context of Indian culture and society, is not a celebration of two people pledging their lives to each other on equal grounds. Rather it is an institution that legitimizes supremacy of men and subjugation of women.

2.2 Origins and Extent of Hypergamy

The principle of hypergamy is in conformity with a widespread Indian concept *Anuloma* which is a Sanskrit term used in the *Manusmriti* to describe an union between a high born man and a woman of a lower standing (by birth) relative to the respective man. As per Hindu scriptures, *Anuloma* marriages or unions are accepted historically in the Indian society. On the other hand, the reverse union called *Pratiloma* marriages, where a high born woman unites with a man of low birth (relative to the woman) was condemned. Manu bitterly criticizes and condemns these unions which were considered as 'going against the hair or grain' and holds them responsible for the degeneration of the parties involved, subsequent to the union.

Unfortunately, the origin of hypergamy is not very clear. As noted by Parry (1979, p. 198), some scholars like Célestin Bougle and W.H.R. Rivers have attributed the origin of this practice in India to the "deficit of Aryan women with which the invading Aryan armies had to contend, and in the fact they were in a position to extract wives from the indigenous population without giving them daughters in return". Thus, Shah (1982) concludes, hypergamy emerged primarily from political power.

In contrast to this view, Dumont (1970) argues that hypergamy originated from the doctrine of *Kanyadan.* He notes that the hypergamous pattern of marriage harmonizes with the idea of *dan* (donation), especially with the doctrine of *Kanyadan,* which is described by Parry (1979, p. 200) as a doctrine in which "the virgin (kanya) is. . .a meritorious gift made to somebody of superior status". Mohanadoss (1995) argues that the following factors add weight to the doctrine of *Kanyadan* as a source of hypergamy. First, the notion that the wife-takers are superior to wife-givers in a hypergamous society (Milner, 1988). Karve (1965, p. 170) in this context notes: "the degree of inferiority may be so great the groom does not go personally to the bride's village for the marriage ceremony but sends his sword to represent him". Second, hypergamous society has a pronounced patrilineal line. Consequently, the children inherit the status of the father. Third, according to Kolenda (1984), the image of a bride that emerges from Indian weddings is that of a 'tribute' to the groom's family.

According to Mohanadoss (1995), the ideology of *Kanyadan* makes the logic of hypergamy explicit. The ideology of *Kanyadan* is that a virgin is gifted to a man of superior status. It

encourages the brides's family to offer a substantial *stridhan* to the family of the groom and forbids them to receive money (or other women) in return to their gift of kanya. Milner (1988, p. 150) summarizes the logic of hypergamy in the following way: "economic resources of the bride's lower status family are implicitly exchanged for the increase in status that results from being on intimate terms with superiors".

Hypergamous marriages are widespread in India. While no official estimates of the prevalence of hypergamy are available, as we discuss in Section 4, calculations based on the dataset used for our analysis shows that if marriages are classified as hypergamous or non-hypergamous based on couples' observed educational attainment, around 78% of all the marriages in India were likely to hypergamous in 2015-16.

3 Empirical Framework

To examine the causal relationship between violation of hypergamy and women's exposure to domestic violence, we focus on the partial identification of the ATE. It represents the effect of hypergamy violation on domestic violence faced by a randomly chosen woman from the entire population. To proceed, we define the conditional ATE as

$$\Psi(1,0 \mid X \in \Omega) = P[Y(1) = 1 | X \in \Omega] - P[Y(0) = 1 | X \in \Omega] \tag{1}$$

where Y is the *realized* domestic violence outcome (which is binary in nature), $Y(1)$ denotes the *potential* domestic violence faced by a woman if she were in a non-hypergamous marriage, $Y(0)$ denotes the analogous outcome if the woman were in a hypergamous marriage, and $X \in \Omega$ denotes conditioning on observed covariates whose values lie in the set Ω. Thus, the ATE reveals how the mean outcome would differ if all women were in non-hypergamous marriages versus the mean outcome if all women were in hypergamous marriages. In our analysis, $Y = 1$ denotes that the woman has faced domestic violence in the last 12 months, and $Y = 0$ otherwise.

In our analysis, we simplify the notation by suppressing the conditioning on subpopulations of interest captured in X. In the usual regression framework, researchers attempt to "correctly" choose a set of control variables for which the exogenous selection assumption applies. Inevitably, however, there is much debate about whether the researcher omitted "important" explanatory variables. In

contrast, conditioning on covariates in our approach *only* helps to define subpopulations of interest as there are no regression orthogonality conditions to be satisfied (recall that we are *not* estimating a regression model). The problem is well-defined regardless of how the subpopulations are specified (Pepper, 2000).

The main identification problem that arises when assessing the impact of violation of hypergamy on domestic violence is the following: the potential outcome $Y(1)$ is (unobserved) counterfactual for all women who are in hypergamous marriages, while $Y(0)$ is (unobserved) counterfactual for all women who are in non-hypergamous marriages. In other words, for any given woman, only one of two potential outcomes is observed. This is referred to as the *selection problem*. Using the Law of Total Probability, this identification problem can be elaborated as follows:

$$P[Y(1) = 1] = P[Y(1) = 1|H = 1]P(H = 1) + P[Y(1) = 1|H = 0]P(H = 0) \tag{2}$$

where $H = 1$ denotes that a woman is in a non-hypergamous marriage, and $H = 0$ otherwise. The sampling process identifies $P(H = 1)$, $P(H = 0)$ and $P[Y(1) = 1|H = 1]$ but not $P[Y(1) = 1|H = 0]$. Thus, $P[Y(1) = 1]$ is not point-identified by the sampling process alone. Absent other information, this value could lie anywhere between 0 and 1. A similar result follows for $P[Y(0) = 1]$.

In light of this identification problem, we derive bounds on the ATE under minimal and transparent assumptions. In order to derive the bounds in the absence of nonparametric identification of the ATE, we use various assumptions related to the nature of selection process discussed below.

Assumption 1. *No Selection Assumption*

A natural starting point is to ask what can be learned in the absence of any assumptions invoked to address the selection problem (see Manski, 1995; Pepper, 2000). Following Manski's (1995) terminology, we refer to this case as the case of worst-case bounds.

In the absence of any assumption on the selection into the treatment, we can assume that the missing counterfactuals $P[Y(1) = 1 \mid H = 0]$ and $P[Y(0) = 1 \mid H = 1]$ must lie within $[0, 1]$ as they represent latent probabilities. Using this information on the missing counterfactuals, we can bound the individuals components of the ATE, $P[Y(1) = 1]$ and $P[Y(0) = 1]$, as follows:

$$P(Y=1,H=1) \leq P[Y(1)=1] \leq P(Y=1,H=1)+P(H=0) \tag{3}$$

$$P(Y=1,H=0) \leq P[Y(0)=1] \leq P(H=1)+P(Y=1,H=0) \tag{4}$$

Each of the terms in these bounds is identified by the observed data. Taking the difference between the upper bound on $P[Y(1)=1]$ and the lower bound on $P[Y(0)=1]$ obtains a sharp upper bound on ATE, and analogously a sharp lower bound (Manski, 1995). These bounds, however, have a width equals unity and includes zero. Hence, it is not possible to sign the ATE in this scenario. To be able to make any meaningful inference regarding the ATE, therefore, the bounds need to be narrowed by making some assumption(s) about the relationship between women's hypergamy violation status and domestic violence. Towards that end, we consider the identifying power of two types of fairly weak monotonicity assumptions: monotone treatment selection (MTS) and a monotone instrumental variable (MIV) restriction.

Assumption 2. *Monotone Treatment Selection (MTS)*

The MTS assumption (Manski and Pepper, 2000) places structure on the selection mechanism. Specifically, MTS assumption assumes that the expected potential outcomes move in a particular direction *conditional on treatment assignment* (i.e., when individuals are compared *across* the treatment as well as the control group). In our context, we assume that women in hypergamous marriages are more likely to face domestic violence than women in non-hypergamous marriages conditional on treatment assignment.[8] More formally:

$$P[Y(1)=1|H=1] \leq P[Y(1)=1|H=0] \tag{5}$$

$$P[Y(0)=1|H=1] \leq P[Y(0)=1|H=0]. \tag{6}$$

We believe the MTS assumption is plausible in our setting because women who are in hyperga-

[8] Just to be clear, the potential positive effect of hypergamy violation on the probability of domestic violence (due to male backlash effect or instrumental reasons) does not constitute a rejection of the MTS assumption. The MTS assumption is an assumption only about potential outcomes across the treated and untreated individuals holding treatment status fixed.

mous marriages are likely to be disadvantaged compared with women who are in non-hypergamous marriages across several economic, social and demographic characteristics. These characteristics are also likely to be associated with higher domestic violence. For example, compared to natal as well as husbands' homes of women in non-hypergamous marriages, the prevalence of patriarchal attitudes in natal and husbands' homes of women in hypergamous marriages is likely to be higher. This is because hypergamy is a fundamental tenet of patriarchy (Therborn, 2004), and in case of women in hypergamous marriages (but not their counterparts) adherence to this tenet is observed (i.e., they are "married up" or married to men of higher economic status than themselves). Given that natal home and husbands' home of women in hypergamous marriages are likely to be more patriarchal than that of their counterparts' and because patriarchy "naturalize[s] domestic violence" (Sultana, 2010, p. 12), women in hypergamous marriages and their husbands are more likely to consider domestic violence as a norm than women in non-hypergamous marriages and their husbands. This, in turn, is likely to make the women in hypergamous marriages more susceptible to domestic violence compared to the women in non-hypergamous marriages. In fact, given that natal homes of women in hypergamous marriages are likely to be more patriarchal than that of women in non-hypergamous marriages, even if the former does not consider domestic violence as a norm, they might be still more tolerant of domestic violence (and hence be more exposed to it) than the latter since the option to leave the marital relationship has significantly higher social costs for the former and their families than that for the latter and their families.

The prevalence of higher levels of patriarchy in the natal home and husbands' home of women in hypergamous marriages compared to that in the natal home and husbands' home of women in non-hypergamous marriages could also make the women in hypergamous marriages more predisposed to domestic violence than their counterparts due to extortionary reasons. As noted in Bloch and Rao (2002), in countries like India where the culture of dowry (or groom price) is prevalent, the husbands' family often continue making demands for monetary payments even after the marriage. It is very likely that such dowry demands[9] are higher in high patriarchal environments compared to low patriarchal environments since dowry demands are ultimately an indicator of patriarchal attitudes

[9]Note, dowry does not only refer to payments made by the bride's family to the groom's family during marriage. According to the Supreme Court of India, any demand made by the husband or his relatives before or after the marriage comes within the definition of dowry (see https://timesofindia.indiatimes.com/india/Any-demand-made-by-husband-in-laws-is-dowry-SC/articleshow/46415580.cms)

(Naved and Persson, 2010). Since literature finds dowry demands to be positively correlated to domestic violence (see, e.g., Naved and Persson, 2010),[10] this is likely to suggest that women in hypergamous marriages have a higher likelihood of facing domestic violence than their counterparts.

Additionally, it is likely that women in hypergamous marriages have lower levels of education in absolute terms than women in non-hypergamous marriages.[11] This is likely to cause the former to have lower options outside marriage, and therefore a lower likelihood of leaving an abusive relationship than the latter (Erten and Keskin, 2018). Given that exposure to domestic violence is negatively related to women's options outside marriage and likelihood of leaving an abusive relationship (Farmer and Tiefenthaler, 1997), this is likely to make women in hypergamous marriages more vulnerable to domestic violence than their counterparts.[12]

Under the MTS assumption, the bounds on ATE are as derived in Manski and Pepper (2000) and Kreider et al. (2012). Note, for estimation of the worst case bounds on the ATE and the MTS bounds, we just need to compute the empirical probabilities.

Assumption 3. *Monotone Instrumental Variable (MIV)*

To further tighten the bounds of ATE, we make use of new information through the introduction of a MIV (Manski and Pepper, 2000). As cautioned by Millimet and Roy (2015), a MIV should *not* be viewed as a typical instrumental variable. The *only* condition that needs to be satisfied for an MIV to be valid is that potential outcomes must vary monotonically with the variable used as an MIV. Following Kreider et al. (2012), the MIV assumption imposes

[10] Higher the dowry demand, higher is the likelihood that the bride's family is unable to meet the demand fully which in turn is likely to provoke the husbands to engage in higher levels of domestic violence.

[11] Indeed in our sample the average years of education of women in the treatment group is 7 years and that of women in the control group is 4 years.

[12] Of course, one might argue that since husbands of hypergamy non-violators could potentially be more educated than husbands of hypergamy violators, this could violate the MTS assumption. We recognize this concern (especially since our data also show that, on average, education of husbands of hypergamy non-violators is 8.5 years and that of their counterpart is 6 years) but strongly feel that the MTS assumption is unlikely to be violated due to this reason. This is because although the husbands of hypergamy non-violators might have higher education, it must be kept in mind that they are likely to come from families that have strong patriarchal values which, as noted previously, is why they adhere to the prescription of patriarchy and get married to women who are inferior to them in terms of economic status. Given the family background of these men, this is likely to cause them to believe that domestic violence is 'normal' even though they might be relatively highly educated.

$$P[Y(1) = 1|v = u_2] \leq P[Y(1) = 1|v = u] \leq P[Y(1) = 1|v = u_1] \tag{7}$$

$$P[Y(0) = 1|v = u_2] \leq P[Y(0) = 1|v = u] \leq P[Y(0) = 1|v = u_1] \tag{8}$$

where v is the MIV and $u_1 < u < u_2$. In other words, lower values of v are associated with worse potential outcomes.

Here, we use the literacy rate and gross state domestic product (GSDP) per capita (measured at constant prices) of the woman's state of residence as two alternative MIVs (MIV1 and MIV2 respectively). Higher levels of literacy and GSDP per capita both are likely to reflect higher local economic development which by promoting better governance/criminal justice system and reducing patriarchal culture should lower the likelihood of women facing domestic violence irrespective of whether or not they are in marital relationships that violate hypergamy.

Following Proposition 1 in Manski and Pepper (2000), the joint MTS-MIV assumption implies

$$\sup_{u_2 \geq u} \text{LB}(u_2) \leq P[Y(t) = 1|v = u] \leq \inf_{u_1 \leq u} \text{UB}(u_1), t = 0, 1. \tag{9}$$

where $UB(u)$ and $LB(u)$ denote the upper and lower bounds of the individual components of the ATE obtained under MTS assumption evaluated conditional on $v = u$.

To calculate these bounds in practice, the sample is first divided into five roughly equally sized five cells based on the MIV values. We then calculate the MTS bounds for $P[Y(1) = 1]$ and $P[Y(0) = 1]$ for each cell. Weighted averages of the estimates of the UB and LB across the five cells yield joint MTS-MIV bounds on the individual components of the ATE (Corollary 1 of Proposition 1 in Manski and Pepper (2000)). Having obtained bounds for the individual components of ATE in this way, we can bound the ATE. Note, as shown in Manski and Pepper (2000), the MIV estimator suffers from a bias in the presence of finite sample analysis. As such, we use Kreider and Pepper's (2007) nonparametric finite sample bias-corrected MIV estimator.

Inference To address the uncertainty arising from sampling variability, along with the bounds, the Imbens and Manski (2004) 95% confidence intervals are reported (see Kreider et al. 2012).[13]

[13] We implement the bounds approach using codes written by McCarthy et al. (2015).

4 Data

For our analysis, the data come from the fourth round of the NFHS of India (NFHS 2015-16). The NFHS, a nationwide cross-section demographic health survey for India, provides information on various topics such as population demographics, health and nutrition for India. It is conducted by the International Institute for Population Sciences (IIPS) in Mumbai administered under the Ministry of Health and Family Welfare (MoHFW), Government of India, and is a part of the global Demographic Health Survey (DHS) program.[14] The NFHS 2015-16 survey was conducted between January 2015 and December 2016, and covered 601,509 households located throughout India. The sample was drawn using stratified random sampling (for more details on the survey methodology see International Institute for Population Sciences (IIPS) and ICF, 2017 and the online appendix).

The NFHS 2015-16 administered a separate woman's questionnaire to collect information on all women aged 15-49 in the sampled households. The questionnaire included questions on background characteristics, reproduction, prevalence of hysterectomy, family planning, contacts with community health workers, maternal, child health, breast-feeding, nutrition, marriage, sexual activity, fertility preferences, husband's background, women's work, and women's empowerment, and domestic violence. However, questions on certain topics like domestic violence and menstrual hygiene were restricted to a subset of the eligible women. In particular, domestic violence information was collected for 79,729 currently married women only. These are the women who are from households belonging to the state module of the NFHS (which was implemented for a subsample of 15% of the households) since the domestic violence questionnaire was administered to a randomly selected woman from each household which was a part of the state module.[15] Given the focus of our study, we restrict ourselves to this subsample of women (and their husbands) only.

The domestic violence information provided in the NFHS 2015-16 includes information on women's exposure to four different categories of domestic violence: less severe physical violence, severe physical violence, sexual violence, and emotional violence. For each of the four categories of domestic violence, there is a binary variable that takes a value one for a woman if she reports to have faced at least any one kind of the underlying violences in the last twelve months, and zero

[14] The DHS surveys for all countries are available at https://dhsprogram.com/

[15] Some households in the State module did not have eligible women who could answer questions on domestic violence. Also, in some households in the State module domestic violence questionnaire could not be administered since privacy could not be obtained or due to other issues.

otherwise (Table 1 provides a complete list of underlying violences for each type of domestic violence). These four indicators of domestic violence along with an additional indicator, *any violence*, which takes a value one for a woman if she reports to have at least one of the four kinds of domestic violence, and zero otherwise, form the core set of outcome variables of this study.[16]

This study examines the impact of hypergamy violation on domestic violence. Therefore the treatment variable is hypergamy violation or more precisely the status of marriage in respect of violation of hypergamy. We measure hypergamy violation using a binary indicator constructed based up on couples' observed educational attainment. Specifically, the variable takes a value one if a woman's observed educational attainment is at least as high that of her husband (hypergamy is violated), and zero if her observed educational attainment is strictly less than that of her husband (hypergamy is not violated). Previous research on hypergamy has also used couple's observed education to measure hypergamy in marital relationships (see, e.g., Bouchet-Valat & Dutreuilh, 2015; Lin et al., 2020) since individuals' educational attainment is likely to be a reasonably good indicator of individual's long-term social status.[17]

Two things are worth mentioning here. First, while we measure hypergamy violation using couples' observed educational attainment, one could potentially use other alternative variables as well to measure hypergamy violation. These include long term average earnings of husbands and wives and long term employment status of husbands and wives. In fact, one can even argue that such variables are better suited to measure the status of marriage in respect of violation of hypergamy than couples' observed education since, compared to couples' observed education, they are more

[16] Collecting valid and reliable data on domestic violence poses serious challenges due to the sensitivity of the issue and the consequent difficulties in collecting correct information, maintaining ethical concerns, ensuring safety of the respondent and interviewer, as well as protecting the women who disclose violence. However, as noted by Golder et al. (2016, p. 2), "all these issues are well addressed in the NFHS surveys. It follows both Indian and international guidelines, viz. WHO ethical guidance for research on domestic violence against women, 2001, for the ethical collection of data on violence." Specifically, the following precautions are taken by the survey. First, only one woman per household is selected (randomly) for the interviews. Second, the surveyors ensure that there is no one else in the room when the interviews were conducted. Third, the respondents are informed that their answers would be kept confidential. Fourth, women are asked the questions only toward the end of the interview so that a rapport has been built up between interviewer and respondent before the questions are posed. Fifth, interviewers are provided with extensive training regarding the appropriate way to ask questions of such a sensitive nature. Finally, the survey avoids generic and subjective questions on domestic violence and instead employs questions about specific episodes of violence. This procedure reflects a revised version of the Conflict Tactics Scales (Straus, 1979; Straus et al., 1996), and is considered by social scientists as the gold standard for survey data collection on domestic violence (Guarnieri and Rainer, 2021).

[17] In the baseline analysis, couples with zero education are considered to be a part of the treatment group because technically speaking the women in these couples should be considered to be in non-hypergamous marriages. In unreported analyses, we have dropped these couples and checked the sensitivity of our results. The baseline results largely remain unchanged. Results of this sensitivity analysis are available from the authors on request.

reflective of couples' long-term social status. While that might be true, in this study, we were not able to measure hypergamy violation based on couples' average earnings and employment due to data unavailability.

Second, using couples' observed educational attainment to measure hypergamy violation, in general, has a risk since educational level at the time of the survey might not be a true reflection of the partners' educational levels at the time of union formation as they may have obtained further qualifications since then (and hence the treatment variable might not reflect whether or not in a marital relationship actually hypergamy violation occurred). While we think, for India in particular this is unlikely to be a cause of concern because Indian women generally do not pursue further formal education after getting married given that patrilocal extended families are still prevalent in India (Allendorf, 2013; Lin et al., 2020), and most Indian men do not go for tertiary education (the average years of schooling of men in our analytical sample is 7.5 years), we have carried out a robustness test to examine this issue (see section 5.2). Thankfully, the results of the robustness test indicate that even if this concern is true, our overall findings are likely to remain unaltered.

For our analysis, in addition to domestic violence information and information on type of marriage (hypergamous or non-hypergamous), we also need information on state level literacy rate and GSDP per capita since we use these variables as MIVs. Information on these variables, however, are not available in the NFHS. Consequently, we draw these variables from two different sources. The data for state level literacy rate comes from the Indian Census of 2011.[18][19] The data for GSDP per capita (for 2015-16 measured at 2011-12 constant prices) is compiled from the directorate of economics and statistics of respective state governments.[20]

Table 2 provides the summary statistics of all the variables used in the analysis along with that of some demographic variables. Our analytical sample consists of 65,806 women. These are the women for whom we have non-missing and valid information on different categories of domestic violence, their own education and their spousal education. We find that the proportion of women who report to have faced less severe physical violence in last twelve months is 21%, severe physical violence 6%, sexual violence 5%, emotional violence 11% and any violence 25%. The percentage

[18] 2011 is the year closest to 2015-16 (the survey year of the NFHS) for which literacy rate at the state level is available.

[19] The data are available at https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/-6TABLE4134B659E3B243EE9CB292D36ABC281B.PDF

[20] The data are available at http://mospi.nic.in/download-tables-data.

of women in non-hypergamous marriages is 22%. Figure A1 in the online appendix shows the proportion of women in non-hypergamous marriages across the different Indian states.

5 Results

5.1 Main Results

Figure 1 provides the results for ATE of violation of hypergamy on women's exposure to domestic violence. The results corresponding to the five different categories of domestic violence – less severe physical violence, severe physical violence, sexual violence, emotional violence and any violence – are presented in five different graphs. In each graph for a given figure, we plot and report sharp bounds on the ATE and Imbens and Manski (2004) 95% confidence intervals under various assumptions regarding the selection process. Specifically, we report the ATE and confidence intervals under no assumption on selection (i.e., the worst case bounds), under the assumption of MTS, under the assumption of MTS and MIV1 and under the assumption of MTS and MIV2.

Turning to the results, the following findings stand out. First, without imposing any assumptions concerning the selection process, the bounds are of width one and necessarily include zero as discussed in Section 3. Nonetheless, the bounds are useful in excluding possible values of the ATE. For example, the bounds on the ATE of violation of hypergamy on women's exposure to less severe physical violence are $[-0.505, 0.495]$ and on women's exposure to severe physical violence are $[-0.508, 0.492]$. Thus, a considerable range of values of the ATE, especially in the negative domain, is ruled out.

Second, the MTS assumption, is remarkably powerful in tightening the bounds. In particular, compared to the bounds obtained without any assumption concerning selection process, the bounds under MTS are significantly narrower. For example, we observe that the imposition of MTS causes the bounds on the ATE of violation of hypergamy on women's exposure to severe physical violence to shrink from $[-0.508, 0.492]$ to $[0.006, 0.492]$. Likewise, the imposition of MTS causes the bounds on the ATE of violation of hypergamy on women's exposure to sexual (emotional) physical violence to shrink from $[-0.509, 0.491]$ ($[-0.507, 0.493]$) to $[0.004, 0.491]$ ($[0.006, 493]$). It is worth noting here that not only does the MTS assumption tighten the bounds, it also allows us to identify the sign of all the ATEs. This indicates that, even without invoking further assumptions, we can claim

that, violation of hypergamy increases the likelihood of women facing domestic violence.

Third, the MIV restrictions when imposed along with the MTS assumption leads to further tightening of the bounds. For both MIV1 and MIV2 (imposed in addition to MTS), the estimated bounds on *all* the ATEs are now strictly positive; the 95% confidence interval excludes zero as well. Specifically, under MIV1, we observe that the bounds on the ATE of violation of hypergamy on women's exposure to less severe physical violence are [0.161, 0.366], on women's exposure to severe physical violence are [0.060, 0.411], on women's exposure to sexual violence are [0.049, 0.419], on women's exposure to emotional violence are [0.060, 0.416], and on women's exposure to any violence are [0.169, 0.361]. Similar results hold when MIV2 is used in place of MIV1. The MTS-MIV bounds, thus, clearly indicate that violation of hypergamy increases a woman's likelihood of facing all types of domestic violence.

What broad conclusion can one draw about the magnitude of the effect of hypergamy violation on women's exposure to domestic violence based on these results? To answer this question, we focus on the impact of violation of hypergamy on women's exposure to *any* violence under the combined MTS-MIV assumptions. Under MTS and MIV1 (MIV2) assumption, the bounds on the ATE for hypergamy violation reveal that violation of hypergamy increases likelihood of women's exposure to any domestic violence by *at least* 17% (14%). Given that these figures indicate only the lower bound of the true ATE, our results clearly suggest that hypergamy violation leads to severe increase in domestic violence. This is an extremely alarming finding and is largely consistent with recent findings of Bhalotra et al. (2021), Guarnieri and Rainer (2021) and Tur-Prats (2021), all of which suggest that an increase in female economic status relative to male economic status increases domestic violence.

5.2 Robustness Checks

To assess how robust our results are, we carry out a battery of robustness tests.

Alternative Treatment Group We alter the definition of the treatment group. In our baseline analysis, the treatment group consists of all women whose economic status exceeds or equals their husbands' economic status. Now, we include only those women in the treatment group whose economic status strictly exceeds that of their husbands'. Thus, when assessing the impact of

hypergamy violation on domestic violence, the treatment group consists of women whose completed years of schooling exceeds that of their husbands. The results are presented in Table A1 in the Appendix. Reassuringly, the results are qualitatively similar to the baseline results.

Alternative Measures of Domestic Violence We follow González and Rodriguez-Planas (2020) and construct alternative intensity-based measures of less severe physical violence, severe physical violence, sexual violence and emotional violence. The intensity-based measure of a particular type of domestic violence is computed as the sum of binary variables indicating different types of underlying violences to which the woman may have been exposed during the twelve months prior to the survey (we will refer to the sum of binary variables as intensity score). However, we cannot use these intensity-based measures directly in our analysis since these are non-binary while the outcome variable in our model has to be binary. For each category of domestic violence, therefore, we create three groups: women with no exposure to domestic violence, women with exposure to mild domestic violence, and women with exposure to severe domestic violence. In the group of women with exposure to mild domestic violence, we include those women whose domestic violence intensity score is one (i.e., they have been exposed to one type of underlying violence). In the group women with exposure to severe domestic violence, we include those women whose domestic violence intensity score is greater than one (i.e., they have been exposed to more than one type of underlying violence). Using these three groups, for each category of domestic violence, we examine how hypergamy violation affects the women's exposure to mild domestic violence and exposure to severe domestic violence.

The results are presented in Table A2. The results indicate that violation of hypergamy leads to an increase in women's exposure to both mild as well as severe domestic violence. That is, compared to women who are in hypergamous marriages, women who are in non-hypergamous marriages – some of them have a higher likelihood to being exposed to mild domestic violence while others have a higher likelihood of being exposed to severe domestic violence.

Misclassification of Treatment Status As noted in Section 4, Indian women generally do not pursue further formal education after getting married, especially given that patrilocal extended

families are still prevalent in India.[21] Thus their educational attainment is likely to be fixed at the time of union formation. For Indian men as well, there is a high likelihood of this being the case since most men in India do not go for tertiary education as noted previously. However, for Indian men, unlike Indian women, we perhaps cannot completely rule out the possibility that their educational attainment observed during the survey is not their educational attainment at the time of union formation. This implies that a marriage that is actually non-hypergamous, although rarely, could be observed as a hypergamous marriage in the survey (the husband at the time of union formation was less educated than the wife but became more educated post-marriage) This, in other words, means that our binary explanatory variable could be misclassified such that for some women the treatment variable which should actually take the value of 1 (they actually "married down" or their marriage was actually non-hypergamous) erroneously takes the value zero (they "appear" to have "married up" or their marriage "appears" to be hypergamous).[22]

In light of this concern, we feel it is important to check how the main results get affected if we allow this binary indicator variable to contain misclassification error such that some non-hypergamous marriages are misclassified as hypergamous marriages. As such, we conduct a robustness check in which we allow a specific proportion of women whom we observe (or categorize) to be in hypergamous marriages to be actually in non-hypergamous marriages, and check the implication of such misclassification (or mis-observation) error on our baseline results. We use the same econometric model which we had used for our baseline analysis but now allow the treatment variable to contain one-way misclassification error ("false negatives") (see Kreider et al., 2012, Millimet and Roy, 2015 for details on estimation of nonparametric bounds on the ATE in presence of misclassification error). Since we believe that the proportion of misclassification is unlikely to be too high (since, as noted previously, it is highly likely that for most men during union formation, their educational attainment becomes fixed), we carry out our analysis for misclassification rates, 1%, 5% and 10% (a 1% misclassification rate indicates that of the all the marriages observed as hypergamous, 1% are actually non-hypergamous, a 5% misclassification rate indicates that of all the marriages observed as hypergamous, 5% are actually non-hypergamous and so on).

[21] In fact, there is a fairly large literature on Indian girls dropping out of school once they attain puberty.

[22] Note, however, a marriage which is actually hypergamous will always be observed as hypergamous in the survey since women do not continue education post-marriage and even if men continue education post-marriage, a marriage which was actually hypergamous would always be observed as hypergamous.

Our results are reported in Table A3. We find that, for 1%, 5% and 10% rates of misclassification in the treatment status, the estimated bounds on the ATE of hypergamy violation on all forms of domestic violence are strictly positive and statistically significant suggesting that women who are in marital relationships in which hypergamy is violated are exposed to more domestic violence than their counterparts. This, we believe, is an incredibly remarkable result showing that, based on observed educational attainment of couples, even if we have wrongly classified up to 10% non-hypergamous marriages as hypergamous marriages in our sample (which is around 5,000 observations), the main findings and overall conclusion of the paper remain unaltered. This suggests that our baseline results are remarkably robust to misclassification in the treatment status, and the fact that we have defined our treatment variable based on couples' educational attainment observed at the time of the survey, and not their educational attainment at the time of union formation, is unlikely to have any bearing on the main findings of the paper.

Misreporting of Domestic Violence We investigate the sensitivity of our results to possible misreporting of women's exposure to domestic violence. Misreporting would be a cause of concern for our identification strategy if it arises in form of underreporting of domestic violence by women who are in hypergamous marriages (i.e., women who do not violate hypergamy) since in that case our findings could be explained by women in hypergamous marriages not disclosing domestic violence or having a higher acceptance of domestic violence. To examine this issue, we do the following.

We assume that 5% of the women in the hypergamous marriages ($H = 0$) underreport their prevalence of domestic violence. That is, these women reported no episode of domestic violence ($Y = 0$) even though they were exposed to it ($Y = 1$). Under this assumption, for estimating the "true" bounds on the ATE, we should ideally be able to find the women who actually underreport. Since that is not possible, we randomly choose 5% of women in the hypergamous marriages ($H = 0$) who have reported no exposure to domestic violence ($Y = 0$) in our sample and replace their response from not exposed ($Y = 0$) to exposed ($Y = 1$), and repeat this exercise 100 times. This gives us 100 simulated samples. Next, for each simulated sample, we estimate the impact of violation of hypergamy on women's exposure to domestic violence under the assumption of MTS and MIV. We then compare the results based on these 100 samples with our original result to examine if our

assumption that 5% of the women in the hypergamous marriages underreported their prevalence of domestic violence was actually true then how our results would have changed.

In Figure A2, we present the results of average treatment effect (ATE) of violation of hypergamy on women's exposure to any type of domestic violence i.e. physical, sexual or emotional. The results corresponding to the first MIV, state literacy rate, is presented in the first graph, and the results corresponding to the second MIV, GSDP per capita (measured at constant prices), is presented in the second graph. In each graph, the horizontal (vertical) axis indicates the estimated lower (upper bound). As evident, irrespective of the MIV used, the bounds on ATE of hypergamy violation on women's exposure to domestic violence, based on each and every simulated sample, are strictly positive. This is extremely reassuring as it suggests that even if (up to) 5% of the women who are in hypergamous marriages actually underreported their exposure to domestic violence, the qualitative results and the main takeaway of our study are likely to remain unchanged.

Additional Robustness Checks In addition to the above, we also conduct several other robustness checks. We re-estimate our baseline model using survey/sampling weights. Given that NFHS follows a complex survey design, it is worthwhile to check whether our baseline results change when we include survey weights in our analysis (Table A4). Next, we repeat our baseline analysis splitting the sample into 3 MIV cells as well as splitting the sample into 10 MIV cells (Table A5). Finally, we carry out a placebo test to check whether or not we are picking up some confounding effect. Specifically, we estimate the ATE of month of birth of women's first child on women's exposure to domestic violence. The ATE of month of birth of women's first child on women's exposure to domestic violence should be zero (Table A6).

These robustness checks are discussed in detail in the Appendix, and the results are presented therein. Our main results, thankfully, pass all the robustness tests.

5.3 Heterogeneity Analysis

We cut our analytic samples in various ways, and examine the effect of hypergamy violation on domestic violence for different subsamples (see the online appendix). Specifically, we examine heterogeneity by (i) area of residence (rural versus urban) (Table A7), (ii) presence of children (children present versus children absent) (Table A8), (iii) household type (one/two generation

versus three generation households) (Table A9), (iv) household wealth (household belonging to the poorest, poorer, middle, richer and richest wealth quintile) (Table A10), (v) couple's (average) age (relatively older couples versus relatively younger couples) (Table A11), (vi) Couple's timing of marriage (couples married in the last 5 years versus couples married before 5 years) (Table A12), (vii) Woman's and husband's caste (women married to men of same caste versus women married to men of different caste) (Table A13). We find that the bounds on the ATE of hypergamy violation, irrespective of how hypergamy is measured, are strictly positive and almost always statistically significant across all the subpopulations. This indicates that domestic violence in response to violation of hypergamy is not restricted to only certain groups in the Indian society.

5.4 Mechanisms

We now proceed with an examination of potential channels underlying our finding of hypergamy violation causing higher domestic violence. We divide our analysis into two subsections by focusing on the causal effects of hypergamy violation on the following: (a) the likelihood of violation of patriarchal norms and beliefs about gender roles, and (b) the likelihood of husbands displaying behaviors that potentially could perpetuate domestic violence due to instrumental reasons (i.e., to extract resources from women or sabotage their labor market prospects).

5.4.1 Violation of Patriarchal Norms and Beliefs About Gender Roles

A potential mechanism underlying the effects that we observe is violation of patriarchal norms and beliefs about gender roles due to violation of hypergamy. Violation of hypergamy could lead to undermining of traditional patriarchal gender beliefs and norms which prescribe male dominance and female dependence (Macmillan and Gartner, 1999; Bertrand et al., 2015; Baland and Ziparo, 2017; Bernard et al., 2020), and lead to increased stress, tension, and domestic violence in form of male backlash (Jewkes 2002; Kaukinen, 2004; Atkinson et al., 2005; Vyas and Watts 2009; Weitzman, 2014).

We examine this potential channel by estimating the ATE of hypergamy violation on three binary variables each of which indicates whether or not patriarchal norms about gender roles is violated in a particular type of decision making. These variables are: violation of norm regarding purchase of large household goods, violation of norm regarding visiting relatives/family, and vio-

lation of norm regarding how woman's earnings should be spent. A given indicator of patriarchal gender norm violation takes a value of one if the husband reports to believe that it is only he who should have the final say in that particular decision making but in reality the woman alone or the husband and woman jointly takes that decision, and zero otherwise.[23]

Since patriarchal gender norms prescribe that (only) men should be the decision makers, a value of one for a given patriarchal norm violation variable indicates that the woman's husband intends to follow patriarchal gender norms with respect to the particular decision making which the variable captures but in reality the norm is violated in the household, while a value of zero indicates that either husband does not intend to follow gender identity norms (in which case the question of norm violation does not arise) or that he intends to follow the gender identity norm which is not violated.

Figures 2 presents the results for the impact of violation of hypergamy on violation of patriarchal and norms about gender roles. We find that the bounds on the ATE under the combined MTS-MIV assumptions indicate that hypergamy violation increases the likelihood of violation of patriarchal norms about gender roles for all the types of decision making. More exactly, under MTS and MIV1 (MIV2) assumption, the bounds on the ATE for hypergamy reveal that violation of hypergamy increases the likelihood of women violating patriarchal gender norms regarding decisions pertaining to purchase of large household goods by at least 3% (2%), the likelihood of violating gender norms regarding decisions pertaining to visiting family/relatives by at least 9% (8%), and the likelihood of violating gender norms regarding decisions pertaining to spending of women's earnings by at least 7% (7%).

These findings indicate that violation of hypergamy leads to undermining of patriarchal norms and beliefs about gender roles. Because we also find evidence that hypergamy violation increases the likelihood of women's exposure to domestic violence, this result could be interpreted as providing suggestive evidence that a channel through which hypergamy violation impacts domestic violence is change in the levels of adherence to patriarchal norms and beliefs about gender roles.

[23] The summary statistics of these variables along with the variables used to examine whether hypergamy violation leads to higher domestic violence due to instrumental reasons (see section 5.4.2) are presented in Table A14 in the online appendix.

5.4.2 Instrumental Usage of Domestic Violence

Another potential mechanism underlying the effects that we observe is the usage of domestic violence as an "instrument" by the husbands. According to the instrumental theories of domestic violence (Eswaran and Malhotra, 2011; Anderberg and Rainer, 2013), if domestic violence is used by the men as an instrument either to extract financial resources from their wives or to sabotage their labor market prospects (may be because they feel jealous/insecure at the prospect of their wives interacting with other males at workplace), then domestic violence is likely to increase with women's economic status relative to their husbands (women's relative economic status) since an increase in women's relative economic status is likely to increase the financial resources at their disposal and/or their likelihood of labor market participation. Given that hypergamy violation is ultimately an outcome of improvement of women's relative economic status, women who violate hypergamy could be more exposed to domestic violence than their counterparts due to instrumental usage of domestic violence.

We examine this potential channel by estimating the ATE of hypergamy violation on several variables capturing husbands' behavior. All of these variables could potentially act as factors perpetuating domestic violence due to instrumental reasons discussed above. These variables include: husbands extract (or having full control over) wife's earnings, husband feel jealous if wife talks with other men, husband accuses wife of unfaithfulness, and the husband insists on knowing the wife's whereabouts. Each of these variables are binary in nature. A given variable takes a value of one if the woman agrees with statement reflected by the variable-name, and zero otherwise.

Figure 3 presents the bounds on the ATE for the impact of violation of hypergamy on the factors that could be perpetuating domestic violence due to instrumental reasons. We find that for all the outcomes considered except the outcome that indicates whether or not the husband extracts wife's earnings, the bounds on the ATE of violation of hypergamy under the combined MTS-MIV1 assumption as well as the combined MTS-MIV2 assumption are strictly positive and statistically significant. For the outcome that indicates whether or not the husband extracts wife's earnings, while the bounds when MIV1 is used is strictly positive and statistically significant, they include zero when MIV2 is used instead of MIV1.

These results, altogether, suggest that hypergamy violation certainly increases husbands' feel-

ings of jealousy, their likelihood of accusing their wives' of unfaithfulness, and their urge to keep track of their wives' whereabouts. However, whether hypergamy violation increases the likelihood of husbands' extracting financial resources from their wives is not very clear. Since hypergamy violation affects several factors that could potentially be leading to men using domestic violence as an instrument to sabotage their wives' labor market prospects, and since we also find evidence that hypergamy violation increases the likelihood of women's exposure to domestic violence, this result could be interpreted as providing suggestive evidence that one channel through which hypergamy violation affects domestic violence is alterations in the levels of husbands' likelihood of using domestic violence as an instrument to sabotage their wives' labor market prospects.

6 Conclusion

In this paper we explore whether violation of hypergamy has a causal effect on women's exposure to domestic violence. Compared to a woman who is in a marital relationship in which hypergamy is not violated, a woman who is in a marital relationship in which hypergamy is violated could have a higher likelihood of facing domestic violence since she is more likely to violate patriarchal gender beliefs and norms regarding gender roles, and/or because her husband might have higher likelihood of using domestic violence "instrumentally" to extract resources from her or thwart her labor market prospects. However, this does not necessarily have to be the case since an increase in economic status of women relative to that of their husbands is likely to lead to an improvement of their intrahousehold bargaining power. This should make a woman who is in a marital relationship in which hypergamy is violated less prone to male-perpetrated violence compared to her counterpart.

Using Indian data and employing a nonparametric bounds approach to achieve causal identification, we find clear evidence that violation of hypergamy leads to a significant increase in women's exposure to domestic violence. Further, we provide suggestive evidence that this result arises because violation of hypergamy is likely to undermine patriarchal beliefs about gender role, and also because it is likely to increase men's likelihood of using domestic violence instrumentally.

Our findings underscore the complexities that policymakers in developing countries have to face when trying to address the problem of domestic violence. While conventional wisdom suggests that policies and programs to promote gender equality might be useful for reducing domestic violence

and improving lives of women, our results indicate that that might not be the case in reality. It should be noted that our findings in no way undermine the importance of welfare policies that seek to empower women in reducing domestic violence. Rather they strongly emphasize that such policies must be complemented by well-designed interventions that aim at changing gender norms, 'enforceable' legislations that offer women legal protection from domestic violence, and removal of restrictions on women's access to divorce for effectively tackling the problem of domestic violence.

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Table 1. Violences underlying each category of domestic violence

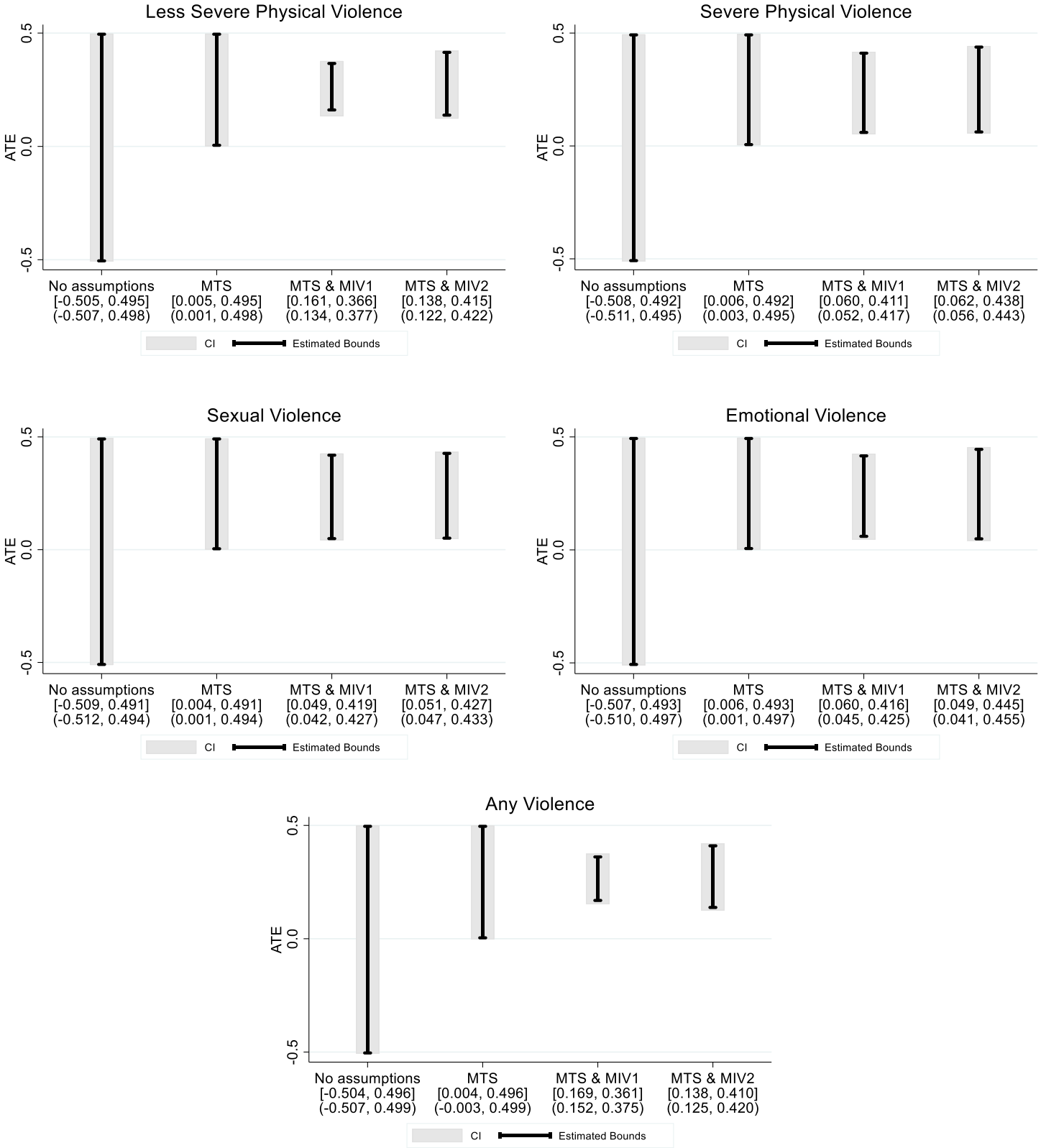
Category of Domestic Violence	Underlying Violences
Less Severe Physical Violence	Acts of pushing, shaking, throwing something, twisting arm, pulling hair, slapping, punching with partner's fist or something else
Severe Physical Violence	Acts of kicking, beating, choking, burning, threatening or attacking with any kind of weapon
Sexual Violence	Forced sexual acts, forced sexual relations resulting from the fear of what the partner would do otherwise, and humiliating sexual acts
Emotional Violence	Acts which caused women to face humiliation, insult, various kinds of threats from their partners to hurt the women or her closed ones

Table 2. Summary statistics

	Mean	SD
Panel A: Main outcomes		
Less severe physical violence	0.207	0.405
Severe physical violence	0.061	0.24
Sexual violence	0.054	0.226
Emotional violence	0.105	0.307
Any violence	0.25	0.433
Panel B: Treatment variable		
Violation of hypergamy	0.220	0.414
Panel C: MIVs		
Literacy rate	0.732	0.075
GSDP per capita (constant 2011-12 INR)	77706	41754
Panel D: Demographic characteristics		
Women's age	33.032	8.100
Husband's age	37.661	9.247
Women's education	5.963	5.198
Husband's education	7.541	4.997
Wealth index	2.971	1.389
Religion (=1 if Hindu)	0.751	0.433
Family size	5.049	2.117
Children absent (=1 if yes)	0.093	0.290
One/two generation household (=1 if yes)	0.626	0.484
Same caste marriage (=1 if yes)	0.943	0.233
Place of residence (=1 if rural)	0.705	0.456
Region of residence		
North/West/Central (=1 if yes)	0.367	0.482
South/East (=1 if yes)	0.633	0.482
N	65806	

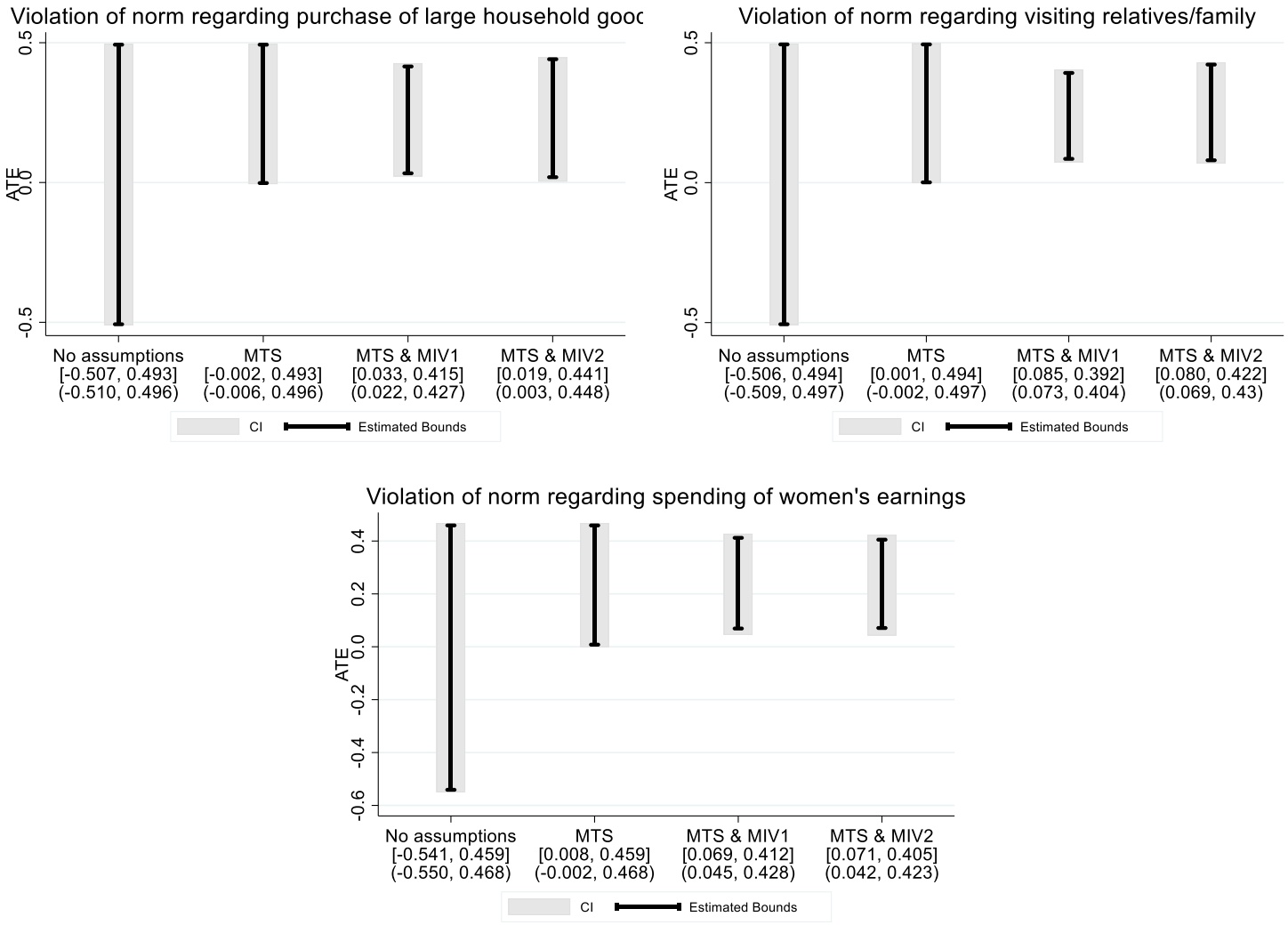
Notes: See text for definition of the outcome variables and the treatment variable. The North/West/Central region includes Bihar, Chandigarh, Chhattisgarh, Dadra and Nagar Haveli, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Madhya Pradesh, Maharashtra, Delhi, Punjab, Rajasthan, Uttar Pradesh and Uttarakhand. The South/East includes the Andaman and Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Daman and Diu, Goa, Karnataka, Kerala, Lakshadweep, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Puducherry, Sikkim, Tamil Nadu, Tripura, Telangana and West Bengal. Information of women's (husbands') caste is not available for 2,917 (20,735) individuals. Also, husbands' age is not available for 18,314 individuals.

Figure 1. ATE of violation of hypergamy on domestic violence



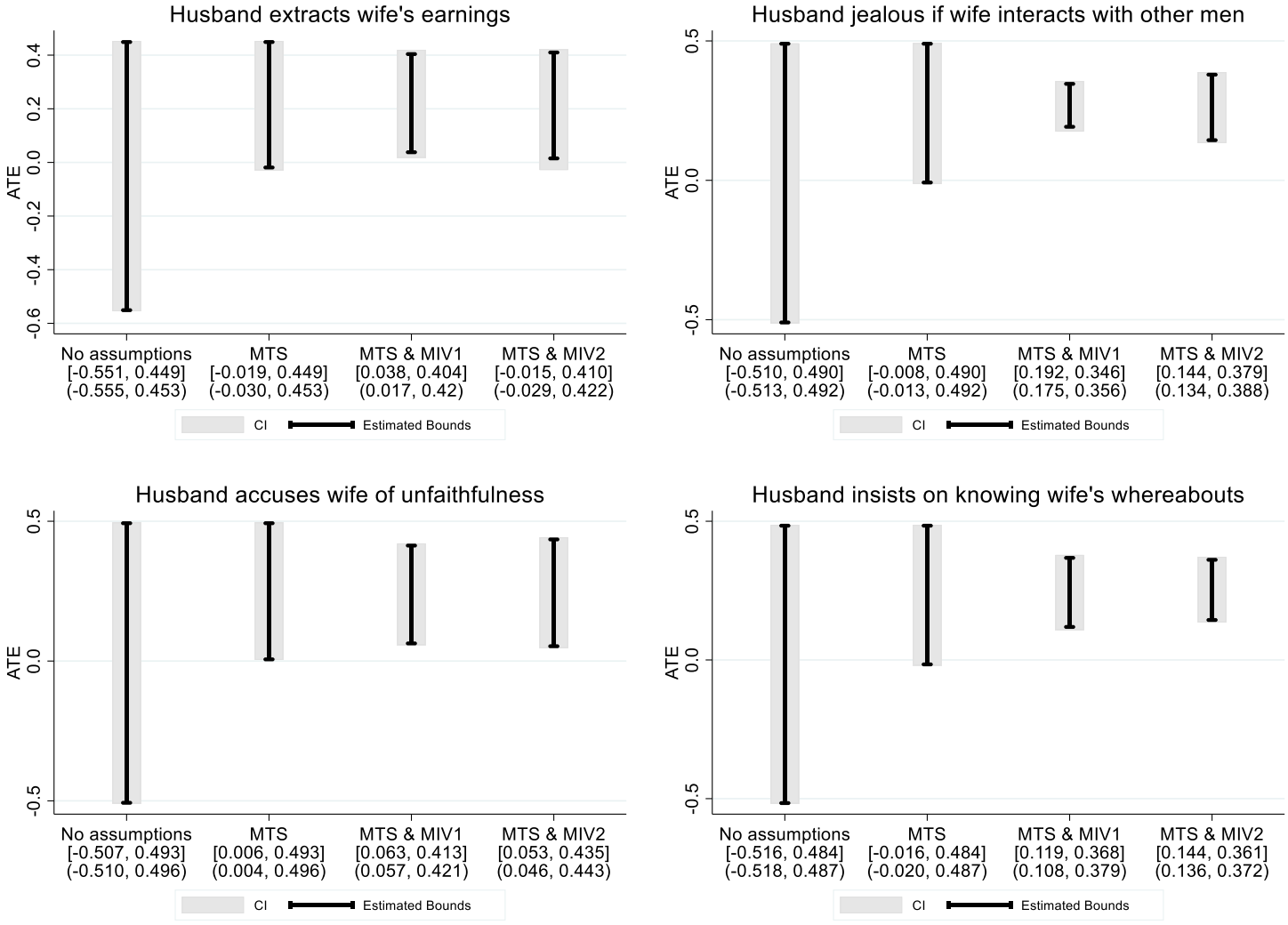
Notes: Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Figure 2. ATE of violation of hypergamy on traditional gender norm violation



Notes: Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Figure 3. ATE of violation of hypergamy on factors perpetuating instrumental violence



Notes: Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parantheses. See text for further details.

Online Appendix

Don't Cross the Line: Bounding the Causal Effect of Hypergamy Violation on Domestic Violence in India

1 Additional Robustness Checks

Using Sampling Weights The NFHS-4 sample is a stratified two-stage sample. The 2011 census served as the sampling frame for the selection of primary sampling units (PSUs). PSUs were villages in rural areas and Census Enumeration Blocks (CEBs) in urban areas. PSUs with fewer than 40 households were linked to the nearest PSU. Within each rural stratum, villages were selected from the sampling frame with probability proportional to size (PPS). In each stratum, six approximately equal substrata were created by crossing three substrata, each created based on the estimated number of households in each village, with two substrata, each created based on the percentage of the population belonging to scheduled castes and scheduled tribes (SCs/STs). Within each explicit sampling stratum, PSUs were sorted according to the literacy rate of women age 6+ years. The final sample PSUs were selected with PPS sampling. In urban areas, CEB information was obtained from the Office of the Registrar General and Census Commissioner, New Delhi. CEBs were sorted according to the percentage of the SC/ST population in each CEB, and sample CEBs were selected with PPS sampling.

In every selected rural and urban PSU, a complete household mapping and listing operation was conducted prior to the main survey. Selected PSUs with an estimated number of at least 300 households were segmented into segments of approximately 100-150 households. Two of the segments were randomly selected for the survey using systematic sampling with probability proportional to segment size. Therefore, an NFHS-4 cluster is either a PSU or a segment of a PSU. In the second stage, in every selected rural and urban cluster, 22 households were randomly selected with systematic sampling.

Given that NFHS follows a complex survey design, it is worthwhile to check whether our baseline results change when we include survey weights in our analysis. Towards that end, we re-estimate our baseline model using survey/sampling weights. The results are reported in Table A4. We find that the bounds on ATE estimated using survey/sampling weights is very similar to the baseline results. This is reassuring and suggests that using or not using survey/sampling weights do not create any difference in the overall findings, quantitatively as well as qualitatively.

Alternate Number of MIV Cells In the nonparametric bounds literature, while there are studies that split the sample into 20 MIV cells (Kreider et al., 2012), there are also studies that split into 4-5 MIV cells (e.g., Millimet and Roy, 2015a; Millimet and Roy, 2015b). This is perhaps because when splitting the sample based on the values of a continuous MIV, there is really no strict recommendation regarding the ideal number of cells the sample should be split into; just that, per cell, there should be sufficient number of observations in the treatment and control groups whose outcome variable takes a value of one, and sufficient number of observations in the treatment and control groups whose outcome variable takes a value of zero. In light of this, our choice of splitting the sample into 5 cells should not be problematic. However, following Kreider et al. (2012), it is worth checking how our results vary when we split our sample into less than and more than the chosen number of MIV cells. This will allow us to check whether the chosen number of MIV cells has any bearing on the baseline results. Towards that end, we repeat our baseline analysis splitting the sample into 3 MIV cells as well as splitting the sample into 10 MIV cells. The results reported in Table A5, reassuringly, are qualitatively similar to baseline results (i.e., the bounds on the ATE are strictly positive and statistically significant), and suggest that the chosen number of MIV cells do not drive our main findings and conclusion.

Placebo Test We carry out a placebo test to check whether or not we are picking up some confounding effect. Specifically, we estimate the ATE of month of birth of women's first child on women's exposure to domestic violence. Month of birth of women's first child is unlikely to be correlated with patriarchal gender norms, and should also have no effect on women's exposure to domestic violence. Hence, the ATE of month of birth of women's first child on women's exposure to domestic violence should be zero. To carry out this test, we convert the month of birth of women's first child variable available in the NFHS into a binary variable – which takes a value one if the woman's first child was born between January and June and zero otherwise – and use this binary variable as the treatment variable. The relevant assumption that we invoke when estimating the ATE of women's first child's month of birth on domestic violence is that of exogenous selection which can formally be expressed as:

$$Y(0), Y(1) \perp H$$

This assumption is relevant since there is no reason why women in treatment group would be more or less predisposed to domestic violence than women in control group. Invoking this assumption allows us to non-parametrically identify the point estimate of the ATEs (as opposed to bounds) (see Millimet and Roy, 2015b for further details). The ATEs for the three samples estimated under the assumption of exogenous selection are reported in Table A6. As evident, all of the estimates of the ATEs are economically and statistically insignificant.

2 Heterogeneity Analysis

In this section, we carry out heterogeneity analysis by cutting the sample in various ways. Specifically, we examine heterogeneity by:

1. Area of residence – rural versus urban
2. Presence of children – children present versus children absent
3. Household type – one/two generation versus three generation households
4. Household wealth – household wealth quintiles (household belonging to the poorest, poorer, middle, richer and richest wealth quintile)
5. Couple's (average) age – relatively older couples (couple's average age equal to or higher than the median) versus relatively younger couples (couple's average age less than the median)
6. Couple's timing of marriage – couples married in the last 5 years versus couples married before 5 years
7. Woman's and husband's caste – women married to men of same caste versus women married to men of different caste

The results of the heterogeneity analysis are presented in Tables A7–A13. While carrying out a between-subpopulation comparison of the ATEs of hypergamy violation on domestic violence is difficult given our bound estimates of the ATEs (since the bounds most of the times partially overlap), what we find remarkable about our results is that, irrespective of which MIV is used, the effect of hypergamy violation is strictly positive and almost always statistically significant across

all the subpopulations.[1] This suggests that our main results are not being driven by only certain subpopulations and not by others. This is interesting (and perhaps alarming) since this suggests that domestic violence in response to violation of hypergamy is not restricted to only certain groups in the Indian society. A woman who is in a non-hypergamous marital relationship has a higher likelihood of facing domestic violence compared to a woman who is in a hypergamous relationship irrespective of whether or not she lives in rural India, whether or not she has children, whether or not she lives in a three-generation household, whether or not she is a part of the household that belongs to the lower end of the wealth distribution, whether or not she and her husband are relatively young, whether or not they have been married relatively recently, and whether or not they belong to the same caste group. From a policy perspective this clearly suggests that to address the problem of domestic violence in India, the policymakers must adopt large-scale policies and interventions that could impact lives of *most* Indian women (and men). Adopting a targeted approach (i.e., targeting policies towards only certain groups of women) instead is unlikely to be very useful in significantly reducing the problem of domestic violence in India.

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[1] One exception is the bounds on the ATE of hypergamy violation obtained using MIV2 for the women belonging to the "richest" households (Table A10, bottom-most panel). These bounds, although always positive, are not statistically significant for most of the cases.

Table A1. Robustness Check, Alternative Treatment Group

	Less Severe Physical Violence	Severe Physical Violence	Sexual Violence	Emotional Violence	Any Violence
MTS & MIV1	[0.104, 0.446]	[0.038, 0.537]	[0.039, 0.547]	[0.041, 0.527]	[0.109, 0.428]
	(0.088, 0.454)	(0.029, 0.548)	(0.032, 0.556)	(0.033, 0.538)	(0.092, 0.441)
MTS & MIV2	[0.087, 0.447]	[0.033, 0.541]	[0.043, 0.537]	[0.027, 0.533]	[0.083, 0.436]
	(0.072, 0.470)	(0.027, 0.551)	(0.032, 0.545)	(0.014, 0.545)	(0.063, 0.443)

Notes: The treatment group includes women whose educational attainment is higher than that of their husbands'. Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Table A2. Robustness Check, ATE of Hypergamy Violation on Intensity of Exposure to Domestic Violence

	Less Severe Physical Violence		Severe Physical Violence		Sexual Violence		Emotional Violence	
	Mild	Severe	Mild	Severe	Mild	Severe	Mild	Severe
MTS & MIV1	[0.057, 0.405]	[0.138, 0.380]	[0.054, 0.414]	[0.010, 0.431]	[0.031, 0.426]	[0.021, 0.429]	[0.027, 0.424]	[0.041, 0.423]
	(0.046, 0.410)	(0.104, 0.387)	(0.043, 0.420)	(0.006, 0.437)	(0.025, 0.433)	(0.017, 0.439)	(0.019, 0.433)	(0.033, 0.434)
MTS & MIV2	[0.045, 0.413]	[0.124, 0.407]	[0.054, 0.438]	[0.010, 0.436]	[0.027, 0.426]	[0.024, 0.427]	[0.023, 0.447]	[0.037, 0.438]
	(0.037, 0.423)	(0.115, 0.415)	(0.049, 0.445)	(0.007, 0.453)	(0.023, 0.434)	(0.020, 0.435)	(0.016, 0.457)	(0.030, 0.442)

Notes: Mild domestic violence indicates exposure to one type of underlying violence. Severe domestic violence indicates exposure to more than one type of underlying violence. Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Table A3. Robustness Check, Misclassification of Treatment Status

	Less Severe Physical Violence	Severe Physical Violence	Sexual Violence	Emotional Violence	Any Violence
Panel A: 1% misclassification					
MTS & MIV1	[0.151, 0.377]	[0.058, 0.423]	[0.047, 0.428]	[0.054, 0.424]	[0.159, 0.372]
	(0.129, 0.388)	(0.044, 0.481)	(0.039, 0.474)	(0.048, 0.425)	(0.141, 0.455)
MTS & MIV2	[0.129, 0.425]	[0.059, 0.448]	[0.049, 0.436]	[0.045, 0.456]	[0.127, 0.420]
	(0.110, 0.437)	(0.045, 0.518)	(0.038, 0.441)	(0.038, 0.463)	(0.113, 0.429)
Panel B: 5% misclassification					
MTS & MIV1	[0.117, 0.417]	[0.048, 0.451]	[0.038, 0.450]	[0.037, 0.464]	[0.118, 0.412]
	(0.094, 0.428)	(0.039, 0.480)	(0.030, 0.478)	(0.031, 0.465)	(0.106, 0.442)
MTS & MIV2	[0.094, 0.465]	[0.048, 0.480]	[0.039, 0.466]	[0.028, 0.496]	[0.086, 0.460]
	(0.088, 0.455)	(0.034, 0.513)	(0.034, 0.468)	(0.021, 0.501)	(0.079, 0.469)
Panel C: 10% misclassification					
MTS & MIV1	[0.075, 0.467]	[0.035, 0.451]	[0.028, 0.450]	[0.014, 0.475]	[0.067, 0.462]
	(0.049, 0.478)	(0.030, 0.460)	(0.024, 0.457)	(0.010, 0.476)	(0.059, 0.470)
MTS & MIV2	[0.051, 0.515]	[0.036, 0.480]	[0.028, 0.466]	[0.007, 0.506]	[0.034, 0.510]
	(0.044, 0.521)	(0.030, 0.520)	(0.021, 0.502)	(0.002, 0.510)	(0.031, 0.516)

Notes: Misclassification of treatment status of women in hypergamous marriages allowed (see text for a discussion on this). Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Table A4. Robustness Check, Using Sampling Weights

	Less Severe Physical Violence	Severe Physical Violence	Sexual Violence	Emotional Violence	Any Violence
MTS & MIV1	[0.165, 0.363]	[0.070, 0.405]	[0.050, 0.419]	[0.073, 0.410]	[0.177, 0.361]
	(0.141, 0.369)	(0.052, 0.420)	(0.039, 0.427)	(0.066, 0.430)	(0.160, 0.376)
MTS & MIV2	[0.131, 0.398]	[0.060, 0.427]	[0.061, 0.420]	[0.062, 0.440]	[0.145, 0.402]
	(0.111, 0.420)	(0.040, 0.453)	(0.053, 0.457)	(0.051, 0.468)	(0.133, 0.423)

Notes: Sampling weights provided in the NFHS-4 used. The treatment group includes women whose educational attainment is at least as high as that of their husbands'. Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Table A5. Robustness Check, Alternate Number of MIV Cells

	Less Severe Physical Violence	Severe Physical Violence	Sexual Violence	Emotional Violence	Any Violence
Panel A: MIV Cells = 3					
MTS & MIV1	[0.081, 0.430]	[0.036, 0.449]	[0.024, 0.452]	[0.023, 0.456]	[0.076, 0.431]
	(0.071, 0.432)	(0.030, 0.451)	(0.020, 0.457)	(0.019, 0.465)	(0.072, 0.439)
MTS & MIV2	[0.095, 0.422]	[0.036, 0.451]	[0.037, 0.446]	[0.026, 0.460]	[0.092, 0.425]
	(0.089, 0.429)	(0.032, 0.455)	(0.033, 0.449)	(0.021, 0.466)	(0.087, 0.430)
Panel B: MIV Cells = 10					
MTS & MIV1	[0.185, 0.314]	[0.063, 0.342]	[0.069, 0.352]	[0.090, 0.356]	[0.213, 0.314]
	(0.166, 0.338)	(0.052, 0.367)	(0.065, 0.391)	(0.073, 0.373)	(0.189, 0.327)
MTS & MIV2	[0.196, 0.388]	[0.081, 0.417]	[0.061, 0.405]	[0.078, 0.425]	[0.199, 0.384]
	(0.177, 0.396)	(0.069, 0.422)	(0.052, 0.416)	(0.071, 0.434)	(0.186, 0.395)

Notes: Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Table A6. Placebo Test: ATE of Women's First Child's Month of Birth on Domestic Violence

	Less Severe Physical Violence	Severe Physical Violence	Sexual Violence	Emotional Violence	Any Violence
Exogenous Selection	[-0.009, -0.009]	[0.002, 0.002]	[0.000, 0.000]	[-0.002, -0.002]	[-0.006, -0.006]
	(-0.016, -0.003)	(-0.001, 0.006)	(-0.003, 0.004)	(-0.007, 0.004)	(-0.014, 0.001)

Notes: Treatment variable is binary and takes a value one if women's first child was born between January and June, and zero if otherwise. Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Table A7. Heterogeneity Analysis, Rural versus Urban

	Less Severe Physical Violence	Severe Physical Violence	Sexual Violence	Emotional Violence	Any Violence
Rural					
MTS & MIV1	[0.149, 0.393]	[0.057, 0.426]	[0.044, 0.428]	[0.041, 0.436]	[0.148, 0.394]
	(0.131, 0.406)	(0.044, 0.436)	(0.033, 0.440)	(0.022, 0.444)	(0.132, 0.400)
MTS & MIV2	[0.144, 0.412]	[0.065, 0.443]	[0.049, 0.431]	[0.050, 0.450]	[0.146, 0.414]
	(0.133, 0.421)	(0.058, 0.450)	(0.044, 0.440)	(0.041, 0.459)	(0.134, 0.425)
Urban					
MTS & MIV1	[0.071, 0.371]	[0.021, 0.399]	[0.030, 0.400]	[0.030, 0.402]	[0.085, 0.370]
	(0.051, 0.386)	(0.011, 0.410)	(0.020, 0.411)	(0.020, 0.420)	(0.067, 0.389)
MTS & MIV2	[0.095, 0.413]	[0.029, 0.426]	[0.029, 0.414]	[0.041, 0.430]	[0.095, 0.414]
	(0.071, 0.432)	(0.016, 0.437)	(0.021, 0.424)	(0.027, 0.440)	(0.078, 0.424)

Notes: Rural includes households living in rural areas. Urban includes households living in urban areas. Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Table A8. Heterogeneity Analysis, Presence of Children versus Absence of Children

	Less Severe Physical Violence	Severe Physical Violence	Sexual Violence	Emotional Violence	Any Violence
Children present					
MTS & MIV1	[0.166, 0.370]	[0.063, 0.418]	[0.048, 0.425]	[0.063, 0.421]	[0.172, 0.364]
	(0.156, 0.383)	(0.054, 0.428)	(0.041, 0.433)	(0.054, 0.431)	(0.157, 0.373)
MTS & MIV2	[0.144, 0.418]	[0.067, 0.443]	[0.052, 0.431]	[0.051, 0.449]	[0.143, 0.414]
	(0.130, 0.424)	(0.062, 0.451)	(0.045, 0.439)	(0.042, 0.455)	(0.131, 0.422)
Children absent					
MTS & MIV1	[0.082, 0.359]	[0.029, 0.354]	[0.057, 0.355]	[0.015, 0.373]	[0.085, 0.371]
	(0.027, 0.373)	(0.010, 0.372)	(0.041, 0.374)	(-0.005, 0.404)	(0.054, 0.399)
MTS & MIV2	[0.096, 0.379]	[0.019, 0.399]	[0.044, 0.399]	[0.028, 0.406]	[0.106, 0.375]
	(0.072, 0.418)	(0.003, 0.423)	(0.027, 0.427)	(0.010, 0.449)	(0.074, 0.404)

Notes: Children present includes couples who have at least one living child. Children absent includes couples with no living children. Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Table A9. Heterogeneity Analysis, Three Generation versus One/Two Generation Households

	Less Severe Physical Violence	Severe Physical Violence	Sexual Violence	Emotional Violence	Any Violence
Three generation					
MTS & MIV1	[0.099, 0.359]	[0.040, 0.388]	[0.041, 0.378]	[0.031, 0.392]	[0.087, 0.354]
	(0.048, 0.398)	(0.022, 0.400)	(0.024, 0.390)	(0.012, 0.412)	(0.020, 0.402)
MTS & MIV2	[0.107, 0.371]	[0.047, 0.406]	[0.056, 0.390]	[0.050, 0.407]	[0.106, 0.365]
	(0.089, 0.394)	(0.035, 0.423)	(0.044, 0.398)	(0.040, 0.416)	(0.080, 0.388)
One/two generation					
MTS & MIV1	[0.168, 0.396]	[0.063, 0.434]	[0.047, 0.441]	[0.056, 0.440]	[0.178, 0.395]
	(0.141, 0.410)	(0.048, 0.445)	(0.038, 0.447)	(0.044, 0.448)	(0.154, 0.401)
MTS & MIV2	[0.154, 0.425]	[0.070, 0.440]	[0.047, 0.433]	[0.047, 0.453]	[0.156, 0.426]
	(0.142, 0.436)	(0.064, 0.450)	(0.038, 0.439)	(0.038, 0.462)	(0.147, 0.437)

Notes: Three generation refers to three generation households. One/two generation refers to one or two generation households. Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Table A10. Heterogeneity Analysis, Wealth Quintiles

	Less Severe Physical Violence	Severe Physical Violence	Sexual Violence	Emotional Violence	Any Violence
Poorest					
MTS & MIV1	[0.119, 0.418]	[0.048, 0.404]	[0.049, 0.399]	[0.063, 0.406]	[0.116, 0.434]
	(0.084, 0.435)	(0.034, 0.429)	(0.013, 0.421)	(0.050, 0.410)	(0.095, 0.454)
MTS & MIV2	[0.152, 0.415]	[0.078, 0.409]	[0.069, 0.408]	[0.077, 0.408]	[0.135, 0.425]
	(0.114, 0.427)	(0.060, 0.412)	(0.050, 0.422)	(0.069, 0.424)	(0.113, 0.445)
Poorer					
MTS & MIV1	[0.104, 0.423]	[0.042, 0.452]	[0.032, 0.454]	[0.047, 0.462]	[0.099, 0.429]
	(0.081, 0.443)	(0.022, 0.470)	(0.017, 0.466)	(0.029, 0.486)	(0.069, 0.450)
MTS & MIV2	[0.122, 0.416]	[0.043, 0.461]	[0.041, 0.454]	[0.038, 0.471]	[0.100, 0.425]
	(0.095, 0.426)	(0.030, 0.471)	(0.029, 0.463)	(0.016, 0.486)	(0.061, 0.437)
Middle					
MTS & MIV1	[0.116, 0.401]	[0.034, 0.449]	[0.033, 0.459]	[0.038, 0.457]	[0.117, 0.393]
	(0.079, 0.419)	(0.015, 0.480)	(0.023, 0.463)	(0.025, 0.476)	(0.094, 0.416)
MTS & MIV2	[0.099, 0.420]	[0.024, 0.444]	[0.037, 0.426]	[0.022, 0.457]	[0.096, 0.418]
	(0.075, 0.441)	(0.016, 0.459)	(0.022, 0.439)	(0.013, 0.483)	(0.085, 0.438)
Richer					
MTS & MIV1	[0.084, 0.353]	[0.028, 0.375]	[0.013, 0.369]	[0.020, 0.381]	[0.076, 0.345]
	(0.071, 0.364)	(0.018, 0.399)	(0.006, 0.386)	(0.007, 0.389)	(0.065, 0.364)
MTS & MIV2	[0.048, 0.438]	[0.023, 0.448]	[0.019, 0.429]	[0.023, 0.449]	[0.050, 0.435]
	(0.031, 0.446)	(0.012, 0.455)	(0.002, 0.441)	(0.009, 0.462)	(0.042, 0.446)
Richest					
MTS & MIV1	[0.050, 0.350]	[0.012, 0.368]	[0.021, 0.369]	[0.021, 0.363]	[0.052, 0.353]
	(0.029, 0.361)	(0.006, 0.393)	(0.011, 0.379)	(0.009, 0.371)	(0.021, 0.365)
MTS & MIV2	[0.026, 0.381]	[0.002, 0.401]	[0.004, 0.407]	[0.005, 0.412]	[0.018, 0.385]
	(0.010, 0.417)	(-0.006, 0.405)	(0.000, 0.440)	(-0.004, 0.427)	(-0.008, 0.392)

Notes: Poorest includes households belonging to the first quintile of the wealth distribution, poorer includes households belonging to the second quintile of the wealth distribution, middle includes households belonging to the third quintile of the wealth distribution, richer includes households belonging to the fourth quintile of the wealth distribution, and richest includes households belonging to the fifth quintile of the wealth distribution. Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Table A11. Heterogeneity Analysis, Older couples versus younger couples

	Less Severe Physical Violence	Severe Physical Violence	Sexual Violence	Emotional Violence	Any Violence
Older couples					
MTS & MIV1	[0.156, 0.377]	[0.067, 0.425]	[0.052, 0.432]	[0.058, 0.429]	[0.165, 0.375]
	(0.136, 0.385)	(0.060, 0.437)	(0.044, 0.443)	(0.048, 0.442)	(0.148, 0.385)
MTS & MIV2	[0.145, 0.421]	[0.067, 0.451]	[0.054, 0.436]	[0.051, 0.458]	[0.147, 0.417]
	(0.133, 0.434)	(0.060, 0.459)	(0.049, 0.445)	(0.044, 0.468)	(0.138, 0.428)
Younger couples					
MTS & MIV1	[0.131, 0.365]	[0.045, 0.374]	[0.037, 0.381]	[0.042, 0.388]	[0.131, 0.367]
	(0.109, 0.384)	(0.030, 0.385)	(0.027, 0.394)	(0.023, 0.406)	(0.111, 0.385)
MTS & MIV2	[0.124, 0.389]	[0.048, 0.402]	[0.039, 0.396]	[0.040, 0.413]	[0.119, 0.396]
	(0.098, 0.400)	(0.035, 0.415)	(0.029, 0.408)	(0.030, 0.426)	(0.096, 0.411)

Notes: Older couples include couples whose average age (age of the husband plus wife divided by 2) is higher than or equal to the median average age. Younger couples include couples whose average age is lower than the median average age. Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Table A12. Heterogeneity analysis, Couples married in the last 5 years versus couples married before 5 years

	Less Severe Physical Violence	Severe Physical Violence	Sexual Violence	Emotional Violence	Any Violence
Couples married in the last 5 years					
MTS & MIV1	[0.089, 0.316]	[0.033, 0.341]	[0.041, 0.341]	[0.052, 0.344]	[0.112, 0.314]
	(0.056, 0.342)	(0.015, 0.375)	(0.030, 0.356)	(0.030, 0.360)	(0.082, 0.331)
MTS & MIV2	[0.109, 0.378]	[0.039, 0.365]	[0.047, 0.359]	[0.041, 0.381]	[0.117, 0.373]
	(0.097, 0.382)	(0.026, 0.385)	(0.031, 0.374)	(0.026, 0.395)	(0.078, 0.383)
Couples married before 5 years					
MTS & MIV1	[0.168, 0.377]	[0.068, 0.429]	[0.050, 0.437]	[0.060, 0.433]	[0.175, 0.373]
	(0.143, 0.403)	(0.062, 0.438)	(0.041, 0.446)	(0.050, 0.440)	(0.158, 0.382)
MTS & MIV2	[0.143, 0.423]	[0.066, 0.451]	[0.051, 0.436]	[0.047, 0.455]	[0.140, 0.418]
	(0.133, 0.433)	(0.051, 0.458)	(0.046, 0.447)	(0.035, 0.464)	(0.130, 0.429)

Notes: Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details.

Table A13. Heterogeneity analysis, Women married to men of same caste versus women married to men of different caste

	Less Severe Physical Violence	Severe Physical Violence	Sexual Violence	Emotional Violence	Any Violence
Women married to men of same caste					
MTS & MIV1	[0.096, 0.410]	[0.042, 0.419]	[0.026, 0.418]	[0.016, 0.432]	[0.086, 0.414]
	(0.034, 0.443)	(0.025, 0.429)	(0.014, 0.435)	(-0.002, 0.447)	(0.005, 0.459)
MTS & MIV2	[0.122, 0.411]	[0.055, 0.429]	[0.042, 0.421]	[0.033, 0.437]	[0.120, 0.412]
	(0.111, 0.426)	(0.045, 0.441)	(0.038, 0.436)	(0.022, 0.453)	(0.106, 0.421)
Women married to men of lower caste					
MTS & MIV1	[0.257, 0.422]	[0.099, 0.446]	[0.054, 0.436]	[0.083, 0.573]	[0.218, 0.418]
	(0.181, 0.508)	(0.028, 0.498)	(0.031, 0.493)	(-0.039, 0.633)	(0.103, 0.505)
MTS & MIV2	[0.101, 0.401]	[0.035, 0.418]	[0.043, 0.416]	[0.020, 0.407]	[0.132, 0.359]
	(0.049, 0.451)	(-0.014, 0.499)	(0.011, 0.463)	(-0.016, 0.489)	(0.033, 0.430)
Women married to men of higher caste					
MTS & MIV1	[0.064, 0.398]	[0.025, 0.399]	[0.052, 0.418]	[0.023, 0.404]	[0.076, 0.395]
	(0.009, 0.449)	(-0.011, 0.518)	(0.000, 0.524)	(-0.025, 0.496)	(0.006, 0.508)
MTS & MIV2	[0.128, 0.353]	[0.041, 0.407]	[0.071, 0.426]	[0.064, 0.432]	[0.155, 0.366]
	(0.069, 0.417)	(-0.011, 0.455)	(0.030, 0.482)	(-0.010, 0.472)	(0.060, 0.445)

Notes: High caste includes Brahmin and non-Brahmin upper castes. Low caste includes SC, ST and OBC. Point estimates of LB and UB around the unknown parameter Ψ in brackets; 95% Imbens-Manski confidence intervals calculated using bootstrap method in parentheses. See text for further details. We could not examine the effect of violation of earnings hypergamy on domestic violence for the different subsamples because the subsamples of women married to men of lower caste and women married to men of higher caste are extremely small in size (around 250 observations).

Table A14. Summary Statistics, Additional Outcomes

	N	Mean	SD
Violation of norm regarding purchase of large household goods	47492	0.165	0.371
Violation of norm regarding visiting relatives/family	47492	0.141	0.349
Violation of norm regarding how woman's earnings should be spent	11809	0.11	0.313
Husband extracts wife's earnings	14941	0.157	0.363
Husband feels jealous if wife talks with other men	65806	0.291	0.713
Husband accuses the wife of unfaithfulness	65806	0.102	0.498
Husband insists on knowing wife's whereabouts	65806	0.219	0.578

Notes: See text for definition of the outcome variables.

Figure A1. Proportion of women in state violating hypergamy

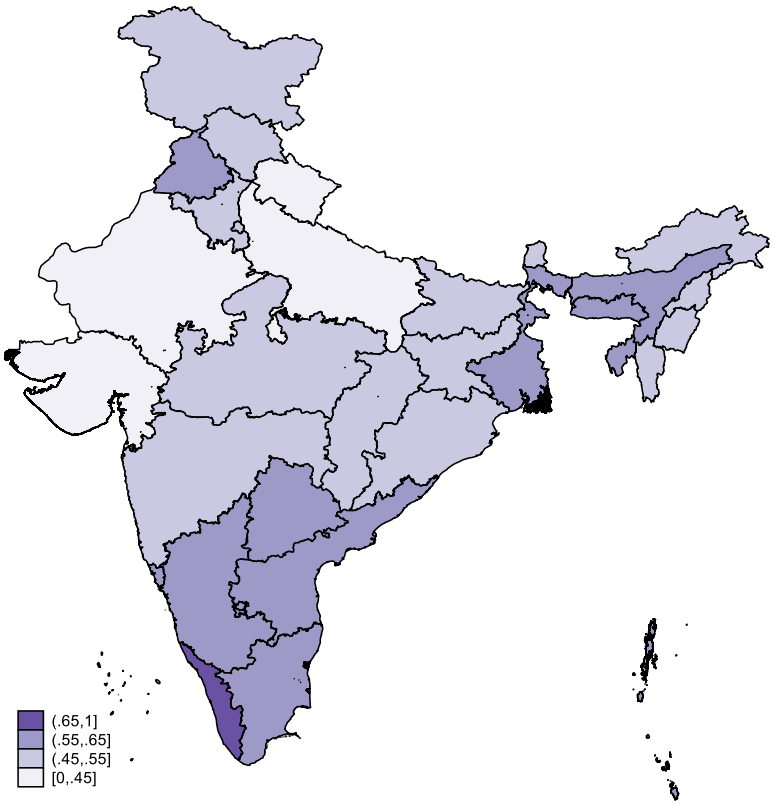
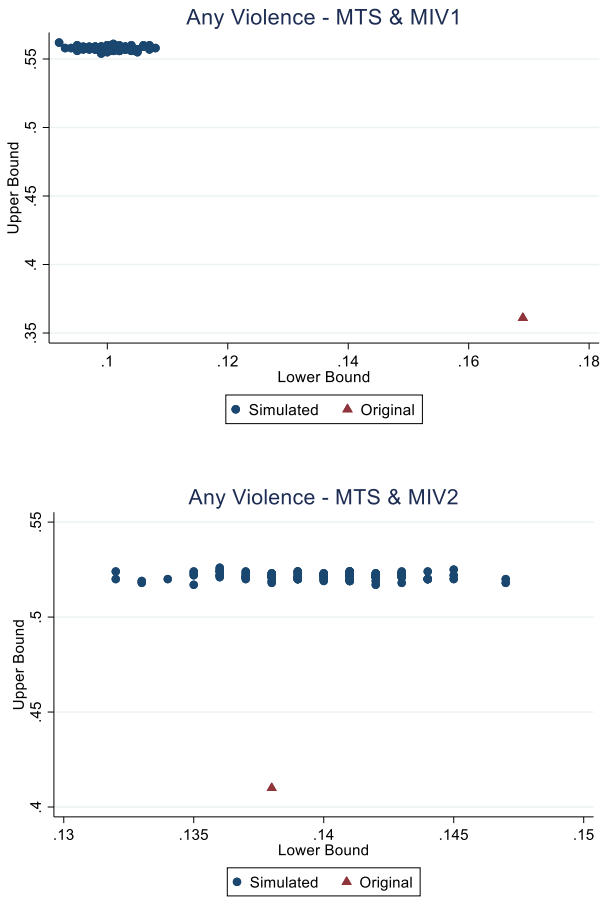


Figure A2. Assessing the impact of underreporting of domestic violence by women in hypergamous marriages



Notes: A simulated sample is constructed by choosing 5% women and assuming that they have been exposed to domestic violence (i.e., their outcome variable takes a value one) from the set of women who are in hypergamous marriages and report to have not been exposed to domestic violence.