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**A Touch of Violence - Welfare Outcomes under Bride  
Exchange and Child Brides**

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# A Touch of Violence - Welfare Outcomes under Bride Exchange and Child Brides

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## Abstract

This paper investigates the impact of marital traditions on women's welfare. It constructs and structurally estimates a theoretical model to understand how cultural preferences influence a husband's decision to abuse his wife. Within the context of Pakistani exchange marriage custom - Watta Satta and the practice of child brides, the estimated latent preferences imply that abusive husbands have a negative perception of time invested in home production and prefer to have a relatively lower contribution to it than wives. Contrary to the literature, the main policy takeaway from the counterfactual policy experiment conducted in this paper is that women's empowerment schemes for financial independence will fail to impact marital abuse in patriarchal societies, while male-centric policies - favourable perceptions about daughters by men and education for boys have significant returns.

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# 1 Introduction

Marriage embodies intricate configurations of overlapping relations with a complex set of post-marriage outcomes. Researchers across various social sciences disciplines have long defined marital relations as the interactions between spouses themselves and their extended family network where regional heritage and social structures contribute to a wife's welfare (see Anderson 2007, Bloch & Rao 2002, Jacoby & Mansuri 2010 and Quisumbing & Maluccio 2003). Societies where women have lower bargaining power than men, the returns to women-centric welfare programs remain uncertain as they are traditionally perceived to be contrary to cultural norms. Thus, insight into how local traditions impact women's well-being and marital bargaining power remains a concern for policymakers.

To address this concern, this paper investigates what factors contribute to the likelihood of women being in an abusive marriage, a form of marital power relations, in societies with solid marital traditions. Examples of such traditions are the Pakistani marital practices of *Watta Satta* bride exchange and child brides. *Watta Satta* is a practice of two households bartering brides where the brides are traditionally blood kin of the seeking spouse males.

This paper argues that the adoption of *Watta Satta* is motivated by non-compliance with the Sharia act of 1967 that entitles women to patrimony (Ahmad et al. 2016 and Rauf 1987). Furthermore, the nature of *Watta Satta* ensures that a husband does not demand his wife's patrimony because if he does, his *Watta* brother-in-law will reciprocate. This paper also reinforces the findings of Jacoby & Mansuri (2010), in the sense that the double threat of patrimony exchange in a *Watta Satta* marriage also is true for spousal violence. That is if one spouse abuses his wife, his *Watta* inlaw will retaliate by abusing his wife. These conclusions are confirmed by estimating the underlying structural parameters of the theoretical model. The estimates find that individuals in *Watta Satta* contracts have spousal violence-detering empathy for their *Watta* blood kin and that they use abuse as a reaction to maltreatment of their *Watta* kin.

By controlling for the abuse reporting censoring problem, the main contribution of this analysis lies in the role of male characteristics and preferences in reducing the incidence of spousal abuse. The policy prescription is that a lack of male education and a preference for sons increases the odds of women being victims of spousal abuse. These recommendations are tested by conducting counterfactual experiments. The experiments suggest that returns to male education and social campaigns that alter male fertility preference

indeed reduce the likelihood of spousal abuse. The results argue that compared to conventional schemes that provide women with some form of financial independence, men receiving compulsory education and having altered perceptions about fertility can reduce the incidence of marital abuse. Additionally, the experiments suggest that either of the two policies does not impact the odds of child brides.

Moreover, the contribution of this paper is threefold: (i) it provides insights into the causes of domestic abuse; (ii) it clarifies the causes of child marriage; and (iii) it improves the understanding of the type of households that opt for marriage exchange. This research addresses significant limitations in existing work: since gender-based violence is prone to under-reporting, most previous studies may suffer from substantial biases. Due to limited survey data availability, papers that consider the censoring issue discount for significant confounding correlates to spousal violence. This paper accounts for these limitations by using empirical techniques to address response censoring by the respondents and interviewers. The estimates using censorship bootstrap (Efron 1981) and misclassification indicator (Hausman et al. 1998) show that the conclusions remain robust after accounting for the underreporting issue.

The organisation of the rest of the paper is as follows: Section 2 summarises the literature on household preferences about marriage, while Section 3 constructs a theoretical model based on these preferences. Section 4 summarises the data, and 5 describes the empirical strategy. Next, Section 6 presents the reduced form results, followed by Section 7 where the result robustness under abuse response censoring is checked. Structural estimates are reported in Section 8, with a counterfactual analysis in 9. Finally, Section 10 summarises and concludes the paper.

## 2 Background

Understanding the motivations for child brides and spousal abuse in culture requires a dissection of household and individual preferences and traditions. In the context of this paper, *Watta Satta* bride exchange and child marriage are the two cultural considerations. This section summarises the underlying mechanisms of how *Watta Satta* and women being child brides influence domestic abuse as discussed in the literature. It also identifies and motivates causes for domestic abuse and child marriage, as they are used in Section 3 to construct the theoretical model and in Section 5 for the selection of observed covariates.

## 2.1 Watta Satta

*Watta Satta* is a marriage exchange tradition observed in Pakistan. It involves a barter of brides between two independent households via contracting a simultaneous marriage of related man-woman pairs. Since the *Watta* brides are kins of the spouse seeking male, brother-sister and first cousin pairs are frequently bartered. Variants of this custom also include “one-for-one” and “one-for-many” bachelorx exchanges. That is, more than one bride can be offered for a groom and vice versa. Less prevalent forms include inter-generational pairs such as uncle-niece, daughter-father and granddaughter-grandfather.

Household selection into a *Watta Satta* contract is motivated by the protection it provides to women (Jacoby & Mansuri 2010). It gives households reciprocal leverage in controlling a husband’s violent impulses. With virilocal residence, if a wife is mistreated, her natal family can sanction the punishment of her abuser’s kin. As a result, *Watta Satta* contracts provide an incentive to household members (namely parents) to intrude in violent situations.

The effectiveness of *Watta Satta* protection is uncertain at best. First, the motivation disregards households where abuse is perceived to be a part of the matrimonial culture. Often spousal abuse is an inter-generational habit where future abusers and victims are child observers (Pollark 2004 and Ulbrich & Huber 1981). Second, repercussions of early age exposure result in under-reporting and censoring abuse in women and perception of aggression as a marital norm in men (Palermo et al. 2014 and Chin et al. 2017). Overall, *Watta Satta* assumes that abusive men are empathetic towards the maltreatment of their *Watta* kin. This logic is counter-intuitive given that a man is willing to sanction violence for his wife but is critical of violence in his *Watta* kin’s marriage. Lastly, based on Jacoby & Mansuri (2010) argument households selecting *Watta Satta* have to have perfect information about male violent behaviour ex-ante marriage, i.e., family members can correctly predict if a man is going to be abusive towards his future wife prior to him getting married. This argument is disputable, especially for individuals who perceive abuse as a part of matrimonial duty.

Besides marital insurance, what else motivates *Watta Satta*? Ahmad et al. (2016) and Rauf (1987) observe that in rural Pakistan, there is a resistance to compliance with Islamic law about women’s inheritance (Muslim Personal Law (Shariat) Application Act of 1962). Under this law, women are entitled to a portion of a deceased’s estate (men obtain twice the share). The practice of *Watta Satta* acts as a means to circumvent this legislation and ensures the maintenance of agnatic kinship structure without legal reper-

cussions. Moreover, it guarantees that a woman will forfeit her right to patrimony. In the case of failure, her *Watta* kin can claim on behalf of his wife. The threat of reciprocal patrimony claim reduces the expected size of the inheritance for both male *Watta Satta* participants. To avoid such uneconomic fallout, the family patriarch decides *Watta Satta* barter at birth/young age of those concerned. He does this to ensure that his estate does not become fragmented or uneconomic for subsequent generations.

In Pakistan, a majority of rural households are either landless or owners of uneconomic holding. Uneconomic holdings are unprofitable fragmented agricultural plots. According to the West Pakistan Land Revenue (Amendment) Ordinance 1978, land holdings of less than 200 kanals (10.117 hectares) are considered to be uneconomic and are not required to pay the land revenue tax.<sup>1</sup> It is hypothesised that landowners are more likely to practice *Watta Satta* to ensure that the estate does not become fragmented during the intergenerational transfer. For landless (or subsistence) households, the apparent motivation for *Watta Satta* is the demand for a discounted dowry/dower. However, Parsons et al. 2015 find that if the brides are less than 18 years of age, dower and dowry paid is lower in value than an adult bride. Section 2.2.1 further develops this argument in detail.

## 2.2 Ex-ante and Ex-post Marital Discontents

### 2.2.1 Child Brides

The legal definition of a “child bride” under the United Nations charter (2019) is a union of a female under 18 years of age. In Pakistan, the legal marriage age is 16, while in Islam, the age of marriage coincides with the age of menarche. Hence, since Pakistan is predominantly Muslim, it is not unusual to be married at 13 years old.

Traditional societies take elaborate steps to protect women because they view female identity as an honour concern (Fischer 1991). A notable component of honour is the protection of the chastity of an unmarried child/woman. Therefore, parents are motivated to marry their daughters off at the age of menarche as it reduces the effort required for her protection (Bettencourt 2000 and Lari 2011).

Additionally, delaying a daughter’s marriage is viewed as an increased risk of female transgression, including a higher probability of refusing to marry a selected partner. In turn, a daughter’s agency can lead to questions about a household’s honour, resulting

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<sup>1</sup>In this paper, the average size of a holding is 110.6 kanals (5 hectares)

in damaging implications for households. For example, community and extended family members may hesitate to form new marriage alliances and avoid fulfilling prior marital promises. Moreover, unmarried household members will have problems finding partners.<sup>2</sup> In such situations, girls become victims of honour killing as they are perceived to have brought dishonour to the family.<sup>3</sup> To circumvent this, households offer child brides so that the betrothed's family shares the protection effort prior to marriage.

Men prefer child brides for two reasons: (i) increased years of fertility that leads to an increased likelihood of bearing sons; and (ii) reducing a bride's agency in selecting a mate. An extension of this preference is a consanguineous marriage where individuals demonstrate family solidarity by forming unions with household members or extended family (Charsley 2007 and Fricke et al. 1986).

Since *Watta Satta* is commonly transacted within the extended family, households select participating *Watta* pairs during childhood/infancy due to the threat of eligible mates being taken up by other household candidates. This competition causes *Watta Satta* to be one of the major contributors to child marriage in Pakistan (see Lane 2011, Nasrullah et al. 2014a and Nasrullah et al. 2014b).

Moreover, child marriage literature frequently identifies poverty, lesser valued dowry, religion and male education as significant motivators for child brides (Jain & Kurz 2007, Nour 2009 and Parsons et al. 2015).<sup>4</sup> The medical literature finds that intimate partner violence is positively correlated with the practice of child brides (Kidman 2016, Nasrullah et al. 2014c and Santhya et al. 2010) and negatively correlated with women's decisional independence (Klugman et al. 2014).

### 2.2.2 Spousal Abuse

Spousal abuse encompasses a range of behaviours and behavioural patterns. Riggs et al. (2000) state that two strategies to examine these behaviours are: (i) to directly examine aggression and (ii) to study correlates and consequences that control and entrap victims. He identifies household and individual demographics, socioeconomic status and culture as possible covariates to explain partner violence.

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<sup>2</sup>This includes siblings, maternal and paternal uncles and aunts.

<sup>3</sup>In Pakistan, immediate family members like fathers, brothers, uncles and cousins are often participants and instigators of honour killings (Nasrullah et al. 2009).

<sup>4</sup>Parson et al. (2015) find that grooms demand lower-valued dowry for younger and less educated brides.

A recent development on domestic abuse motivators is based on the popular “bargaining theory” (Tauchen et al. 1991 and Farmer & Tiefenthaler 1991). This theory proposes that men have a preference to inflict violence on their spouses and that preference affects the intra-households bargaining process where a man bribes his wife into accepting some level of physical violence by offering her a form of compensation. This theory predicts that an increase in a woman’s relative wage monotonically decreases levels of violence. An alternative to this explanation is Bloch & Rao (2002) “signalling theory”. This theory posits that spousal violence is a signal to communicate a husband’s marital dissatisfaction and is a means of extracting transfers from the wife’s family.

In South Asia, prevalent abuse motivators are gender stratification via patrilineal descent, patrilocal residence, discounting women from inheritance and secession practices, and hierarchical relations in which the patriarch or his relatives have authority over household members (Jejeebhoy & Sathar 2001). In Pakistan, the culture of defending family honour is a significant motivator for partner violence, where violent actions redeem lost honour (Vandello & Cohen 2003). Spouses who face aggression in silence are considered loyal and honourable, while those who report bring disgrace to the family.

Patrilocal residence brings uncertain spillovers for women’s welfare. Fernandez (1997) finds that hostilities arise due to a conflict of loyalties between a wife and her inlaws. In extreme cases, this leads to spousal violence, where the husband’s kin are often participants in the abuse.

As discussed in Section 2.1, it is ambiguous whether *Watta Satta* contracts protect women. Bhutta et al. (2015) explain that exchange marriages often lead to complicated physical abuse situations with one or more women involved. This abuse is sustained due to the notion that dissolution of a marriage contract due to abuse can result in retaliatory abuse or divorce of reciprocal *Watta* marriage. Moreover, there is a societal preference for avoiding divorce as it increases household costs due to the return of un-economic/noncontributing member(s) (the divorced woman and her children). There is also a loss of social capital due to the cultural stigma associated with divorce.

National Institute of Population Studies and ICF International (2013) finds that 40 per cent of Pakistani ever-married women aged between 15 and 49 years have suffered a form of spousal violence. However, due to underreporting and censoring by the victim, the actual incidence of spousal abuse ranges from 30 to 79 per cent (Khan et al. 2009). A common cause for this in Pakistan is visiting one’s natal home without permission from one’s husband or family (Sami & Ali 2006).



Lastly, in the later stages of marriage, women with abusive husbands lack reproductive agency. Literature finds that victims of domestic abuse are likely to experience pregnancy coercion and are less likely to adopt contraceptives (Miller et al. 2010 and Stephenson et al. 2008). The repercussion of this is that victims of domestic abuse have higher fertility rates, with many experiencing unwanted pregnancies (Gul et al. 2013 and Shaikh 2003).

### 3 Theoretical Model

This section develops a general equilibrium model where a man and a woman are in a relationship with spousal violence. The goal is to develop hypotheses that address the following questions theoretically: (i) what factors contribute to a violent marriage equilibrium; and (ii) under what conditions individuals select *Watta Satta* marriage. The empirical hypothesis taken to the data are *Watta Satta* selection is contingent on a husband's expectation of bequest; and that enforcement of *Watta Satta* contracts, and a change in male fertility and psychological preferences contributes to a changing incidence of marital abuse.

The model requires a husband ( $i$  henceforth) to maximise utility subject to the constraint that his wife will remain in the marriage. If no equilibrium exists within this constraint, divorce will ensue. Individual  $i$  obtains utility from private consumption,  $c_i$ , a home-produced household good,  $Q_i$  (Anderberg & Rainer 2013), having  $n_i$  children (McDonald & Zhang 2012) and bequests for children,  $B_i$  (McDonald & Zhang 2012 and De la Croix & Gosseries 2012).

Besides basic preferences,  $i$  values esteem and psychological gratification. Tauchen et al. (1991) and Farmer & Tiefenthaler (1997) model this by assuming that the assailant in the relationship,  $i$ , has expressive and instrumental motives for inflicting violence. This assumption is adopted by incorporating expressive levels of violence,  $a_i$  into the utility function directly where utility is increasing in self-esteem, power, behaviour modification, or any other psychological factors present in a violent relationship. For instance, violence gives men a feeling of being in control, which in turn increases utility.

A standard utility function with additively separable preferences is assumed where there is no bargaining between spouses. Thus, in the initial specification, there is no external violence intervention. However, once *Watta Satta* contracts are introduced in the specification, this restriction is relaxed.

Using logarithmic preferences (for analytical tractability), the utility function is:

$$V_i(c_i, n_i, B_i, q_i^H, a_{ii}) = \ln c_i + \rho \ln n_i + \tau \ln B_i + \alpha \ln Q_i + \ln a_i + \Psi_i, \quad \rho, \tau, \alpha > 0, \quad (1)$$

where the parameter  $\rho$  weighs individual  $i$ 's preference for the number of children  $n_i$ ,  $\tau$  characterises inter-generational altruism,  $\alpha$  is a measure of the relative importance of the household produced goods, and  $\Psi_i$  encompasses psychological indicators such as general contentment and happiness. Since  $i$  represents an individual from an agricultural household with a patriarchal kinship structure,  $\rho$  is assumed to be strictly positive. Furthermore, agriculturist  $i$  requires at least one male child as he needs a bearer of the family name and prefers to have more sons than daughters as they have a higher economic value in providing essential farm labour. Therefore, the model assumes that  $n_i$  is the number of sons and that  $i$  does not care about these sons' human capital. Furthermore, parents are indifferent about their children's adult utility, as in dynastic altruism.

Individuals are self-employed and face the following constraints. The first is a budget constraint that limits the amount spent on consumption,  $c_i$ :

$$c_i + B_i \leq y_i, \quad (2)$$

taken at a given level of household income,  $y_i$  and aggregate bequests to children,  $B_i$ . To account for traditional gender roles,  $i$  is the sole income earner and leaves child-rearing to his wife. Thus, individual  $i$ 's time is divided between income generation  $h_i$  and household production,  $q_i^H$ :

$$h_i + q_i^H \leq 1. \quad (3)$$

Here  $q_i^H$  is interpreted as time allocated to non-income generating activities that are essential for the household's survival. Such activities include household chores like household maintenance, cooking, cleaning and grocery shopping. In turn, income earned,  $y_i$  is a function of bequests received,  $k_i$  and time devoted to market-oriented labour,  $h_i$ :

$$y_i \leq h_i k_i. \quad (4)$$

Equation 4 has constant returns with respect to efficiency units  $h_i k_i$ . These efficiency units and hours worked are perfect substitutes. For simplicity, there are no monetary transfers between spouses.

To incorporate both domestic abuse's cooperative and non-cooperative aspects, home-produced household good,  $Q_i$  is introduced in the utility function. Anderberg & Rainer

(2013) state that  $Q_i$  introduces family decision-making into the model and the concept that spousal abuse may be part of a Pareto-improving trade between spouses. Under the cooperative frameworks, spousal abuse is a repercussion of spousal cooperation in family decision making. Under the cooperative framework, the model assumes that men prefer violence and women tolerate it in return for higher transfers (Tauchen et al. 1991 and Farmer & Tiefenthaler 1991), while in a non-cooperative setup, spousal abuse is a consequence of spousal disagreement regarding economic roles. (Anderberg & Rainer 2013). Hence it is assumed that all active households have a family-specific household good,  $Q_i$  that requires time contributions from spouses:

$$Q_i(q_i^H, q_i^W) = (q_i^H)^\mu (q_i^W)^{1-\mu}, \quad \mu \in (0, 1) \quad (5)$$

where the superscripts  $H$  and  $W$  stand for husband and wife, while  $\mu$  is the externality of a spouse's contribution to domestic production.  $0 < \mu < 1$  implies that time contributed to household production by spouses can be both complements and substitutes, meaning that some jobs can only be done by the husband while others by the wife and some by both.

Anderberg & Rainer (2013) find that time allocation choice by spouses is associated with the Nash equilibrium point. That is, household behaviour implicitly appeals to folk theorems so that efficient resource allocations is sustained through repeated interaction. This argument ignores that results only apply if and only if individuals are infinitely patient (in the limit when the discount factor turns to one). By relaxing this assumption and allowing for heterogeneity of discount factor, families will sort endogenously into cooperative and non-cooperative allocation regimes. It is essential to permit behavioural non-cooperation, as couples can behave non-cooperatively as much as 25 per cent of the time (Del Boca & Flinn 2012). In the given context, the husband chooses whether or not he is going to engage in sabotaging his wife's productivity by abusing her. What is important here is this sabotage might give him direct utility but also will impact the utility indirectly as her contribution to the home production, economic labour and child rearing activities will also be impacted by his abuse.

Hence composite measure for women's time allocated to home production and economic labour,  $q_i^W$  introduces the non-cooperative aspect of domestic abuse into the model. This time allocation function is important as it implies that spouses simultaneously and non-cooperatively decide on how to allocate their unit time endowment between market work, child-rearing and the production of household good. For women, time allocation function

includes time recovering from or being abused as well as child-rearing activities:

$$q_i^W = 1 - \kappa(N_i^H)^\gamma n_i - a_i. \quad (6)$$

Here, the distinction between home production and economic labour is unnecessary as it does not modify the result. Also, in Pakistan, a wife's monetary contribution (besides dowry) is frequently income from part-time positions. It is a function of time leftover after child-rearing and other household responsibilities.<sup>5</sup>

Since the model assumes that parents are recipients and benefactors of ad-hoc altruism, the total bequests received,  $k_i$ , is a sum of his own and his wife's inheritances. Besides dowry, in a traditional marriage,  $k_i$  includes a wife's share in patrimony. Hence the aggregate bequests received is given by:

$$k_i = \begin{cases} \frac{K^H}{N_i^H} + \frac{K^W}{N_i^W} & \text{for benchmark marriage;} \\ \frac{K^H}{N_i^H - 1} & \text{for } \textit{Watta Satta}; \end{cases} \quad (7)$$

where  $K$  is the total parental estate and  $N_i$  is the number of co-beneficiaries of that estate.

Bequests received,  $k_i$  in a *Watta Satta* marriage represents the implicit contract between individuals  $i$  and  $j$ , that both will forgo the claim on their respective wives' patrimony  $\left(\frac{K^W}{N_i^W}\right)$ . Thus, a woman's contribution,  $K^W$  becomes zero, and the number of beneficiaries for  $i$ 's father's estate,  $N_i^H$  is reduced by 1.<sup>6</sup>

Based on individual  $i$ 's utility, selection into *Watta Satta* marriage depends on aggregate bequests received  $k_i$  and the efficiency of the *Watta Satta* patrimony punishment mechanism.<sup>7</sup> Considering that the efficiency of the punishment mechanism is observed ex-post marriage, selection of *Watta Satta* will initially depend on bequests of  $k_i$ .

**Proposition 1** (*Watta Satta Selection*) *Individual  $i$  selects into a Watta Satta marriage*

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<sup>5</sup>According to Tanaka & Muzonones (2016), only 25 per cent of university-educated Pakistani women work outside the home. Reasons attributed to low participation are social, cultural and religious norms, safety, husband/family approval and availability of transport.

<sup>6</sup>For the sake of model tractability and because of negligible impact on empirical results, dowry and dower are not included in bequest received,  $k_i$ . This assumption is justified because summary statistics indicate that wedding contributions as a ratio of household wealth are minuscule.

<sup>7</sup>There are no household savings and interest rate is zero.

if his wife's bequest,  $K^W$  is such that:

$$K^W < \frac{K^H N_i^W}{(N_i^H - 1)N_i^H}.$$

Proposition 1 motivates the selection of instruments and covariates for the empirical analysis; hence it is essential to the analysis. It shows that  $i$ 's selection of entering a *Watta Satta* marriage depends household estate size,  $K$  for both  $H$  and  $W$ , and number of siblings,  $N_i$  are observable ex-ante marriage.  $i$  only select into the *Watta Satta* contract if the value of expected inheritance is larger than a benchmark marriage where  $\frac{N_i^W}{(N_i^H - 1)N_i^H}$  is the a weight for comparing the inheritance brought into the marriage by both spouses. For instance if both  $K_i^H$  and  $K_i^W$  are equal, selection into *Watta Satta* will depend on the relative gap between number of estate beneficiaries. This means that *Watta Satta* is preferable if the  $i$ 's number of sibling  $N_i^H$  are less than his wife's,  $N_i^W$  and less preferable if  $N_i^W \geq N_i^H$ .

For ex-post marriage outcomes, the abuse retaliation dynamic of *Watta Satta* is introduced in  $i$ 's utility by explicitly modelling reported abuse exercised by *Watta* counterpart  $j$ ,  $a_{jj}$ . Hence, the aggregate level of domestic abuse in a marriage,  $a_i$  will have the following functional form

$$a_i = a_{ii}^{\psi_i} a_{jj}^{1-\psi_i}. \quad (8)$$

Under *Watta Satta*, aggregate abuse in a marriage,  $a_i$  depends on  $i$ 's own violent actions,  $a_{ii}$  and reported abuse in the counterpart *Watta* marriage  $j$ ,  $a_{jj}$ . Moreover both  $a_{ii}$  and  $a_{jj}$  have a complimentary nature. A parameter for reactive/proactive violent temperament,  $\psi_i$  is introduced to account for the motivators under which  $i$  exercises spousal violence: (i) his wife "deserves it" ( $\psi_i > 0.5$ ); (ii) retaliation against  $j$ 's use of violence ( $\psi_i < 0.5$ ); or (iii) both ( $\psi_i = 0.5$ ).<sup>8</sup>

Equation 8 assumes concavity for domestic violence, i.e.,  $i$ 's marginal utility from violence is decreasing in purchased good consumption. This introduces the correlation between financial stress and spousal violence into the model.<sup>9</sup> Setting up spousal abuse this way allows for household equilibrium to depend on relative abuse and not actual abuse level.

The psychological contentment parameter,  $\Psi_i$  encompasses the disutility from  $j$ 's violent

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<sup>8</sup>Adopted from Gracia-Moreno et al. (2005).

<sup>9</sup>Violence is not necessarily decreasing in income.

actions on  $i$  emotional health under *Watta Satta* exchange and a constant,

$$\Psi_i = Constant - \theta \ln a_j = Constant - \theta \ln (a_{jj}^{\psi_j} a_{ii}^{1-\psi_j}), \quad \psi_j \in (0, 1). \quad (9)$$

Here *Constant* accounts for other sources of general contentment and happiness. For the level of empathy,  $\theta$  the sign is negative since  $i$  is assumed to have disutility if his *Watta* kin experiences abuse  $a_{jj}$ . Correspondingly,  $\psi_j$  is  $i$ 's perception of reactive violent temperament of his *Watta* inlaw  $j$ .

By substituting saturated constraints equations (2 to 9) into the objective function, the individual  $i$ 's maximisation problem can be rewritten as:

$$\begin{aligned} \max_{n_i, b_i, q_i, a_{ii}} \quad & \ln((1 - q_i)k_i - B_i) + \rho \ln n_i + \tau \ln B_i + \alpha \ln((q_i^H)^\mu (1 - \kappa N_i^{H\gamma} n_i - a_i)^{1-\mu}) \\ & + \ln(a_{ii}^{\psi_i} a_{jj}^{1-\psi_i}) - \theta \ln(a_{jj}^{\psi_j} a_{ii}^{1-\psi_j}) + Constant. \end{aligned}$$

Since the maximisation problem is strictly convex, the first-order conditions (henceforth FOCs) are necessary and sufficient. Assuming that  $i$  has egotistic preferences so that the welfare of household members (wife and children) does not depend on his consumption, the FOCs theoretically prove Rao & Bolch (2002) "signalling theory". This theory hypothesises that  $i$ 's taste in his wife's productive contribution is negatively associated with domestic abuse - if  $i$  perceives his wife to be lazy, he will resort to domestic abuse. Also, the parameter associated with female productive time,  $q_i^W$ , increases the marginal cost of having children, while the parameter associated with a bequest,  $B_i$ , increases the marginal utility of having children.

Solving for  $c_i, B_i, q_i^H, n_i$  and  $a_{ii}$  yields closed form solutions given by:

$$B_i = \begin{cases} \frac{\tau(K^W N_i^H + K^H N_i^W)}{N_i^H N_i^W (1 + \alpha\mu + \tau)} & \text{for benchmark marriage;} \\ \frac{\tau K^H}{(N_i^H - 1)(1 + \alpha\mu + \tau)} & \text{for } Watta \text{ Satta;} \end{cases} \quad (10)$$

$$q_i^H = \frac{\alpha\mu}{1 + \alpha\mu + \tau}; \quad (11)$$

$$n_i = \frac{\rho\psi_i}{\kappa N_i^{H\gamma} ((1 + \alpha(1 - \mu) + \rho)\psi_i - \theta(1 - \psi_j))}; \quad (12)$$

$$a_{ii} = \begin{cases} \frac{1}{(1 + \alpha(1 - \mu) + \rho)} & \text{for benchmark marriage;} \\ \left( \frac{\psi_i - \theta(1 - \psi_j)}{a_{jj}^{1-\psi_i} ((1 + \alpha(1 - \mu) + \rho)\psi_i - \theta(1 - \psi_j))} \right)^{\frac{1}{\psi_i}} & \text{for } Watta \text{ Satta.} \end{cases} \quad (13)$$

**Proposition 2** (*Determinants of Domestic Abuse*) Individual  $i$ 's equilibrium spousal abuse,  $a_{ii}$  is a function of: (i) household production parameters  $\alpha$  and  $\mu$ ; (ii) fertility  $\rho$ ; (iii) empathy for Watta kin  $\theta$ ; and (iv) the reactive nature  $\psi$  of  $i$  and  $j$ .

*Proof.* See Appendix A.

The partial derivative of abuse,  $a_{ii}$  with respect to reactive nature  $\psi$  for temperaments of  $i$  and  $j$  shows the abuse-deterrent motivation in the model. This derivative being positive implies that a recursive abuse cycle will be observed where both individuals use spousal abuse to respond to each others' actions. In the extreme, the limit of this game is a spouse dying or becoming estranged (Jacoby & Mansuri 2010). Additionally, if both  $i$  and  $j$  use violence as a response to maltreatment of the Watta kin ( $\psi < 0.5$ ), the equilibrium abuse  $a_{ii}$  will be lower compared to the case if they are both susceptible of violence ( $\psi > 0.5$ ). This mechanism translates into the following lemma:

**Lemma 1** *Equilibrium spousal abuse in a Watta Satta marriage,  $a_{ii}$  for given level of  $a_{jj} > 0$ , is increasing in  $\psi_i$  and  $\psi_j$ .*

*Proof.* See Appendix A.

The dynamics of Lemma 1 are presented in Figure 1, which displays maps of iso-abuse curves. Each curve in panel (a) and (b) represents constant reactive temperament level in the plane the abuse level  $a_{ii}$  x  $a_{jj}$ . As the iso-abuse curve follows toward the right, abuse by  $j$ ,  $a_{jj}$  decreases and abuse by  $i$ ,  $a_{ii}$  increases, with the reactive temperament  $\psi_i$  remaining constant. The curve exhibits that  $a_{ii}$  and  $a_{jj}$  have a positive limit for a given level of  $\psi$ . This limit is interpreted as a minimum level of abuse tolerated/found acceptable in a marriage. Moreover, an increase in the reactive temperament of individual  $i$ ,  $\psi_i$  causes an inward upward move from one iso-abuse curve to another in panel (a), while an increase in the  $i$ 's perception about  $j$ 's reactive temperament,  $\psi_j$  cause the curves to move outwards. This implies that husband  $i$  in a Watta Satta marriage is less abusive if he exercises abuse as a reaction to  $j$ 's actions, while a recursive cycle of abuse is likely if he perceives  $j$  to be highly reactive.

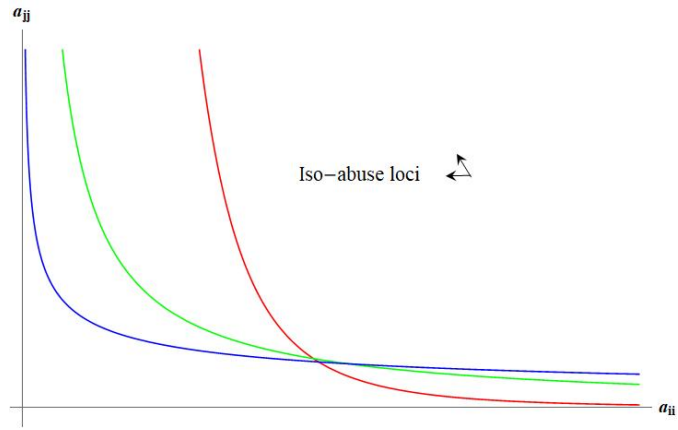
While panel (a) and (b) assume that that  $i$  has a fixed level of empathy for his Watta kin, panel (c) relaxes this assumption. Panel (c) shows the range of the iso-abuse curves for various levels of  $\theta$ . It shows that as  $\theta$  increases, the level of abuse in both marriages decrease.

Additionally, Figure 1 also confirms the convexity of abuse for a reactive individual. The

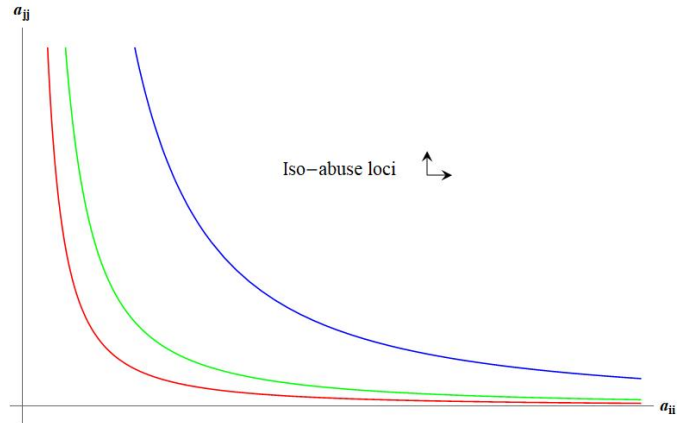
following second order condition reinforces this conclusion:

$$\frac{\partial^2 a_{ii}}{\partial \psi_i^2} < 0, \quad \frac{\partial^2 a_{ii}}{\partial \psi_j^2} < 0.$$

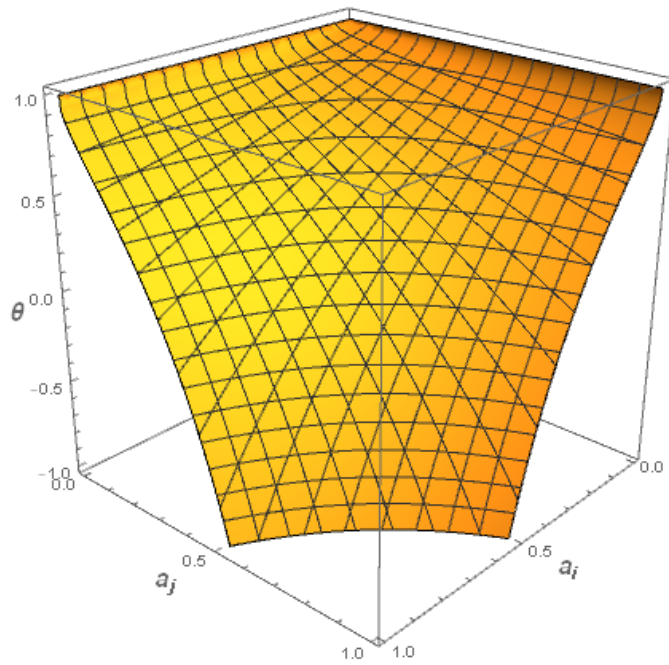




(a) Map for increasing  $i$ 's reactive temperament,  $\psi_i$



(b) Map for increasing  $i$ 's perception of  $j$ 's reactive temperament,  $\psi_j$



(c) Empathy

Figure 1: Map of iso-abuse curves under *Watta Satta*.

Equations 12 and 13 show that the *Watta Satta* punishment mechanism affects equilibrium abuse,  $a_{ii}$  and fertility decisions,  $n_i$ . Based on this, the following lemma is proposed:

**Lemma 2** *Equilibrium fertility under Watta Satta,  $n_i$ , is decreasing in the temperament parameter,  $\psi$ .*

*Proof.* See Appendix A.

Individuals, who use spousal violence for reasons beyond the response to the *Watta* kin maltreatment, have a lower number of children compared to individuals who exercise violence just because of maltreatment. A potential reason for this might be that highly abused victims are more likely to develop long-term health problems, hence are more likely to miscarry a child.

## 4 Data

This paper uses cross-sectional data from the Pakistan Rural Household Survey (henceforth PRHS) undertaken in 2004-2005 to test the propositions developed in Section 3. The sample consists of 1,342 married couples from 967 households, with women aged between 15 and 53 years. These randomly sampled households are from 94 villages in 10 districts of the provinces of Sindh and Punjab. The survey has detailed modules on marital history, marriage-related transfers and women's welfare. Table 1 summarises the key characteristics of the sample.

The outcomes, women, being child brides and being victims of spousal abuse, are dichotomous indicators, where 1 means experiencing these outcomes once. Specifically, being a child bride depends on *Ruqsati* age - an age when a woman moves in with her husband. The sample mean age of *Ruqsati* is 17.58 years. On average, *Watta* brides move in with their husband 1.32 years before a conventional bride.<sup>10</sup> Under the United Nations (2019) definition of child marriage, the summary statistics indicate that, on average, a woman in the sample is a child bride.

The abuse indicator is constructed by asking women if their husband has exercised exten-

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<sup>10</sup> *Watta* brides leave natal house at 16.92 years while conventional brides at 18.25.

Table 1: DESCRIPTIVE STATISTICS

Variable definition	All women (1)	<i>WattaSatta</i> (2)	Non- <i>WattaSatta</i> (3)
Woman age of marriage $\leq 18$	0.576	0.652	0.499
Ever been physically abused by husband	0.209	0.223	0.194
Number of brothers $\leq 5$ years	0.951	1.223	0.677
Number of sisters $\leq 5$ years	0.826	0.829	0.824
Number of female cousins related to woman $\leq 5$ years	4.487	5.406	3.562
Endogamy- cousin marriage	0.700	0.753	0.646
Husband attended secondary school	0.159	0.123	0.196
Age of the woman	28.28	28.130	28.42
$0 < \text{Father's holding} \leq 100$ kanals	0.362	0.327	0.398
$100 < \text{Father's holding} \leq 200$ kanals	0.042	0.048	0.037
Father's holding $> 200$	0.049	0.043	0.055
Received dower	0.666	0.637	0.695
Natal family resides locally	0.590	0.669	0.511
Number of brother-inlaws	2.576	2.756	2.746
$0 < \text{Father-inlaw's holding} \leq 100$ kanals	0.388	0.360	0.417
Father-inlaw holding $\geq 100$ and $< 200$ kanals of land	0.064	0.064	0.064
Father-inlaw's holding $> 200$ kanals	0.066	0.046	0.085
Patrilocal residence	0.583	0.568	0.598
Number of living daughters	1.422	1.456	1.387
Number of living sons	1.440	1.456	1.423
Paid worker	0.200	0.199	0.200
Relative Autonomy Index	3.534	3.548	3.521
Number of observations	1,342	673	669

sive margin of physical violence in the past year.<sup>11</sup> Note that this indicator is restricted in the sense that it does not indicate actual spousal violence, but rather represents self reported spousal assault rates. The initial analysis of Section 6 does not account for this limitation, though it is formally addressed in Section 7.

To account for husband attributes, a combination of covariates is used, including indicators concerning his natal family, him being of kin and his education. Household dynamics are controlled by including covariates concerning the extended family structure, wedding transfers, contribution to domestic production, fertility behaviour and the land ownership profile. The land ownership profile, composed of three binary indicators, is an important consideration as it accounts for wealth effects. Based on the State Bank of Pakistan (2003) and Saquib et al. (2016) classifications, households with holdings

<sup>11</sup>In this paper, spousal abuse means violent physical actions that include slapping, pushing, being thrown, kicking, choking, burning or being attacked with a weapon and excludes sexual violence (non-consensual sex), verbal threats, and coercive psychological acts.

less than a hundred kanals are classified as lower-subsistence, while holdings between a hundred and two hundred are upper-subsistence and non-subsistence holdings are more than two hundred kanals. In the analysis, these three categories are compared to the benchmark case of a household being landless.

*Watta Satta* categorisation is directly observed in the PRHS where 50.15 per cent of respondents categorised themselves as *Watta* brides while 49.85 per cent were “conventional”. For the variable “endogamy”, this paper only considers maternal or paternal first cousin as a blood relative. Literacy indicators show that only 15.9 per cent of men have a secondary education or higher while 17.1 per cent of women have ever been to school. Out of the school-going women, 74.63 per cent have some primary and 97.43 having both secondary and primary education. Only 12.79 per cent of *Watta* brides have some form of school attendance.

The number of wife’s siblings and father’s landownership profile accounts for natal family attributes. Since there is a direct correlation between wedding transfers and outcomes of child brides and spousal abuse, the analysis also incorporates dowry and dower. The marital transfers section of the PRHS details that all women received a type of dowry. For example, 61.70 per cent of women report having received gold, while 17.92, 98.62 and 4.60 per cent received silver, household goods and cash, respectively. Besides dowry, at the time of marriage, dower is also exchanged.<sup>12</sup> Table 1 reports that 66.6 per cent of women in the sample received some dower in the form of either gold, silver, household goods or cash.

Ex-post marriage covariates relevant to the analysis include household structure indicated by virilocity and matrilocality. The number of living sons and daughters represents fertility behaviour. A woman’s decision making autonomy is controlled by constructing an index from the decision making section of PRHS. To gauge autonomy, women score decisional agency for fertility, consumption and socialising decisions on a scale of 1 to 5, where 1 means complete autonomy. The index used in the estimation is a log sum of these responses as it responds to skewness towards large values; i.e., cases in which one or a few women total score are much larger than the bulk of the respondent.

The binary indicator of women being able to partake in the paid labour market indicates women’s productive contributions. Summary statistics show that 20 per cent of the sampled women partake in paid labour activities with no difference between *Watta Satta* and non *Watta Satta* women. On average, the surveyed women earned less than

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<sup>12</sup>Typical to traditional Islamic marriages, dower is insurance paid to the bride in case of divorce or death of the husband (Anderson 2007).

0.261 US Dollars (based on 2004 US dollar exchange rate) per day, with *Watta Satta* brides earning 0.227 US Dollars a day.

## 5 Empirical Strategy

### 5.1 Econometric Strategy

Following Jacoby & Mansuri's (2010) notation convention, let  $\zeta$  represent the unobserved statehood in a marriage. The latent variables - child bride ( $c$ ) and spousal abuse ( $a$ ) are denoted by binary indicators  $y_o$ , where  $o = c$  and  $a$ . A system of equations is estimated, with the  $o$ th equation being of form

$$y_o = 1(\beta_o \zeta + \mathbf{X} \xi_o + u_o > 0), \quad (14)$$

where  $\beta_o > 0$ ,  $\mathbf{X}$  is a matrix of exogenous characteristics. Here the error term  $u_o$  is i.i.d and is uncorrelated with the diagonal of a covariance matrix. The variable of interest is *Watta Satta*, which has the following indicator function

$$\zeta = \eta WS + \epsilon. \quad (15)$$

Here  $\epsilon$  is the error terms with variance  $\sigma_\epsilon^2$ .<sup>13</sup> Proposition 1 and empirical content is embodied in parameter  $\eta$ . Substituting 15 into 14 leads to

$$y_o = 1(\eta_o WS + \mathbf{X} \xi_o + \nu_o > 0), \quad (16)$$

where  $y_o$  is a vector of the dependent variable,  $\eta_o = \beta_o \eta$  and  $\nu_o = \beta_o \epsilon + u_o$ . Since the magnitude of  $\eta$  is not of the direct interest, the null hypothesis ( $\eta = 0$ ) is tested against  $\eta < 0$ , by looking at each of the  $\eta_o$  (since  $\beta_o > 0$ )

An individual's ability and willingness to participate in this custom also depend on the latent variables' personal and cultural factors.

Jacoby & Mansuri (2010) conclude that *Watta Satta* is prevalent in households where women have low status, and thus are more likely to be poorly treated. This conclusion is applied to the likelihood of being a child bride and hypothesised that a lower status of women also implies that parents view unmarried daughters as a liability and uneconomic consumers. Therefore, households are motivated to marry daughters closer to menarche

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<sup>13</sup>Without loss of generality  $\mathbf{X}$  has been left out from equation 15.

age than legal age. Having child brides means natal families can divert resources to a more profitable agent (namely sons and their spouses), as the daughter/bride is no longer their financial responsibility.

The direction of violence in a *Watta Satta* contract compared to a baseline marriage is uncertain from the theoretical model. In this instance Proposition 2 is insightful as it suggests that domestic abuse,  $a_i$  is impacted by the type of reactive nature,  $\psi$  for  $i$  and  $j$ , and level of male empathy,  $\theta$ . Hence, it is reasonable to believe Jacoby & Mansuri (2010) conclusion that a selection into *Watta Satta* is based on some latent variable that also affects marital discord and age of marriage.

Additionally, to address the endogeneity problem, *Watta Satta* is governed by a ‘first stage’ equation given by

$$WS = 1(\mathbf{Z}\pi + \omega > 0), \quad (17)$$

where  $\mathbf{Z}$  are the instruments and  $\omega = \beta_w\epsilon + \Upsilon$  is the disturbance term.<sup>14</sup> The instruments and disturbance for the two reduced form equations  $o$  are uncorrelated.

For these estimations  $\nu_o$  and  $\omega$  are assumed to be normally distributed, with equations 16 and 17 being simple probits conditional on  $\epsilon$ . Tantamount to Jacoby & Mansuri (2010),  $\epsilon$  is modelled nonparametrically using discrete factor approximation where coefficients are estimated jointly by maximum likelihood.<sup>15</sup> Benefits of using discrete factor approximation with maximum likelihood are: (i) that it controls for sample selection biases (see Keane et al. 1988); and (ii) when disturbances are not normally distributed, discrete factor approximations perform better than regular maximum likelihood estimators that assume joint normality (Moroz 1999).

## 5.2 Identification

Jacoby & Mansuri (pg. 1817, 2010) build their first stage on the argument that

“... having an older brother ... increases the likelihood of the woman’s entering

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<sup>14</sup>The disturbance terms  $\Upsilon$  and  $u_o$  are assumed to be mutually uncorrelated.

<sup>15</sup>Since gradient-based algorithms fit probit estimation better (see Zheng & Liu 2012), the maximum likelihood estimation uses the Broyden, Fletcher, Goldfarb & Shanno (henceforth BFGS) algorithm. This algorithm is a class of quasi-Newton optimisation methods with the added benefit of being simple and less computationally expensive than Newton-Rap. Additionally, to avoid getting trapped in local minima or maxima, the estimates are also confirmed using Kirkpatrick et al.’s (1983), Simulated Annealing algorithm (henceforth SANN). The estimates under SANN and BFGS are identical and are reported in Table 2.

*Watta Satta* (bride exchange). Likewise, a woman’s sisters, particularly older ones not too far away in age will be competing with her for an available brother to form a *Watta* so that the probability declines as the number of close older sisters increases.”

Section 2.1 establishes that this argument is valid for only “one-for-one” brother-sister exchange, but it fails to account for other combinations of *Watta Satta* pairs such as cousin-cousin. This paper accounts for this variation by incorporating extended household members like maternal and paternal first cousins as additional instruments. The logic of this addition remains the same that the likelihood of a woman/girl entering *Watta Satta* contract is increasing in the number of older but not too far away in age female cousins. This number positively increases *Watta Satta* selections due to the consanguineous marriage culture and that these female cousins can act as potential counterpart brides for the *Watta* contract. The female cousin instrument does not distinguish between maternal and paternal cousins; instead is based on an aggregate number reported.<sup>16</sup>

The estimated system of equations has uniform specifications with uniform set of instruments—wife’s number of brothers  $\geq 5$  years, wife’s number of sisters  $\geq 5$  years and wife’s number of female cousins  $\geq 5$  years. Based on the preferences presented in Section 2 and the model developed in Section 3, the first-stage equation for *Watta Satta* (equation 17) controls for husband characteristics like being kin, education level, number of brothers and household landholding categorisation. The natal family living locally and being from a patrilocal residence indicate residential dynamics. Dower accounts for marital transfers. For women’s natal family characteristics, the categorisation of the father’s landholding is included in the specification.

## 6 Results

### 6.1 First Stage

Columns (1) and (4) of Table 2 report the determinants of *Watta Satta*. Diagnostic tests show that the instruments - number of brothers, sisters and female cousins  $\leq 5$  years are not weak. The Wald test reports a  $\chi^2$  value of 22.105 with a  $p$ -value  $\leq 0.000$ .<sup>17</sup> The

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<sup>16</sup>Total number of male cousins and male cousins who are less than five years older than a woman, both are not significantly correlated with *Watta Satta* in the sample. Hence it is not a considered instrument.

<sup>17</sup>Wald test is conducted in a linear probability specification.

results are estimated by nonparametric full information maximum likelihood with three-point support for finite mixture distribution. The difference between the two models is that Model I assumes no selection bias while Model II accounts for it. The selection bias is ignored by restricting the correlation between first stage *Watta Satta* residuals with residuals from  $y_a$  and  $y_c$ , to zero ( $\beta_o = 0 \Rightarrow \text{corr}(\nu_o, \omega) = 0$ ). The log-likelihood test confirms that there is indeed a selection bias ( $\chi^2 = 27.273$  with  $p < 0.000$ ), hence Model II is preferable to I. With the inclusion of the two error correlations in Model II, the precision of the estimates improves, especially for three instruments for *Watta Satta*. Additionally, the coefficients are estimated in a probit, hence the magnitude is not straightforward to interpret. The purpose of this sections estimates is to identify and understand significant covariates, which will be used in Section 10 to propose and test policy recommendations. Hence, the significance and sign of the coefficient in table 2 are only of interest.

The estimates indicate that having brothers, sisters and female cousins  $\leq 5$  years increases the likelihood of a woman entering a *Watta Satta* marriage. The estimate about brothers has a consistent positive sign in the two specifications and confirms the Proposition 1. In case for sisters, the increasing *Watta Satta* likelihood is attributed to “one-groom- to- many- brides” *Watta Satta* contracts. It also corresponds to a natural sex ratio in children. That is since post-natal sex selection (both infanticide and abortions) is religiously condemned, couples use fertility stopping rules as a means to implement son partiality. To obtain the desired number of male heirs, households will have higher fertility without the distorting natural sex ratio (Almond et al. 2013). The repercussion of children sex composition is close to the natural sex ratios is that more daughters will be available for an exchange marriage. In other words, sisters in a similar age cohort do not compete for a given marriage contact, rather can be part of the same *Watta Satta* contract. Additionally, this argument is also true for female cousins  $\leq 5$  years. Having more female cousins in a similar age cohort increases the likelihood of a woman entering a *Watta Satta* marriage is attributed to a patrilocal residence where extended family members cohabit. With increased household membership, female cousins residing in the same residence acts as complimentary brides for consanguineous and non-consanguineous *Watta Satta* contracts.

Additionally, a woman’s father having a holding larger than 200 kanals reduces her likelihood for exchange marriage selection, while men being members of economically landed households increases it. These results further confirm Proposition 1, in the sense that the size of a man’s expected bequests,  $k_i$  motivates exchange marriage. Furthermore, it indicates a presence of income effects in men’s marriage type selection - wealthier house-



holds opt for exchange marriage to prevent estate fragmentation during inter-generational transfer.<sup>18</sup> The magnitude, sign and significance of the dower indicator also support this hypothesis, that men who can afford to pay religiously sanctioned dower to their wives are more likely to select a *Watta Satta* marriage.

## 6.2 Main Results

The remainder of Table 2 summarises estimation results of the outcomes given by being a child bride (*c*) and ever abused (*a*) under the two econometric restrictions. Since there is a presence of selection bias, all interpretations are of model II estimates.

The coefficients associated with the odds of being a child marriage indicate that a husband's demographic profile significantly influences the likelihood of being a child bride. Men who are educated, not residing with their parents, and from economically landed households opt for adult brides. The negative correlation between natal family residing locally and being a child bride signals a preference of adult brides in local emigrants and men from non-subsistence households.

In support of Lane 2011, Nasrullah et al. 2014a and Nasrullah et al. 2014b, the estimates confirm that *Watta Satta* increases the likelihood of being a child bride. Since *Watta Satta* contract is based on a bride demand for an older male relative, early marriage is a consequence of (i) a man's desire for marriage because he is of age; (ii) households preference of cost-saving via single marriage ceremony for all *Watta* participants; and (iii) increased likelihood to bear son as the number of fertile years in women increase.

Estimates show that child brides have more daughters, which is caused by an increased fertile time in women and a wife's lack of agency in fertility decisions. This conclusion is further supported by the magnitude and the sign of the relative autonomy index, where a third of the questions in the survey concern fertility decisions.

For the abuse outcome, columns (3) and (6) show the likelihood of acknowledging spousal abuse under the two specifications. Here it is assumed that there is no censoring by the respondent, nor there is misclassification of the abuse outcome and that non-acknowledgement of abuse is the absolute truth.

Overall, there is a strong indication that women from and married into highly subsist households are more prone to domestic abuse than landless and non-subsistence households (land holdings > 200 kanals). Likewise, the significance and magnitude of dower

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<sup>18</sup>To partial out the impact of income, all estimations have district dummies.

Table 2: RESULTS

Variable	Model I			Model II		
	<i>WS</i>	<i>c</i>	<i>a</i>	<i>WS</i>	<i>c</i>	<i>a</i>
Endogamy- cousin marriage	-0.12 (0.225)	-0.067 (0.096)	0.038 (0.032)	-0.002 (0.094)	-0.072 (0.095)	0.04 (0.032)
Husband has secondary education	0.047 (0.281)	-0.298** (0.128)	-0.14 (0.09)	0.077 (0.102)	-0.289** (0.13)	-0.146 (0.094)
Natal family resides locally	-0.423* (0.225)	-0.257*** (0.093)	-0.123 (0.172)	-0.423* (0.229)	-0.271*** (0.093)	-0.104 (0.182)
Patrilocal residence	-0.169 (0.171)	-0.208** (0.091)	-0.38** (0.182)	-0.194 (0.171)	-0.211** (0.091)	-0.399** (0.184)
0 < Father's holding ≤ 100 kanals	-0.51** (0.203)	-0.035 (0.098)	0.204 (0.134)	-0.523** (0.204)	-0.046 (0.099)	0.211* (0.114)
100 < Father's holding ≤ 200 kanals	-0.75*** (0.239)	0.383* (0.222)	0.234*** (0.036)	-0.781*** (0.242)	0.353 (0.22)	0.261*** (0.045)
Father's holding > 200 kanals	-0.442* (0.193)	0.118 (0.23)	-0.127*** (0.038)	-0.481** (0.201)	0.133 (0.225)	-0.13*** (0.039)
Number of sons	-0.305 (0.19)	0.028 (0.034)	0.028*** (0.008)	-0.342* (0.191)	0.029 (0.035)	0.027*** (0.009)
Number of daughters	-0.184 (0.197)	0.067** (0.033)	-0.043 (0.082)	-0.202 (0.19)	0.065* (0.033)	-0.033 (0.084)
Watta Satta		0.111 (0.089)	-0.12 (0.096)		0.184* (0.099)	-0.121 (0.098)
0 < Father-inlaw's holding ≤ 100 kanals	0.082 (0.18)	0.084 (0.096)	52.773*** (1.6)	0.046 (0.18)	0.09 (0.097)	4.53*** (1.182)
100 < Father-inlaw's holding ≤ 200 kanals	-0.201 (0.824)	-0.311 (0.203)	0.486* (0.252)	0.002 (0.23)	-0.347 (0.216)	0.235** (0.1)
Father-inlaw's holding > 200 kanals	68.373*** (1.548)	-0.386* (0.22)	-0.366 (0.295)	1.207*** (0.282)	-0.379* (0.226)	-0.237** (0.115)
Number of brothers-inlaws	0.249 (0.812)	-0.012 (0.024)	0.355 (0.23)	0.088 (0.239)	-0.014 (0.025)	0.114 (0.096)
Relative Autonomy Index	66.967*** (1.399)	0.4** (0.143)	0.155 (0.266)	0.707*** (0.23)	0.401*** (0.148)	-0.053 (0.092)
Dower	67.919*** (1.592)	-0.023 (0.088)	-9.838*** (0.277)	1.034*** (0.282)	-0.032 (0.089)	-2.078*** (0.254)
Paid worker	67.829*** (1.601)	0.183* (0.101)	-0.683** (0.271)	0.879*** (0.291)	0.186* (0.104)	-0.17* (0.094)
Number of brothers ≤ 5 years	67.883*** (1.616)			1.076*** (0.295)		
Number of sisters ≤ 5 years	68.655*** (1.513)			1.238*** (0.316)		
Number of female cousins ≤ 5 years	67.882*** (1.602)			1.17*** (0.306)		
Log Likelihood			-2097.253			-2110.88

Notes:

<sup>a</sup>Standard errors in parentheses. Significant codes: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01.

<sup>b</sup>Estimation sample is 1,342 women. All reported specifications control for log age of woman and include district dummies.

<sup>c</sup>Model I and Model II are joint estimates of the two marital discord indicator equations- child marriage (*c*) and domestic abuse (*a*) is by nonparametric FIML with three points support for the finite mixture distribution.

<sup>d</sup>In Model I, residual correlations between first-stage *Watta Satta* and second-stage (*y<sub>c</sub>* and *y<sub>a</sub>*) is restricted to zero, while Model II allows them to be free.

also give credence to this hypothesis - men, who can afford to pay dower, are less likely to abuse their wives. Alternatively, the dower-abuse correlation also means that men who fulfil dower religious obligations are less likely to abuse their wives.

Moreover with the exception of latent psychological parameters ( $\theta$ ,  $\psi_i$  and  $\psi_j$ ), Proposition 2 is confirmed by Table 2. Irrespective of the selection bias, domestic production and fertility influence abuse outcomes. The sign of women being paid workers supports the “bargaining theory” to domestic abuse (see Tauchen et al. 1991 and Farmer & Tiefenthaler 1991), where a husband bribe his wife into accepting some level of physical violence by offering her payments as compensation. The estimate shows that a woman having an income reduces the likelihood of abuse; hence by not accepting a husband’s abuse-related bribe, women will experience lower abuse.

Another interpretation of this result is that women receive better treatment in households where they have a measured productivity contribution via wages. In a household where women earn wages, abuse is less likely due to the higher bargaining power of the wife due to her financial independence. However, given the gender wage gap and women being part-time rural workers, a woman’s contribution is marginal if not minuscule compared to a husband’s.<sup>19</sup> The large wage gap between spouses is a potential explanation for the negative correlation between the likelihood of abuse and women’s paid labour. That is, Pakistani rural spousal’s wage differential is so significant that a husband is not insecure about his wife’s financial contribution and independence.

Additionally, the likelihood of an abused woman is positively correlated to her having more sons. This correlation is interpreted as: (i) for a given level of natural sex ratios, more sons mean higher fertility (total number of children is high); and (ii) more son implies that the household has a son preference, i.e., keep on having children until the desired number of son are achieved.

The estimates also indicate that the likelihood of domestic abuse decreases in patrilocal households. A possible explanation of the negative correlation is censoring abuse response by the victim due to a lack of trust or inlaws’ arbitrating marital discord. Overall, the role of inlaws in spousal altercations is not clear as inlaws either can be peacekeepers or disciplinarians on behalf of the spouse. Niaz (2004) finds that 70 per cent of respondents never acknowledge abuse in metropolitan areas and 43 per cent of suicidal women have a conflict with inlaws. These numbers identify a standard problem within this literature,

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<sup>19</sup>Even though the proportion of women’s financial contribution in aggregate household income is unknown, on average working women earn 0.261 USD per day. A husband’s income calculated in this instance as a majority them work on family farms.

hence Section 7 attempts to account for under-reporting and checks for the robustness of these conclusions.

Lastly households, where women have a lower status, are likely to opt for child brides and have a higher likelihood of abuse after marriage. The point estimates suggest this as the underlying residual correlations,  $corr(\nu_a, \nu_c)$  are positively significant. Additionally,  $corr(\epsilon, \nu_o)$  where  $o = a, c$  is estimated to be insignificant.

## 7 Underreporting and Censoring of Abuse

Marital violence literature is frequently limited by the issue of underreporting and censoring by the victim. (see Chin et al. 2017 and Palermo et al. 2014). The reasons attributed this include shame, stigma, retaliation, loss of children (Gracia-Moreno et al. 2005), cultural beliefs (Wolf et al. 2003) and/or perception of the normalcy of marital violence (Fugate et al. 2005). It is reasonable to assume that aforementioned motivators are applicable to Pakistan's case as well.

Response underreporting and censoring is an important consideration for policy evaluation as it leads to biased results via the following mechanisms: (i) self-censoring by respondents; and (ii) censoring by the interviewer during the interview and/or data entry. This section accounts for these biases and checks for the robustness of Section 6.2 conclusions by running Efron's (1981) censoring bootstrap to account for the respondent self-censoring and by introducing Hausman misclassification indicator (see Hausman et al. 1998) to address censoring and missclassification by interviewer.

### 7.1 Self-Censoring by the Respondents

Using the Efron (1981) empirical bootstrap technique for right-censored data, the system of equations under Model II is replicated 1400 times. Figure 3 shows the stability of the estimates at a 95 per cent confidence level. Overall, all estimates of Model II fall between the 95 per cent confidence bands irrespective of their significance in the initial estimates.

The confidence intervals indicate that after correcting for self-censoring, women who received a dower, live with their inlaws, earn wages and have husbands from landed families (father-inlaw's holding  $\geq 200$  kanals) are less likely to be victims of domestic abuse. Additionally, the small confidence range for the number of sons shows that sons' impact on the probability of spousal abuse remains consistent with a stable magnitude.

The 1400 bootstrap replications can also be used to check the robustness of the outcomes *Watta Satta* and being a child bride. The three instruments for *Watta Satta* are found to be consistent in significance and direction of correlation, i.e., the number of brothers, sisters and female cousins  $\leq 5$  years increases the likelihood of entering a *Watta Satta* contract. Additionally, the estimate for father-inlaw's holding  $> 200$  kanals having a positive confidence interval reinforces the plausibility of Proposition 1 pertaining *Watta Satta* selection criteria. For the negative correlation between father's holding size and *Watta Satta*, 1400 replications with replacement do not change the direction of this correlation.

For odds of being a child brides, the results are within 95 per cent confidence bands, with the sign being similar to the estimates of Table 2. The strictly negative interval range of a father-inlaw's holding  $> 200$  kanals indicates the presence of strong wealth effects. Also, the result of a husband having an education and being an internal migrant reduces him selecting a child bride remains robust after 1400 replications.

## 7.2 Response Censoring by the Interviewer

To assess the empirical implication of response censoring by the interviewer, the Hausman et al. (1998) estimator is used to correct misclassified 1s of domestic abuse recorded as 0s. Here, the probability of misclassification,  $\iota$  depends on the domestic abuse indicator,  $\tilde{y}_i^a$  and is independent of the covariates  $\mathbf{X}_i$ . This translates into a probability function

$$\iota_1 = Pr(y_i^a = 0 | \tilde{y}_i^a = 1),$$

where  $\iota_1$  is the probability of a 1 being misclassified as a 0. Given that misclassification of 0s being reported as 1s is ignored, the probability of domestic abuse becomes

$$Pr(y_i^a = 1 | \mathbf{X}_i) = (1 - \iota_1)F(\mathbf{X}_i' \xi_a), \quad (18)$$

which collapses into a reduced form expression  $F(\mathbf{X}_i' \xi_a)$  when there is no misclassification. Identification conditions for  $(\iota_1, \xi_a)$  are similar to those for the traditional binary choice model with  $\iota$  being monotonic ( $\iota_1 < 1$ ) (Hausman et al. 1998).

Equation 18 is substituted into the system of equation and estimated in a maximum likelihood setup similar that of Model II in Section 6. Table 3 shows that there is no misclassification in the data as the  $\iota_1$  is insignificant. Furthermore, the significance and sign estimates Model II do not change with the addition of the Hausman indicator (refer

to Table 6 for more details).

Table 3: MISCLASSIFICATION OF DOMESTIC ABUSE

Misclassification indicator, $\iota_1$	0.150
Standard Error	(0.571)
Log likelihood	-2109.059

## 8 Structural Estimation

Since the results of the previous sections are rigorously robust, the data is used to estimate  $i$ 's latent preferences as outlined in Proposition 2. This section does this by re-estimating Model II with the preference parameters to identify the correlation of  $i$ 's latent preferences to the abuse outcome. These estimates are essential to the remaining analysis as they aid in assessing the viability of abuse prevention policy interventions.

### 8.1 Maximum Likelihood Function

Amount of spousal violence,  $DA_i$  exercised by  $i$  is correlated with all the model II covariates estimated in Section 6.2 and has the functional form

$$DA_i = \mathbf{X}_i \xi + \nu_i. \quad (19)$$

Using equation 13, the equilibrium level of spousal violence depends on  $i$ 's preferences which are unobserved by the econometrician. A woman reports spousal abuse ( $y_i^a = 1$ ) if the amount of violence exercised by her husband is equal or greater than the equilibrium level  $a_{ii}$ ,

$$y_i^a = \mathbb{1}\{DA_i \geq a_i\},$$

where  $\mathbb{1}\{\cdot\}$  is the indicator function for reporting spousal abuse that equals 1 if its argument is true and 0 otherwise. As Section 7.2 find that the estimates do not suffer from misclassification and censoring, it is assumed that reporting abuse is monotonic to actual abuse. This implies that a woman experience/tolerate some form of abuse in a marriage where she will report if a husband is more violent than her tolerance level. Here tolerance level of minimum marital abuse is given by equation 13.

$$\begin{aligned} Pr(y_i^a = 1) &= Pr(DA_i \geq a_{ii}) \\ &= Pr(DA_i \geq a_{ii} | WS_i = 1) + Pr(DA_i \geq a_{ii} | WS_i = 0), \end{aligned} \quad (20)$$

where the later follows from the law of total probability. Substituting  $a_{ii}|WS_i = 0$  and  $a_{ii}|WS_i = 1$  from equation 13 into equation 20 yields

$$\begin{aligned} Pr(y_i^a = 1) = & Pr\left\{\mathbf{X}_i\xi \geq \left(\frac{(\psi_i - \theta(1 - \psi_j))a_{jj}^{\psi_i-1}}{(1 + \alpha(1 - \mu) + \rho)\psi_i - \theta(1 - \psi_j)}\right)^{\frac{1}{\psi_i}}\right\}Pr(WS = 1) \\ & + Pr\left(\mathbf{X}_i\xi \geq \frac{1}{1 + \alpha(1 - \mu) + \rho}\right)(1 - Pr(WS = 1)). \end{aligned} \quad (21)$$

By plugging in a distributional specification of  $DA_i$  into equation 21, following probability of a wife reporting abuse is obtained

$$Pr(y_i^a = 1) = \Phi(h_1(\delta, X))\Phi(h_3(\pi, Z)) + \Phi(h_2(\delta, X))(1 - \Phi(h_3(\pi, Z))) = H(\delta, \pi, X, Z), \quad (22)$$

where  $X$  and  $Z$  are vector of covariates for domestic abuse and *Watta Satta* from Section 6.2 respectively,  $\delta = [\alpha, \xi, \mu, \psi_i, \psi_j, \rho, \theta, \sigma]$  and  $\pi$  are set of parameters and  $\Phi(\cdot)$  is a cumulative distribution of the standard normal. The function  $h_\ell(\cdot)$ ,  $\ell = 1, 2, 3$  appearing in equation 22 are defined by

$$\begin{aligned} h_1(\delta, X) &= \frac{1}{\sigma}\left(\mathbf{X}_i\xi - \left(\frac{(\psi_i - \theta(1 - \psi_j))a_{jj}^{\psi_i-1}}{(1 + \alpha(1 - \mu) + \rho)\psi_i - \theta(1 - \psi_j)}\right)^{\frac{1}{\psi_i}}\right), \\ h_2(\delta, X) &= \frac{1}{\sigma}\left(\mathbf{X}_i\xi - \frac{1}{1 + \alpha(1 - \mu) + \rho}\right), \\ h_3(\pi, Z) &= \mathbf{Z}_i\pi. \end{aligned}$$

Equation 22 is jointly estimated as a part of system of equation in a maximum likelihood.<sup>20</sup> The estimated structural parameters are the relative importance of the household produced good,  $\alpha$ ; externality strength of spouses' contribution to domestic production,  $\mu$ ; preference in children,  $\rho$ ; empathy for *Watta Satta* sister,  $\theta$  and reactive measure for exercising violence by *Watta* inlaws  $\psi_i$  and  $\psi_j$ ; and the standard deviation of spousal abuse,  $\sigma$ .

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<sup>20</sup>The number of observations reduce to 922 from 1342 due to the additional parameter of  $a_{jj}$ . In PRHS (2004), abuse response for matched *Watta Satta* pairs is available. The loss of observations is due to missing data concerning *Watta* counterpart,  $j$ .

## 8.2 Results

Table 4 reports maximum likelihood estimates where parameters, the standard deviation for abuse  $\sigma$  and  $\psi_j$  are fixed to get meaningful estimates.<sup>21</sup> The parameter  $\alpha$  is regarded as individual  $i$ 's "perception" of household goods,  $Q_i$ . Overall, the likelihood of domestic abuse declines as  $\alpha$  increases, implying that improved perception about household goods/contributions leads to a reduced likelihood of abused wives. Since that  $Q_i$  is a composite function of time allocated to unpaid labour by  $i$ ,  $q_i^H$  and a wife's productive time spent for paid labour and housework,  $q_i^W$ , it is ambiguous to say whether  $i$ 's use of violence is a repercussion of him not wanting to contribute to housework or his perception of his wife is being unproductive.

Moreover, estimated negative  $\alpha$  shows evidence supporting the "signalling theory" developed by Bloch & Rao (2003). The estimates show that an average abusive husband  $i$  has a negative perception/ disutility associated with home-produced household goods,  $Q_i$  and use violence acts as a signal to communicate dissatisfaction to his wife. This result, in conjunction with the negative correlation between a woman being a paid worker and abuse likelihood (see Table 2), also signals that the source of  $i$ 's dissatisfaction is from the time invested in home-produced household good  $q_i^H$  and not from his wife's time allocation for home production and economic labour  $q_i^w$ . Thus, it remains unclear if an abusive  $i$ 's dissatisfaction is due to him not wanting to contribute to domestic production or just having a negative perception about his unpaid contribution.

Furthermore, the externality of a husband's domestic production contribution  $\mu$  further clarifies this abuse as a repercussion of a husband dissatisfaction with housework. The positive significance and marginal effects of  $\mu$  suggest that, on average, an abusive  $i$ 's wife's contribution to household production has a higher relative externality than his contributions. This indicates that  $i$  perceives his wife to have a natural disposition and temperament for housework, making her more efficient at home production. However, further investigation is required to conceptually disentangle the nature of marital household contributions as it is outside the scope of this paper. In the context of domestic abuse,  $\mu$  combined with a negative  $\alpha$  imply that an average abusive man has a strict view about his wife's marital role, i.e., a woman's contribution to a marriage fulfils household responsibilities and bears children. The stronger this perception is, the more likely a husband is abusive.

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<sup>21</sup>The value is iteratively determined with the highest log-likelihood value.



Table 4: Structural FIML estimates

Parameter	Name	Estimate	Marginal Effect
St. Dev for abuse	$\sigma$	3.341	1.333
Importance of home-produced production	$\alpha$	-0.652*** (0.034)	-0.260
Externality of a man's contribution to domestic production	$\mu$	0.074** (0.032)	0.030
Empathy	$\theta$	0.383*** (0.142)	0.153
Preference for children	$\rho$	0.500** (0.247)	0.195
Reactive temperament to violence of $i$	$\psi_i$	0.294*** (0.497)	0.117
Perception about $j$ 's reactive temperament to violence	$\psi_j$	-0.028	-0.284
Log Likelihood			-861.999
Number of observations			922

Asymptotic standard errors in parenthesis. Significant codes: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

The psychological parameter for sibling empathy,  $\theta$  is positively significant in the abuse likelihood. The positive  $\theta$  implicates dis-utility and emotional dissonance  $i$  feels if his *Watta* kin gets abused and hence is a deterrent to being abusive to his wife. Even though Table 2 estimates fail to establish a correlation between *Watta Satta* and the likelihood of spousal abuse, the significance and magnitude of  $\theta$  is aligned with the conclusions of Jacoby & Mansuri (2010) of *Watta Satta* having a negative effect on the likelihood of spousal abuse.

Individual  $i$ 's reactive temperament to violence  $\psi_i$  confirms that he uses spousal abuse as a reaction to maltreatment of his *Watta* kin. The magnitude of the marginal effects of  $\psi_i$  indicates that  $i$ 's use of violence is contingent on  $j$  use of violence. Under the criteria discussed in Section 3,  $\psi_i$  being less than 0.5 suggests that  $i$  mostly uses violence as a response to  $j$ 's use of violence. Additionally, the magnitude of  $\psi_i$  partially confirms Lemma 2, and indicates that perceived reactive violence increases the likelihood of domestic abuse.

Lastly, the fertility preference parameter,  $\rho$  is estimated to be positive, suggesting that abusive husbands have a positive fertility preference and affection for their children. With the positive returns to having children in an agricultural household and women with sons having a higher abuse likelihood, it is hypothesised that men's preference for children is predominantly for sons rather than daughters. Here the estimated  $\rho$  is the benchmark

affection men feel for their sons and an increase implies that  $i$  starts to have affection for daughters. This hypothesis is tested in the following section, with a counterfactual policy experiment is conducted to investigate how abuse outcomes change with a policy aimed at changing  $i$ 's child preference.

## 9 Counterfactual Policy Experiment

This section uses the estimates from Section 6 and 8 to evaluate the impact of targeted policies on  $i$ 's decision to engage in spousal abuse and child marriage. Since the previous sections suggest that a woman's productive role and a husband's demographic profile and fertility preferences influence the likelihood of a woman being a child bride and a victim of spousal abuse, this section tests policy prescriptions that can remedy reduce the likelihood of these outcomes. It examines how the following policies affect the odds of women being child brides and being in an abusive relationship change with: (i) women's employment schemes; (ii) compulsory education for boys; and (iii) social awareness schemes aimed at changing male preferences about fertility and domestic roles.

### 9.1 Compulsory education for boys and women's employment schemes

Until now, the welfare analysis only considered monetary transfers (land and dower) as the inter-generational inheritance,  $k_i$ . This section relaxes this restriction and includes parental investment in human capital to examine the effect of inheritance on women's marital outcomes. Here the parental investment is an altruistic expenditure that enables children to become financially independent adults. This investment is in skill development either through formal schooling or informal skill development via family members teaching children vocational skills (for instance, skills like sewing, farming and growing crops). For these two investments, a comparative policy experiment is conducted to understand how the odds of child brides and domestic abuse change with the implementation of human capital improvement policies. Since individuals perceive sons to have higher returns than daughters, sons are more likely to receive formal education. (Purewal & Hashmi, 2015). Based on this preference, gender-specific policy experiments are conducted. The first experiment examines the impact of male schooling on the likelihood of abuse and of marrying a child bride, while the second measures how girls receiving training from family members change abuse and child bride odds.

The first experiment, schooling for boys, assume that all respondents have secondary

schooling attendance. Specifically, since only 15.9 per cent of the sampled husbands have ever attended secondary school, the experiment examines how domestic abuse and marital age is impacted if all men had attended.

Since parents are less motivated to send their daughters to school, the definition of parental non-monetary investment in daughters is not as straightforward for the gyno-centric experiment. Since, on average, only 17 per cent of women have ever attended school, altruistic human capital investment is proxied by a woman’s financial independence in marital life, i.e., women being paid workers. This indicates that the woman has received some vocational training.<sup>22</sup> Given the negative correlation between a wife working and abuse likelihood, the second experiment examines how abuse odds are impacted by programs that help circumvent cultural and religious barriers preventing women from working.<sup>23</sup>

The policy impact of the two experiments is quantified in the form of the causal treatment effects for both policy interventions. The technique selection for the estimation is based on the winners of 2016 Causal Inference Data Analysis Challenge.<sup>24</sup> The following techniques were found to be most efficient and are hence used in this paper: (i) targeted maximum likelihood with a machine learning algorithm (henceforth TMLE-SL); and (ii) Bayesian analysis regression tree (henceforth BART). These methods address a unique set of biases and, therefore, act as a robustness check for the policy recommendation.

The first technique, TMLE-SL, is a doubly robust, asymptotically efficient, maximum likelihood-based estimation. Introduced by van der Laan & Rubin (2006), TMLE relaxes the assumption of similarity between exposure groups by statistically adjusting the confounders. This adjustment addresses biases (i) that conflate the actual effect with baseline group differences; and (ii) arising from a finite sample, outliers and sparsity. In case of a misspecified regression, TMLE can be used for bias correction via implementing the machine learning algorithm “Superlearner”.<sup>25</sup> Lastly, in case there is a non-linear response surface or uncertainty concerning nonessential variables and functional form, BART is used to check the robustness of the estimates.

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<sup>22</sup>These skills include expertise in animal husbandry, horticulture and the art of handicrafts.

<sup>23</sup>Such programs include micro-finance schemes, promotion and organisation of women-centric cottage industries.

<sup>24</sup>A detailed description of the challenge motivation, development, and results is provided by Dorie et al. (2019).

<sup>25</sup>This is an ensemble learner with a heterogeneous base learner using V-fold cross-validation to ascertain an optimal convex combination of estimates obtained from the application of each algorithm in a user-specified library of prediction algorithms (van der Laan, Polley & Hubbard 2007).

Table 5 summarises the average treatment effect (henceforth ATE), average treatment on the treated (henceforth ATT) and average treatment on the untreated (henceforth ATC). Using the same sample and covariates as used in Section 6, the estimates show that neither of the two policy interventions significantly impact that child marriage. The precision in the estimation of heterogeneous effects is higher under BART compared to TMLE-SL (see Dorie et al. 2019). Even though TMLE-SL is superior in predicting interval length and coverage, a policy is considered robust only if it is significant for under TMLE-SL and BART. The policy failure is potentially attributed to the prevailing religious and cultural doctrines ingrained in the household marriage decision. Due to marital decisions being taken at a household level (where the patriarch approves the bride-groom match), policies that are parent centric in nature fail. Here, “parent centric” means that parents have more autonomy in deciding the quality and quantity of human capital investment for their children compared to agency in who and when that child can marry. Moreover, Table 5 confirms this hypothesis, as it implies that marriage age and education investment is not correlated and are mutually exclusive decisions. This decisional exclusivity comes from parents wanting approval from their extended family for marital decisions and solely relying on themselves for human capital investments.

In contrast, the experiments for domestic abuse show a precise reduction in abuse if men are exposed to secondary education. Table 5 indicates that, on average, there is a 9 per cent decline in the likelihood of abuse likelihood. The significant ATC indicates that a decline in spousal abuse odds by 8 per cent under TMLE-SL and 6 per cent under BART is observed if all uneducated individuals receive secondary schooling. Furthermore, the insignificance of ATT shows no change in spousal abuse likelihood if secondary educated husbands had not gone to school. This lack of significance can be attributed to the small sample of educated husbands (only 15.9 per cent of husbands have secondary education).

For the second experiment, there is no significant evidence of reduced abuse due to women’s participation in a paid work scheme. A potential reason for the lack of significance is that the estimation fails to gauge women’s productive contribution. In addition, the binary intensity of the treatment - work scheme for women is limiting as (i) heterogeneity of wages due to differences in skill level is discounted from the analysis; and (ii) there is no adjustment for wage differential between sexes.

Table 5: Impact of schooling for boys and women’s work schemes

	ATE		ATT		ATC	
	<i>TMLE-SL</i>	<i>BART</i>	<i>TMLE-SL</i>	<i>BART</i>	<i>TMLE-SL</i>	<i>BART</i>
<i>Child Marriage</i>						
Compulsory schooling for boys	-0.092*** (0.039)	-0.069 (0.040)	-0.090*** (0.033)	-0.067 (0.054)	-0.75 (0.039)	-0.068 (0.039)
Women work schemes	0.010 (0.031)	0.013 (0.032)	0.012 (0.030)	0.012 (0.046)	0.013 (0.031)	0.012 (0.033)
<i>Spousal Abuse</i>						
Compulsory schooling for boys	-0.086*** (0.031)	-0.078*** (0.029)	-0.087 (0.251)	-0.056 (0.045)	-0.080*** (0.032)	-0.061*** (0.031)
Women work schemes	0.050 (0.029)	0.040 (0.030)	0.049 (0.082)	0.041 (0.044)	0.051 (0.029)	0.038 (0.031)

Standard errors in parentheses. Significant codes: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01.

## 9.2 Attitude

Anderberg & Rainer (2013) find that spousal abuse is a repercussion of non-cooperation in household decision making. This experiment tests this argument by examining how a change in  $i$ ’s perceptions about a wife’s role impacts odds of marital discord. In this context, the change in men’s perceptions is an altered attitude about household production and fertility preferences.

The experiment uses the structural estimates of Section 8 to evaluate the impact of awareness campaigns targeted toward altering  $i$ ’s attitudes and behaviours. The evaluations of this experiment are vital as they give empirical insights about the awareness programs on abuse probability and hopefully urge decision-makers.

Social awareness campaigns are assumed to be initiated by the Pakistani government, non-governmental or international organisations. Examples of such schemes include programs by MenEngage Alliance in India, Tostan in Senegal, the White Ribbon Campaign in Canada and UNFPA programs in Turkey. These programs involve community-level outreach, media campaigns, education and engagement to encourage their target groups to evaluate and alter their perceptions concerning fertility and gender.

It is assumed that all the sample respondents are exposed to the scheme and that the exposure increases the absolute numerical value of household duties perception,  $\alpha'$  and fertility,  $\rho'$  by allowing the individuals’ perception to become positive. Here, high  $\rho$  and  $\alpha$  magnitude means “favorable” perception and a more emotionally “happier”  $i$ . The

resulting equations for the two policy exposures are,

$$\alpha' = \alpha + A,$$

$$\rho' = \rho + P,$$

where  $\alpha$  is the estimated structural value of perception about the domestic good, and  $\rho$  is the baseline fertility preference. Here  $A$  and  $P$  represent the additional positive reinforcement after each program exposure. In this setting, the positive reinforcements,  $A$  and  $P$  assumed to benefit from a perfect take-up rate. Therefore the results reflect the maximum gain in absolute utility for the social intervention. The impact of these programs on reported abuse is depicted in Figure 2, where the horizontal axis is the total magnitude of home-produced production perception,  $\alpha'$  and fertility preference,  $\rho'$  and the vertical axis represents variation in the ratio of abuse reporting women ex-ante campaign exposure.

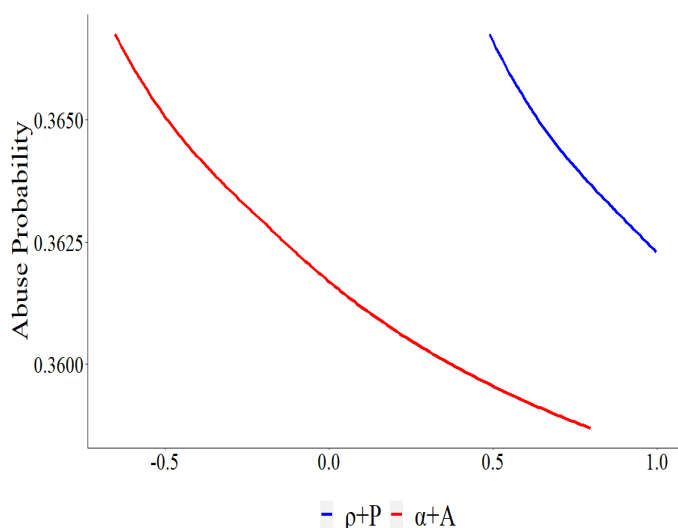


Figure 2: Counterfactual experiment: change in household duties perception and fertility preference in men

The initial value of  $\alpha$  and  $\rho$  is the estimated structural value of  $-0.652$  and  $0.074$ . This means that the starting value of reinforcements  $A$  and  $P$  is 0, the current state, corresponding to the situation where no program is initiated. When  $A > 0$  and  $P > 0$ , Figure 2 shows that the fraction of abuse decreases. Two messages emerge from this pattern. First, reported abuse declines marginally with a large increase (negative to positive) in domestic production perception,  $\alpha'$ . There is a 50 per centage points decline

in abuse when  $\alpha'$  increases from -0.652 to 0, and when  $\alpha' > 0$ , abuse probability only improves by 0.3 per cent. Moreover, this result conveys that a husband's perception about domestic production needs to become positive for him to be less abusive toward his wife.

Second, compared to home production, a slight change in fertility preference,  $\rho'$  yields a more significant decline in domestic abuse probability. The blue line in Figure 2 shows that 0.5 unit increase in  $\rho'$  yields a reduction of 0.4 per cent in abuse. The simulations require that  $\rho'$  is always positive. Given that men already have positive fertility preferences, particularly for sons, a positively altered  $\rho'$  can be interpreted as having a positive perception for daughters. In this context, it is reasonable to conclude that building a positive daughter perception will decrease women's odds of being abused.

Lastly, when comparing the two sets of policies, altering fertility preferences has more significant returns than altering domestic production preference. However, caution needs to be exercised as it remains uncertain which of the two policies is more straightforward to implement due to culture and religious resistance. Furthermore, in comparison to compulsory education intervention for men discussed in Subsection 9.1, the returns to attitude intervention will be more immediate, as it is more contemporaneous, while only by the next generation, returns to education will be realised.

## 10 Conclusion

Culture and family characteristics guide ex-post and ex-ante marital outcomes. This paper explores these relations by examining how local traditions contribute to women's welfare and bargaining power. Specifically, the question of what contributes to the likelihood of women being in an abusive relationship after accounting for traditions of child brides and *Watta Satta* bride exchange is addressed. This question is vital for policymakers as even with the international push for the protection of married women, domestic abuse remains a leading contributor to violence against women. This question is also relevant in academic literature as most research has limited scope due to problem of under-reporting by spousal abuse victims and surveyor response censoring.

By accounting for these limitations and controlling for local traditions of child bride and *Watta Satta* bride exchange, this paper finds that spousal abuse is influenced by a husband's demographic profile and his psychological preferences. A husband receiving secondary education has positive spillovers for women's welfare. Comparatively, the re-

turns to male education for spousal abuse are higher than women-centric empowerment and education programs. Results indicate a strong presence of income effects in the odds of women being in an abusive relationship. Women from and married into highly subsist households are more prone to domestic abuse than landless and non-subsistence households.

Moreover, a man's latent preferences about fertility and home production also contribute to domestic abuse. The estimates indicate that abuse is a repercussion of a husband's dissatisfaction with housework, where interventions in the form of social campaigns that alter perception about housework lead to a positive reduction in likelihood. Similarly, victims of domestic abuse also have higher fertility because the likelihood of abuse increases with a preference of sons. That is abusive husband keep on having children until they have desired number of sons. Finally, policies aimed at altering perceptions about daughters also lead to a reduced incidence of marital abuse.

Amongst the four policies examined, the paper establishes that in a society with patriarchal preferences, culturally and religiously accepted policy prescription that will reduce domestic abuse and child bride preferences is complicated. In this context, the most practical policy prescription is educating boys, but even this does not come without drawbacks. The impact of educated men on women's abuse likelihood would not materialise contemporaneously but would only be realised in the following generations.

## References

- Ahmad, M., Batool, M., & Dziegielewski, S. F. (2016). State of Inheritance Rights: Women in a Rural District in Pakistan. *Journal of Social Service Research*, 42(5), 622-629.
- Almond, D., Edlund, L., & Milligan, K. (2013). Son preference and the persistence of culture: evidence from South and East Asian immigrants to Canada. *Population and Development Review*, 39(1), 75-95.
- Anderberg, D., & Rainer, H. (2013). Economic abuse: A theory of intrahousehold sabotage. *Journal of Public Economics*, 97, 282-295.
- Anderson, S. (2007). The economics of dowry and brideprice. *Journal of Economic Perspectives*, 21(4), 151-174.



- Andreoni, J. (1989). Giving with impure altruism: Applications to charity and Ricardian equivalence. *Journal of Political Economy*, 97(6), 1447-1458.
- Bettencourt, A. (2000). Violence against women in Pakistan. Human Rights Advocacy Clinic.
- Bhutta, R. N., Warich, I. A., Bhutta, A., Bhutta, N. I., & Ali, M. (2015). Dynamics of Watta Satta Marriages in Rural Areas of Southern Punjab Pakistan. *Open Journal of Social Sciences*, 3(12), 166.
- Bloch, F., & Rao, V. (2002). Terror as a bargaining instrument: A case study of dowry violence in rural India. *American Economic Review*, 92(4), 1029-1043.
- Charsley, K. (2007). Risk, trust, gender and transnational cousin marriage among British Pakistanis. *Ethnic and Racial Studies*, 30(6), 1117-1131.
- Chin, Y. M., Song, J. J., & Stamey, J. D. (2017). A Bayesian approach to misclassified binary response: female employment and intimate partner violence in urban India. *Applied economics letters*, 24(20), 1439-1442.
- Dorie, V., Hill, J., Shalit, U., Scott, M., & Cervone, D. (2019). Automated versus do-it-yourself methods for causal inference: Lessons learned from a data analysis competition. *Statistical Science*, 34(1), 43-68.
- De la Croix, D., & Gosseries, A. (2012). The natalist bias of pollution control. *Journal of Environmental Economics and Management*, 63(2), 271-287.
- Del Boca, D., & Flinn, C. (2012). Endogenous household interaction. *Journal of Econometrics*, 166(1), 49-65.
- Efron, B. (1981). Censored data and the bootstrap. *Journal of the American Statistical Association*, 76(374), 312-319.
- Farmer, A., & Tiefenthaler, J. (1996). Domestic violence: the value of services as signals. *The American Economic Review*, 86(2), 274-279.

- Farmer, A., & Tiefenthaler, J. (1997). An economic analysis of domestic violence. *Review of Social Economy*, 55(3), 337-358.
- Fernandez, M. (1997). Domestic violence by extended family members in India: Interplay of gender and generation. *Journal of interpersonal violence*, 12(3), 433-455.
- Fischer, M. D. (1991). Marriage and power: tradition and transition in an urban Punjabi community. *In Economy and culture in Pakistan* (pp. 97-123). Palgrave Macmillan, London.
- Fricke, T. E., Syed, S. H., & Smith, P. C. (1986). Rural Punjabi social organization and marriage timing strategies in Pakistan. *Demography*, 489-508.
- Fugate, M., Landis, L., Riordan, K., Naureckas, S., & Engel, B. (2005). Barriers to domestic violence help seeking: Implications for intervention. *Violence against women*, 11(3), 290-310.
- García-Moreno, C., Jansen, H. A., Ellsberg, M., Heise, L., & Watts, C. (2005). WHO multi-country study on women's health and domestic violence against women. World Health Organization.
- Gul, S., Zeb, L., & Faiz, N. R. (2013). Frequency of different types of domestic violence in antenatal patients. *Journal of Postgraduate Medical Institute (Peshawar-Pakistan)*, 27(3).
- Hausman, J. A., Abrevaya, J., & Scott-Morton, F. M. (1998). Misclassification of the dependent variable in a discrete-response setting. *Journal of Econometrics*, 87(2), 239-269.
- Jejeebhoy, S. J., & Sathar, Z. A. (2001). Women's autonomy in India and Pakistan: the influence of religion and region. *Population and development review*, 27(4), 687-712.
- Jacoby, H. G., & Mansuri, G. (2010). Watta Satta: Bride exchange and women's welfare in rural Pakistan. *American Economic Review*, 100(4), 1804-25.
- Jain, S., & Kurz, K. (2007). New insights on preventing child marriage: A global analysis of factors and programs. International Center for Research on Women (ICRW).

- Keane, M., Moffitt, R., & Runkle, D. (1988). Real wages over the business cycle: Estimating the impact of heterogeneity with micro data. *Journal of political Economy*, 96(6), 1232-1266.
- Khan, A. J., Ali, T. S., & Khuwaja, A. K. (2009). Domestic violence among Pakistani women: an insight into literature. *Isra Medical Journal*, 1(2), 54.
- Kidman, R. (2017). Child marriage and intimate partner violence: a comparative study of 34 countries. *International journal of epidemiology*, 46(2), 662-675.
- Kirkpatrick, S., Gelatt, C. D., & Vecchi, M. P. (1983). Optimization by simulated annealing. *Science*, 220(4598), 671-680.
- Klugman, J., Hanmer, L., Twigg, S., Hasan, T., McCleary-Sills, J., & Santamaria, J. (2014). *Voice and agency: Empowering women and girls for shared prosperity*. World Bank Publications.
- Lane, S. (2011). Stealing innocence: Child marriage and gender inequality in Pakistan. Plan Finland and Abo Akademi University, Finland, 1-44.
- Lari, M. Z. (2011). A pilot study on: 'honour killings' in Pakistan and compliance of law.
- McDonald, S., & Zhang, J. (2012). Income inequality and economic growth with altruistic bequests and human capital investment. *Macroeconomic Dynamics*, 16(S3), 331.
- Mroz, T. A. (1999). Discrete factor approximations in simultaneous equation models: Estimating the impact of a dummy endogenous variable on a continuous outcome. *Journal of Econometrics*, 92(2), 233-274.
- Nasrullah, M., Haqqi, S., & Cummings, K. J. (2009). The epidemiological patterns of honour killing of women in Pakistan. *European Journal of Public Health*, 19(2), 193-197.
- Nasrullah, M., Muazzam, S., Bhutta, Z. A., & Raj, A. (2014a). Girl child marriage and its effect on fertility in Pakistan: findings from Pakistan Demographic and Health Survey, 2006–2007. *Maternal and Child Health Journal*, 18(3), 534-543.

Nasrullah, M., Zakar, R., Zakar, M. Z., Abbas, S., Safdar, R., Shaukat, M., & Krämer, A. (2014b). Knowledge and attitude towards child marriage practice among women married as children-a qualitative study in urban slums of Lahore, Pakistan. *BMC public health*, 14(1), 1148.

Nasrullah, M., Zakar, R., & Zakar, M. Z. (2014c). Child marriage and its associations with controlling behaviors and spousal violence against adolescent and young women in Pakistan. *Journal of Adolescent Health*, 55(6), 804-809.

Niaz, U. (2004). Women's mental health in Pakistan. *World psychiatry*, 3(1), 60.

Nour, N. M. (2009). Child marriage: a silent health and human rights issue. *Reviews in obstetrics and gynecology*, 2(1), 51.

Pakistan Institute of Development Economics & World Bank. (2004). *Pakistan Rural Household Survey*. Retrieved from <http://www.pidelms.com/pphs/>

Palermo, T., Bleck, J., & Peterman, A. (2014). Tip of the iceberg: reporting and gender-based violence in developing countries. *American journal of epidemiology*, 179(5), 602-612.

Parsons, J., Edmeades, J., Kes, A., Petroni, S., Sexton, M., & Wodon, Q. (2015). Economic impacts of child marriage: a review of the literature. *The Review of Faith & International Affairs*, 13(3), 12-22.

Pollak, R. A. (2004). An intergenerational model of domestic violence. *Journal of Population Economics*, 17(2), 311-329.

The Punjab Land Revenue Act, 1967. (2004, January 1). Retrieved from <http://www.punjablaws.gov.pk/laws/212.html>

Purewal, N., & Hashmi, N. (2015). Between returns and respectability: parental attitudes towards girls' education in rural Punjab, Pakistan. *British Journal of Sociology of Education*, 36(7), 977-995.

Quisumbing, A. R., & Maluccio, J. A. (2003). Resources at marriage and intrahousehold

allocation: Evidence from Bangladesh, Ethiopia, Indonesia, and South Africa. *Oxford Bulletin of Economics and Statistics*, 65(3), 283-327.

Rauf, A. (1987). Rural women and the family: A study of a Punjabi village in Pakistan. *Journal of Comparative Family Studies*, 403-415.

Riggs, D. S., Caulfield, M. B., & Street, A. E. (2000). Risk for domestic violence: Factors associated with perpetration and victimization. *Journal of clinical psychology*, 56(10), 1289-1316.

Sami, N., & Ali, T. S. (2006). Psycho-social consequences of secondary infertility in Karachi. JPMA. *The Journal of the Pakistan Medical Association*, 56(1), 19.

Santhya, K. G., Ram, U., Acharya, R., Jejeebhoy, S. J., Ram, F., & Singh, A. (2010). Associations between early marriage and young women's marital and reproductive health outcomes: evidence from India. *International perspectives on sexual and reproductive health*, 132-139.

Shaikh, M. A. (2003). Is domestic violence endemic in Pakistan: perspective from Pakistani wives. *Pakistan Journal of Medical Sciences*, 19(1), 23-28.

State Bank of Pakistan. (2003). *Agricultural Loans Scheme*. Retrieved from [www.sbp.org.pk/acd/Events/appendex-I.pdf](http://www.sbp.org.pk/acd/Events/appendex-I.pdf)

Stephenson, R., Koenig, M. A., Acharya, R., & Roy, T. K. (2008). Domestic violence, contraceptive use, and unwanted pregnancy in rural India. *Studies in family planning*, 39(3), 177-186. Tanaka, S., & Muzones, M. (2016). Policy Brief on Female Labor Force Participation in Pakistan.

Tauchen, H. V., Witte, A. D., & Long, S. K. (1991). Domestic violence: A nonrandom affair. *International Economic Review*, 491-511.

Ulbrich, P., & Huber, J. (1981). Observing parental violence: Distribution and effects. *Journal of Marriage and the Family*, 623-631.

United Nations. (2019). *Child Marriage*. Website:<https://www.unfpa.org/child-marriage>

Vandello, J. A., & Cohen, D. (2003). Male honor and female fidelity: implicit cultural scripts that perpetuate domestic violence. *Journal of personality and social psychology*, 84(5), 997.

Van der Laan, M. J., Polley, E. C., & Hubbard, A. E. (2007). Super learner. *Statistical applications in genetics and molecular biology*, 6(1).

Van Der Laan, M. J., & Rubin, D. (2006). Targeted maximum likelihood learning. *The international journal of biostatistics*, 2(1).

Wolf, M. E., Ly, U., Hobart, M. A., & Kernic, M. A. (2003). Barriers to seeking police help for intimate partner violence. *Journal of family Violence*, 18(2), 121-129.

Wooldridge, J. M. (2015). *Introductory Econometrics: A modern approach*. Nelson Education.

Zheng, S., & Liu, W. (2012). Functional gradient ascent for Probit regression. *Pattern recognition*, 45(12), 4428-4437.

## Appendices

### A Proofs

■

*Proof for Proposition 2.* Equation 13 states that abuse is a function of aforementioned taste parameters. The difference between equilibrium abuse in a *Watta Satta* marriage and a benchmark marriage is that in a benchmark marriage  $a_{jj} = \theta = 0$ ; and  $\psi_i = 1$ . ■

*Proof for Lemma 1.* The consequence of the punishment mechanism on equilibrium abuse,  $a_{ii}$  depends on the individual type ( $\psi$ ). Partial derivative of  $a_{ii}$  with respect to  $\psi_i$  and  $\psi_j$  prove that  $\psi$  increases abuse

$$\frac{\partial a_{ii}}{\partial \psi_i} > 0; \quad \frac{\partial a_{ii}}{\partial \psi_j} > 0.$$

■

*Proof for Lemma 2.* According to equation 12, fertility is a function of reactive violence parameter  $\psi$  for both  $i$  and  $j$ . Equilibrium fertility,  $n_i$  is decreasing in  $\psi$ ;

$$\frac{\partial n_i(\psi_i, \psi_j)}{\partial \psi_i} < 0, \quad \frac{\partial n_i(\psi_i, \psi_j)}{\partial \psi_j} < 0.$$

■





## B Censorship Bootstrap

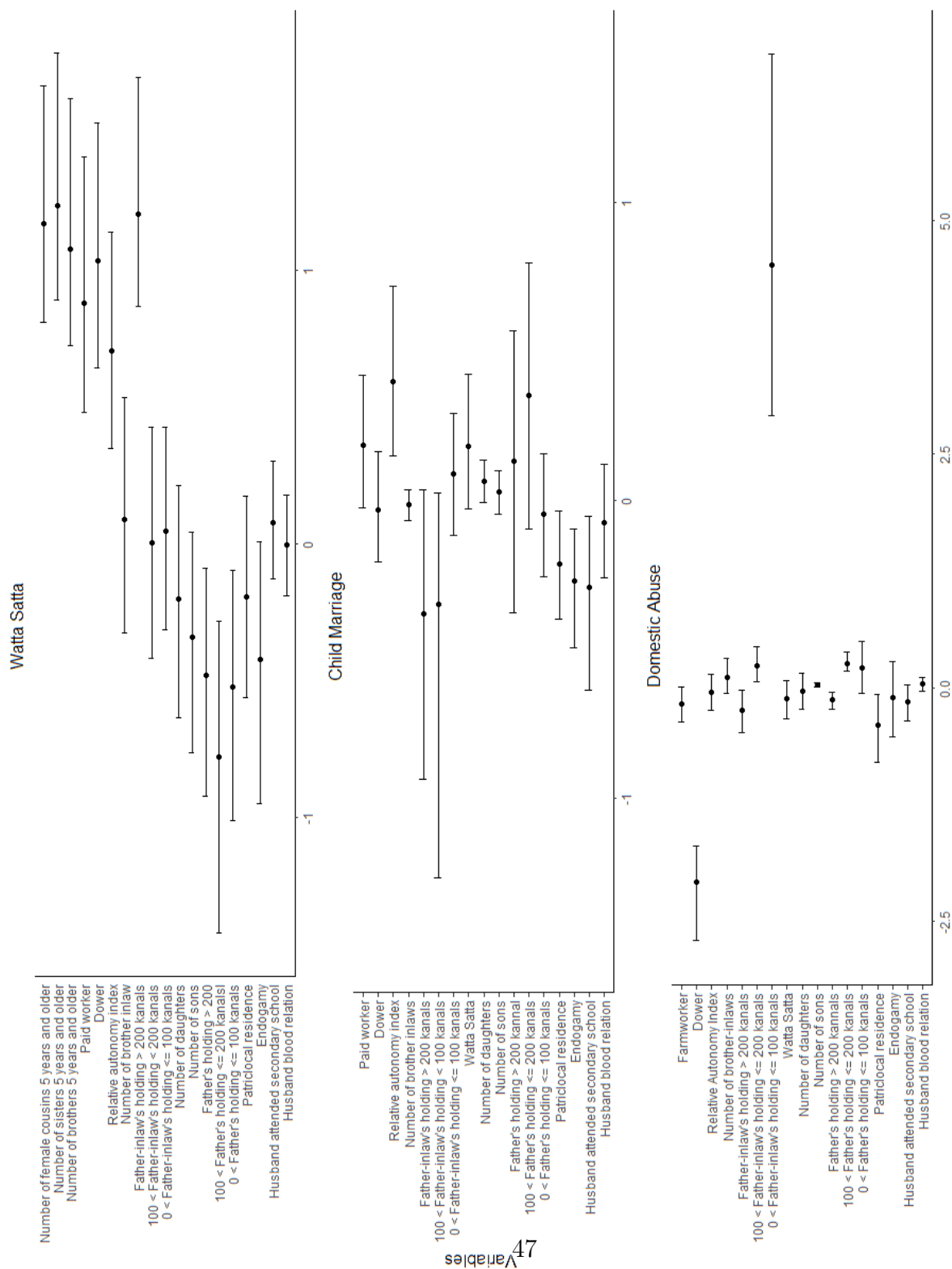


Figure 3: 95 per cent confidence interval from 1400 replications of numerical optimisation with censorship under the Broyden, Fletcher, Goldfarb and Shanno algorithm.

## C Reciprocity and Concordance

Before exploring *Watta Satta* marriage's role in odds of being a child bride and spousal abuse, the concordance and reciprocity *Watta Satta* is investigated. Using the 253 reported pairs domestic abuse information, a linear seemingly unrelated regression for system of equations for domestic abuse, child bride and *Watta Satta* is used to estimate concordance. For the spousal abuse,  $y_a$  *Watta* sister-inlaw abuse response is added to the specification. The descriptive regression for abuse is

$$y_a = \lambda_0 + \lambda \mathbf{X} + \lambda_1 y_a^s + \epsilon,$$

where  $\mathbf{X}$  are the control variables from Table 2 and  $\epsilon$  is the error term. The parameter of interest is  $\lambda_1$  and is estimated to be  $\lambda_1 = 0.469$  with  $SE = 0.109$ . This show that *Watta* wives are concordant and that if one reports abuse the other reciprocates.

## D Misclassification Results

Table 6: MISCLASSIFICATION OF DOMESTIC ABUSE

	<i>WS</i>	<i>c</i>	<i>a</i>
Endogamy	-0.002 (0.088)	-0.072 (0.105)	0.04 (0.033)
Husband has secondary education	0.077 (0.102)	-0.29 (0.153)	-0.146 (0.094)
Natal family resides locally	-0.425 (0.268)	-0.272 (0.15)	-0.104 (0.183)
Patrilocal residence	-0.194 (0.181)	-0.212 (0.143)	-0.399 (0.184)
Father landholding $\leq 100$ kanals	-0.524 (0.285)	-0.046 (0.101)	0.211 (0.146)
$200 \geq$ Father landholding $> 100$ kanals	-0.783 (0.368)	0.355 (0.245)	0.261 (0.042)
Father landholding $> 200$	-0.483 (0.264)	0.134 (0.229)	-0.13 (0.039)
Number of sons	-0.343 (0.223)	0.029 (0.038)	0.027 (0.009)
Number of daughters	-0.203 (0.215)	0.065 (0.052)	-0.033 (0.085)
Watta Satta		0.185 (0.125)	-0.121 (0.098)
Father-inlaw's landholding $\leq 100$ kanals	0.047 (0.187)	0.091 (0.109)	4.534 (0.911)
$200 \geq$ Father-inlaw's landholding $> 100$ kanals	0.002 (0.225)	-0.348 (0.246)	0.235 (0.096)
Father-inlaw's landholding $> 200$ kanals	1.208 (0.186)	-0.381 (0.269)	-0.237 (0.114)
Number of brothers-inlaws	0.088 (0.219)	-0.014 (0.025)	0.114 (0.091)
Household decision making autonomy	0.708 (0.202)	0.403 (0.232)	-0.053 (0.09)
Dower	1.035 (0.203)	-0.032 (0.091)	-2.079 (0.234)
Paid worker	0.88 (0.22)	0.187 (0.121)	-0.17 (0.094)
Number of brothers $\leq 5$ years older	1.077 (0.202)		
Number of sisters $\leq 5$ years older	1.239 (0.21)		
Number of female cousins $\leq 5$ years older	1.171 (0.199)		
Misclassification indicator	0.150 (0.571)		