

Son Preference, Women’s Mental Health, and Well-Being in India^{*}

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Abstract

We document the relationship between son preference and women’s mental health using data on mothers-in-law (MILs) and their co-resident daughters-in-law (DILs) in rural India. We leverage exogenous variation in the sex of the DIL’s firstborn child to analyze the effect of a firstborn (grand)son on mental health and the extent to which having a firstborn boy affects MIL-DIL relations. MILs with firstborn grandsons experience an 18 percent reduction in the risk of anxiety or depression compared to MILs with firstborn granddaughters. We find no impacts of a firstborn son on DIL mental health. The birth of a grandson also increases MIL approval of DILs working outside the home and using family planning, which are consistent with increases in DIL labor force participation and modern contraceptive use. Our findings highlight the costs of gender-biased norms and the need for interventions that jointly address gender equity and mental wellness to improve well-being.

Keywords: Mental Health; India; Mother-in-Law; Son Preference

JEL codes: J13, J16, O15, O33, I15, Z13.

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1 Introduction

Mental health is fundamental to human well-being, affecting more than 450 million people worldwide; yet it remains critically neglected in low- and middle-income countries (LMICs), where almost 90 percent of people who need mental health treatment do not have the resources to receive care (Alloh et al., 2018; Das et al., 2007; Patel et al., 2018).¹ The consequences of this neglect are profound, contributing to poor overall health, impaired productivity, and reduced quality of life (Ridley et al., 2020; Sharac et al., 2010; Thornicroft et al., 2022). Women are affected more by mental health issues than men worldwide (Seedat et al., 2009); in fact, depression is nearly twice as prevalent among women and is more pronounced in older age groups in LMICs (Banerjee et al., 2023; Baranov et al., 2020).

Restrictive social norms and expectations often perpetuate an environment that undermines individual agency and, in turn, adversely affects mental health, especially among women and marginalized populations (Patel, 2024; Tseliou and Ashfield-Watt, 2022). In India, our study context, women are at even greater risk of adverse mental health outcomes due to gender-based inequalities and limited access to resources that support their well-being (Bau et al., 2022). Patriarchal norms, the dowry system, perceptions of marriage as an unchallengeable, permanent union, and the subservient status of women within households further exacerbate these risks throughout the life course (Basu, 2012; Sharma and Pathak, 2015).

Soon after marriage, Indian women face immense pressure from their families and communities to bear male children, tying their self-worth and social status to their ability to fulfill this expectation (Anand, ed, 2020; Barman and Sahoo, 2021; Clark, 2000; Pande and Malhotra, 2006). This expectation may lead to chronic stress, anxiety, low self-esteem, and feelings of inadequacy, particularly if women only have daughters (Das et al., 2012; Supraja et al., 2016). Such environments may also reinforce gendered expectations that limit women’s roles to childbearing and caregiving, leaving little, if any, room for other aspirations; these norms, in turn, create conditions of emotional neglect or abuse, exacerbating poor mental health outcomes (Bedaso et al., 2021; Hathi et al., 2021;

¹Depression is the most common mental illness and is the single largest contributor to global disability, affecting more than 300 million people globally (World Health Organization, 2017).

[Stroope et al., 2021](#)). The mental health toll from son preference may be further amplified by the economic and social disadvantages tied to restrictive norms ([Bau et al., 2022](#)). Women in such settings may have limited access to education, employment, and healthcare, leading to economic dependency and diminished agency in decision-making ([Silva et al., 2016](#)). This lack of self-efficacy can contribute to feelings of helplessness and depression ([Anand, ed, 2020](#); [Rosenfield and Mouzon, 2013](#)). Additionally, women who resist or fail to conform to these norms may face social ostracism, familial conflict, or even violence, further eroding their mental well-being ([Oram et al., 2022](#)). The intergenerational effects of son preference are profound, as daughters raised in these settings often internalize similar values, perpetuating cycles of mental health challenges linked to systemic gender inequality ([Dhar et al., 2019](#)).

In this paper, we analyze the effect of son preference on women’s mental health in rural India. We collected socioeconomic and health data from a sample of married women of reproductive age and their co-residing mothers-in-law (MILs) in Jaunpur district, Uttar Pradesh (UP), between November 2023 and May 2024. As part of this effort, we gathered extensive information on women’s fertility and family planning behavior, preferences for children, strength of social and familial relationships, and measures of mental well-being. In particular, we assess the mental health status of our sample women using the Patient Health Questionnaire-4 (PHQ-4), a validated questionnaire to screen the risk of depression and anxiety ([Kroenke et al., 2009](#)), which has been previously implemented in India ([Nichols et al., 2024](#)). We focus our data collection efforts exclusively on women co-residing with their MILs to contribute to further understanding the household dynamics among these extended families in patrilocal societies (e.g., [Anukriti et al. \(2020\)](#); [Gupta et al. \(2021\)](#); [Khanna and Pandey \(2024\)](#)), by eliciting information from both women and their MILs, we address data gaps from previous studies as usually only women who are daughters-in-law (DILs) are interviewed in household surveys.²

We leverage exogenous variation in the sex of the firstborn child to compare mental health outcomes for women whose first child (or first grandchild from the co-resident DIL) is male versus female. This identification strategy has been used in related empirical studies (e.g., [Anukriti et](#)

²Studies using existent household data surveys, such as the Indian Human Development Surveys (IHDS) or Demographic Health Surveys (DHS), use the household roster to identify the presence of the MIL in the household as the MIL is not directly surveyed ([Bietsch et al., 2021](#)).

al. (2021a,b); Bhalotra and Cochrane (2010); Visaria (2005)) as it relies on the fact that the sex of the first child is as good as random (e.g., Bhalotra and Cochrane (2010); Milazzo (2018)). In addition, we explore pathways through which the sex of the firstborn grandchild may affect MIL mental health. We also ascertain the potential implications of changes in the MIL’s mental health on auxiliary outcomes that capture changes in the MIL’s relationship with her DIL; specifically, we explore whether having a firstborn grandson changes the MIL’s approval of her DIL working and the MIL’s attitudes towards her DIL using family planning. By extension, we further examine whether the DIL’s likelihood of working and using family planning indeed shifts following the birth of a firstborn son relative to a firstborn daughter.

Our analysis yields the following findings. First, we document that 31 percent (18 percent) of our sample MILs (DILs) are at risk of having anxiety or depression, according to the PHQ-4 assessment tool. These estimates are in line with previous evidence documenting the high prevalence of these mental health issues, particularly among older women in India (Banerjee et al., 2023). Next, we find that the MIL’s risk of anxiety or depression decreases by 5.9 percentage points (p.p.), equivalent to an 18 percent relative decline when her co-resident DIL has a firstborn son compared to when her co-resident DIL has a firstborn daughter. The magnitude of this effect is meaningful as it is comparable to recent evidence in India measuring the impact of access to public pensions on women’s depression (Guimbeau and Menon, 2024), or a reform aiming to increase women’s inheritance rights on their mental health (Keskar and Mookerjee, 2024).

Interestingly, we find that the sex of the firstborn child does not affect the DIL’s risk of anxiety or depression. This result might be consistent with the fact that DILs have a weaker son preference than their MILs, given the higher educational attainment and inter-generational differences in gender attitudes. For instance, the DILs’ self-reported ideal proportion of sons among their own children is 44 percent, while this proportion is 55 percent for the MILs and 51 percent for her grandchildren. Furthermore, the DIL has a longer reproductive horizon as she can still have at least one son. Indeed, recent evidence shows that having a son (and not just the firstborn son) plays a key role in defining the skewed sex ratios in India (Jayachandran, 2017, 2023). Heterogeneity analyses of our main findings suggest that the reduction in the risk of reporting adverse mental health outcomes is driven by MILs with younger first grandsons, indicating that mental health

outcomes among MILs with firstborn grandsons and MILs with firstborn granddaughters converge over time, potentially because the MIL is eventually able to satisfy her latent son preference with a grandson. Relatedly, we show that the mental health effects of a firstborn son vary by the DIL’s relative hierarchical status in the household, whereby the impact of a firstborn son on MIL mental health outcomes is significantly larger among MILs with only one DIL and also among MILs whose co-residing DIL is married to their eldest son.

In exploring potential pathways of these effects, we find that having a firstborn grandson increases the likelihood of discussion about grandchildren between the MIL and her co-resident DIL and also increases the amount of time spent by the MIL on childcare by 0.15 hours, an 8 percent relative increase with respect to MILs with firstborn granddaughters (i.e. the control mean). Additionally, we find that having a firstborn grandson increases the MIL’s approval of her DIL working outside the home when her children are young. These changes in attitudes towards work are particularly relevant for relatively younger DILs, coinciding with an increase in their labor force participation (LFP) by about 10 p.p. (a 31 percent relative increase). These effects are significant when considering the low levels of female LFP and the restrictive social and gender norms that constrain women’s economic participation in India ([Fletcher et al., 2017](#); [Heath et al., 2024](#); [Jayachandran et al., 2021](#)).

Finally, we document how changes in the MIL’s attitudes towards her DIL following the birth of a grandson also spill over into changes in the MIL-DIL relationship in other auxiliary domains, including family planning and reproductive health decision-making. Specifically, we find that having a firstborn grandson increases the MIL’s likelihood of discussing family planning with her co-resident DIL by 6.8 p.p. (a 15 percent relative increase with respect to the control mean) and the MIL’s approval of her co-resident DIL’s use of contraceptive methods to limit future fertility by 7.6 p.p (an 11 percent relative increase with respect to the control mean), which is consistent with son-biased fertility preferences and related stopping rules in this context ([Bongaarts, 2013](#); [Milazzo, 2018](#)). These changes in the MIL’s attitudes towards her DIL’s use of family planning are also substantiated by the DIL’s increased likelihood of using modern contraception following a firstborn son. Specifically, DILs who had a firstborn son are 5.2 p.p. (22 percent) more likely to use modern contraception, either by adopting contraception or by switching from traditional methods to modern

methods, than DILs who had a firstborn daughter.

Our study makes several contributions to the literature. First, we add to a limited body of research that documents the poor mental health status of women in India. Despite the growing recognition of mental health as a public health concern ([World Health Organization, 2000, 2017](#)), there remains a significant gap in empirical studies that focus on women’s mental health in the Indian context, where structural constraints and rigid gender norms disproportionately exacerbate women’s psychological distress ([Basu, 2012](#); [Das et al., 2012](#); [Hathi et al., 2021](#); [Rosenfield and Mouzon, 2013](#)). We contribute to this body of work by assessing the risk of depression and anxiety of women and their co-resident MILs in Uttar Pradesh, a context where restrictive patrilineal and patrilocal social norms are widespread ([Anukriti et al., 2020](#)).

Second, we examine the role of son preference as a driver of women’s mental health in India, and more broadly, in low- and middle-income country contexts.³ While the literature on son preference has primarily focused on its demographic and economic consequences ([Barman and Sahoo, 2021](#); [Genicot and Hernandez-de Benito, 2023](#); [Milazzo, 2014](#); [Self and Grabowski, 2012](#); [Shah, 2005](#)), and particularly on the impacts of son bias on women’s fertility and health ([Anukriti et al., 2021a](#); [Milazzo, 2018](#)), their children’s health ([Jayachandran, 2023](#); [Jayachandran and Pande, 2017](#)), and more broadly empowerment ([Heath and Tan, 2018](#)), few studies have directly investigated its psychological impacts on women. By explicitly documenting these effects, we provide a more comprehensive understanding of the role of gender norms and cultural expectations in shaping women’s mental well-being.

Third, our study highlights the intergenerational implications of son preference by examining its effects on older women. As matriarchs and gatekeepers of familial norms, Indian mothers-in-law play a pivotal role in shaping the agency of other household members, particularly their daughters-in-law ([Anukriti et al., 2020](#); [Masood Kadir et al., 2003](#); [Khanna and Pandey, 2024](#); [Kumar et al., 2016](#); [Robitaille and Chatterjee, 2013](#)). We highlight how the preferences of mothers-in-law over their grandchildren influence household dynamics and, ultimately, the health and well-being of younger women in the household.

³The demographic and economic consequences of son preference have been also documented in high income countries (e.g [Dahl and Moretti \(2008\)](#); [Lundberg et al. \(2007\)](#)).

Finally, we contribute to the broader literature on the effects of son preference for women’s overall well-being. Specifically, our auxiliary analyses of MIL-DIL relations offer new evidence on the effect of having a firstborn son on women’s labor force participation. This finding is particularly important given the persistently low levels of female labor force participation in India and its implications for economic growth and gender equality (Fletcher et al., 2017; Jayachandran et al., 2021; Klasen and Pieters, 2015; Mehrotra and Parida, 2017). By linking son preference to both mental health and labor market outcomes, our study underscores the far-reaching consequences of gender-biased norms on women’s lives.

Taken together, our study documents the broader social and relational consequences of son preference, emphasizing its effects on women’s welfare, both within and across generations. Our findings contribute to a greater understanding of how restrictive social practices affect women’s psychological well-being, ultimately informing the design of policies and programs that jointly address gender equity and mental wellness. While targeted mental health services for women can serve to partially mitigate the psychological distress caused by gender-biased pressures, addressing son preference as a fundamental barrier to women’s well-being requires multifaceted policies that promote women’s economic empowerment, more broadly. This is not straightforward, as policies such as increasing women’s education or providing financial incentives to have daughters might have unintended consequences, while providing old age support or changing gender norms at school might be more effective in addressing the roots and consequences of son preference (Jayachandran, 2023).

2 Data

Our analysis is based on primary data that we collected from a sample of 1,572 pairs of MILs and DILs residing in the district of Jaunpur in Uttar Pradesh, India (Figure A.1). From November 2023 to May 2024, we conducted a listing exercise in 103 villages in the two blocks of Jaunpur district (Figure A.2) to identify households that, at the time of the listing: a) had a married female household member (the DIL) between the ages of 18 and 35 who had given birth to at least one child and who was neither pregnant nor sterilized at the time of the interview; and b) had a co-residing

MIL.^{4,5} From March to May 2024, we approached the eligible households to conduct separate in-person surveys with the eligible DIL and her co-residing MIL in their homes. Only one eligible DIL was surveyed per household; if multiple DILs from the same household were eligible, the youngest eligible DIL from the household who consented to the study was chosen to participate. Written or verbal consent was obtained from each respondent, and all respondents were surveyed in a private room or space in their homes by female enumerators.

Our MIL and DIL survey instruments follow a parallel structure. We collected data on household demographics and women’s socioeconomic backgrounds, birth histories, current and prior contraceptive use, marriage and sexual activity, fertility preferences, measures of autonomy and decision-making, social connections, utilization of health services, including family planning and reproductive health services, and broader measures of social and economic well-being. For this study, we leverage data from a module that measured respondents’ self-reported mental health status, which we describe in greater detail below.

2.1 Descriptive Statistics

[Table 1](#) describes the demographic and socioeconomic characteristics of the women (DILs and their co-residents MILs) who were surveyed; detailed definitions of variables are presented in [Appendix A](#). Our sample is predominantly Hindu (95 percent) and from a lower caste: 89 percent of women belong to a Scheduled caste (SC), a Scheduled tribe (ST), or an Other Backward Class (OBC). Almost half of surveyed households can be classified as relatively “poor” because they either fall below the poverty line or are in the bottom tercile of the wealth distribution in our sample.⁶ An average MIL in our sample is 56 years old, while the average age for DILs is 26 years. Unsurprisingly, DILs are more educated than their MILs, which in part is commensurate with broader trends in women’s education over time in India. Only one-fifth of MILs in our sample can read and write, whereas 37 percent of DILs have completed class 12, attaining at least 10 years of schooling. While

⁴We conducted two household listings, a primary listing from November 2023 to January 2024 to elicit the main sampling frame, and a second listing from April 2024 to May 2024 to secure the balance of households needed to achieve our desired sample size for the trial.

⁵This survey forms the baseline for an upcoming randomized controlled trial aimed at improving women’s mental health and family planning and reproductive health.

⁶We construct a household asset index as a proxy of wealth using principal component analysis over a range of household assets and land ownership, as described in greater detail in [Appendix A](#).

both groups of women lack freedom of movement, physical mobility constraints are more severe for DILs, who are also less likely to be working relative to their MILs.

In [Table A.2](#), we compare our DIL sample with a nationally representative sample of married women aged 18-35 who were surveyed in the 2019-21 India National Family Health Survey (NFHS) ([Government of India, 2022](#)). By the same token, [Table A.3](#) presents a comparison between our MIL sample with a nationally representative sample of married women aged 39-85 who were surveyed in the 2017-18 Longitudinal Aging Study in India (LASI) ([Government of India, 2020](#)).⁷ These tables show that both DILs and MILs in our sample are similar across a range of characteristics relative to women who were surveyed in the NFHS and LASI national samples, and to the subamples of NFHS and LASI women from UP and rural India. With this said, we note some differences. Specifically, DILs in our sample have more schooling and are less likely to have ever used a family planning method compared to women from the NFHS sample, while husbands of DILs in our sample also have more schooling and are more likely to have migrated outside the home for at least six months within the last year. Compared to women in the LASI sample, MILs in our sample were more likely to have visited a health facility in the last year and have fewer grandchildren. These differences are meaningful when inferring the external validity of our results.

2.2 Risk of Anxiety and Depression

We assess the mental health status of our sample women using the Patient Health Questionnaire-4 (PHQ-4), which is a four-item, validated questionnaire that is used to screen for anxiety and depression ([Kroenke et al., 2009](#)). The first two questions in the PHQ-4 are drawn from the Generalized Anxiety Disorder-7 scale (the GAD-7) which is commonly used in clinical practice to screen for anxiety disorders; together, these two items are also known as the GAD-2. Similarly, the last two questions in the PHQ-4 are drawn from PHQ-9, a multipurpose instrument for screening, diagnosing, monitoring, and measuring the severity of depression; together, these two items are also known as the PHQ-2. [Kroenke et al. \(2009\)](#) shows that combining the PHQ-2 and GAD-2 into a composite four-item scale yields an index that can simultaneously screen for anxiety and depression

⁷We selected married women between 39 and 85 years old in the LASI sample, as this is the age range of the MILs in our sample.

within the same tool.

As part of the PHQ-4 assessment tool, women were asked how frequently they had experienced the following symptoms during the past two weeks: a) feeling nervous, anxious, or on edge, b) unable to stop or control worrying, c) feeling down, depressed, or hopeless, and d) having little interest or pleasure in doing things. For each item, responses could range in severity from 0 ('Not at all') to 3 ('Nearly every day'); [Table A.1](#) presents the complete assessment tool. The total PHQ-4 score is calculated by adding the scores of each of the four items, and can range from 0 to 12, with higher scores indicating greater levels of anxiety or depression. We follow [Kroenke et al. \(2009\)](#) and classify a respondent to be at risk of anxiety if her scores for the first two items in the PHQ-4 tool sum to 3 or higher; similarly, respondents are classified to be at risk of depression if their scores for the last two items in the PHQ-4 tool sum to 3 or higher. Recent studies have used this tool to measure mental health in the Indian context ([Nichols et al., 2024](#)).

[Figure 1](#) presents the prevalence of anxiety and depression risk in our estimation sample. We find that MILs are at higher risk of anxiety or depression than their DILs; 31 percent of MILs and 18 percent of DILs can respectively be classified as being at risk of anxiety or depression based on their self-reported PHQ-4 scores. For MILs, the risk of anxiety (25 percent) is slightly higher than the risk of depression (21 percent), where as for the DILs, the risk of depression is slightly higher than the risk of anxiety. [Figure A.3](#) shows that these estimates are similar in the full sample.

According to the World Health Organization, an estimated 4 percent of the global population currently experience an anxiety disorder, with the prevalence being higher for girls and women.⁸ Similarly, depression is estimated to occur among 6 percent of adult women (relative to 4 percent for adult men).⁹ The potential prevalence of anxiety and depression among our sample women is substantially higher. Although some of this difference could be driven by different measurement approaches, the prevalence estimates in other studies from India are also much higher than global prevalence estimates. For instance, [Banerjee et al. \(2023\)](#) use data from the 2016-17 LASI and find that 27.5 percent of women aged 61-70 in India have symptoms that indicate a high risk of depression. Although the risk of depression among our MIL sample is lower (21 percent) in

⁸Source: <https://www.who.int/news-room/fact-sheets/detail/anxiety-disorders>.

⁹Source: <https://www.who.int/news-room/fact-sheets/detail/depression>.

comparison to [Banerjee et al. \(2023\)](#), we note that our MIL sample is also younger,¹⁰ and we employ a different set of measurement indicators to capture the risk of depression.¹¹ Our estimates for DILs, who are between 18 to 35 years old, are also slightly lower than what [Anukriti \(2024\)](#) estimates for 18-35-year-old married women with children in Tamil Nadu using the PHQ-4 (24 percent risk of anxiety or depression). Although our setting (rural Uttar Pradesh) is quite different from Tamil Nadu (a more developed state with more gender equality), a more rigorous comparison between the two states is beyond the scope of this study, we present these comparative estimates from the literature to highlight the scope of the problem in the Indian context.

3 Empirical Strategy

The objective of this study is to examine the extent to which child gender impacts women’s mental health and other related outcomes in a setting where son preference is prevalent. Here, we note that a simple comparison of outcomes between women who have a male child and women who have a female child (in the case of mothers) or grandchild (in the case of grandmothers) is unlikely to yield an unbiased estimate of the impact of child gender, particularly if families can resort to manipulating the number and sex composition of their (grand)children through prenatal sex-detection and subsequent sex-selective abortion ([Anukriti et al., 2021a](#); [Arnold et al., 2002](#)). Not controlling for unobservable factors that are correlated both with the likelihood of having a male (grand)child and are also correlated with our outcomes of interest would therefore lead to biased inference.¹²

¹⁰79 percent of the MILs in our sample are younger than 61.

¹¹Specifically, [Banerjee et al. \(2023\)](#) used a shortened version of the Center for Epidemiological Studies for Depression (CESD-10) score that was developed by [Andresen et al. \(1994\)](#) for estimating the risk of depression. The CESD-10 is comprised of seven negatively framed indicators (having a fear of something, having low energy, having trouble concentrating, feeling alone, feeling depressed, being bothered by things, and feeling that everything is an effort) and three positively framed indicators (feeling happy, hopeful, and satisfied). For each of these ten indicators, individuals were asked whether they experienced these symptoms either: 1) rarely or never (less than 1 day in the last week); 2) sometimes (1 to 2 days in the last week); 3) often (3 to 4 days in the last week); or 4) most or all of the time (5 to 7 days in the last week). For negatively framed indicators, responses of ‘rarely or never’ and ‘sometimes’ were assigned a score of 0, while responses of ‘often’ and ‘most or all of the time’ were assigned a score of 1. Scoring for the three positively framed indicators were scored in reverse. An individual’s overall score, calculated as the sum of the 10 individual indicator scores, could range from 0 to 10, and a score of 4 or higher was considered to be indicative of depression.

¹²For instance, richer women may be more likely to have a male birth since they can more easily afford sex-selection, and they may also be more likely to have better mental health outcomes ([Ridley et al., 2020](#)); as a result, not accounting for socioeconomic status would likely generate a positive bias in the estimated

To overcome this issue, we adopt an identification strategy that relies on the sex of the *firstborn* child and compare women whose firstborn (grand)child is male versus female. This estimation approach has been extensively used in the literature (Anukriti et al., 2021a,b) and rests on the assumption that the sex of the firstborn child is less likely to be selected and may therefore be as good as random (Bhalotra and Cochrane, 2010; Gellatly and Petrie, 2017; Milazzo, 2014). Prior empirical literature in this space has established that the proportion of females among firstborn children in India lies within the expected range (the “natural” sex ratio at birth) in the absence of sex selection over time, even in the presence of changes in the availability of prenatal sex-selection technology (Anukriti et al., 2021a; Bhalotra and Cochrane, 2010). Concordant with this evidence, Table 1 shows that there are no significant differences between firstborn boy and firstborn girl families in our study sample across a range of socioeconomic and demographic characteristics. Following McKenzie (2017), the normalized pairwise difference for each characteristic included in Table 1 for the combined sample of MILs and DILs is well below 0.25; moreover, an F-test of joint significance provides additional evidence of balance across covariates by the sex of the firstborn child. In addition, Table A.4 and Table A.5 provide additional evidence of balance across the same set of covariates in the MIL and DIL estimation samples, respectively; the standardized normal differences across all variables are less than 0.25, and evidence of balance is further confirmed by the corresponding F-tests of joint significance.

Given the strong desire to have at least one (grand)son in our context (Jayachandran, 2017), women whose firstborn (grand)child happens to be a boy face lower social and familial pressure to have additional (grand)children and undergo sex-selective abortions at higher parities. As a result, we may likely observe improvements in women’s mental health and other measures of well-being in firstborn-boy households. To test this hypothesis, we estimate the following regression for a woman i (separately for MILs and DILs):

$$Y_i = \alpha + \beta FirstbornBoy_i + \mathbf{X}_i\gamma + \varepsilon_i \tag{1}$$

For MIL specifications (i.e., when woman i is the MIL), the variable $FirstbornBoy_i$ is an

relationship between having a male birth and women’s mental well-being.

indicator variable that refers to the MIL’s firstborn grandchild from the co-resident DIL being male; by the same token, *FirstbornBoy_i* in DIL specifications refers to the DIL’s firstborn child being male. We control for a vector of household, MIL, and DIL characteristics that occasionally vary depending on the outcome variable being studied or whether a robustness check is being conducted. [Table A.8](#) presents the exact sets of controls that are used for different regression tables. For all specifications, we use heteroskedastic-robust standard errors for inference. As a robustness check, we include village fixed effects and cluster our standard errors at the village level ([Table A.13](#)). However, we note that our preferred specification does not include village fixed effects because the villages in our sample are quite proximal to each other and are similar in terms of the characteristics that are relevant for our analysis (see [Figure A.2](#)); for this reason, there is likely to be no bias or confounding due to unobserved heterogeneity in son preference at the village level.

In our MIL regressions, the core set of controls includes indicator variables for whether the MIL belongs to a Scheduled caste, belongs to an Other Backward Class, belongs to a household that can be classified as poor, is literate, is a widow, owns a personal cellphone, has at least one friend in Jaunpur, visited a health facility last year, and MIL age fixed effects. In addition, we control for three indices that capture the MIL’s attitudes towards domestic violence (as a proxy for her gender attitudes), her freedom of physical mobility, and her social desirability. Lastly, we also add a few controls that capture her DIL’s characteristics, including whether her DIL is her eldest son’s wife, has completed class 12, and has freedom of physical mobility. We also include DIL age fixed effects.¹³

Our DIL regressions include a similar set of controls with a few differences. First, in the DIL regressions, we control for her husband’s age, years of schooling, and migration status because these are relevant for outcomes such as the DIL’s family planning use and labor force participation.¹⁴ Second, when examining DIL outcomes, the variables capturing cellphone ownership, freedom of physical mobility, attitudes towards domestic violence, social desirability, visits to a health center, having a friend are defined for the DIL rather than the MIL. Lastly, we add a few controls that capture her MIL’s characteristics, including MIL age fixed effects and indicators for the MIL’s

¹³Appendix A describes the exact definition of all outcome and control variables included in the models.

¹⁴Although we do not include the MIL’s husband’s characteristics in her regressions, we show that their inclusion does not change any of our findings. Results are available upon request.

literacy and widowhood status. It is worth noting in [Table A.8](#) that in addition to the set of core controls for the analysis of MIL and DIL mental health and family planning related outcomes, we control for whether DIL and MIL were employed last year. Nevertheless, to avoid any potential endogeneity between past employment and current work-related outcomes, we drop these variables when the outcome of interest is related to time allocation and labor force participation.

Due to missing observations in some of our covariates, the estimation samples for the MIL and DIL regressions have fewer than 1,572 observations, with the estimation sample for the MIL and DIL regressions consisting of 1,356 MILs and 1,411 DILs, respectively. As [Table A.6](#) and [Table A.7](#) suggest, there are no significant differences between the full sample and the estimation sample, on average, across a wide range of observable socioeconomic and demographic characteristics. Similarly, [Figure A.3](#) indicates that the full samples and estimation samples are similar in terms of the prevalence of anxiety or depression for both MILs and DILs.

We note that when woman i is the MIL, the first grandchild refers to the first child of the youngest eligible co-resident DIL whom we surveyed. However, this grandchild of interest may not, in fact, be the MIL’s first grandchild among all her grandchildren. Similarly, the DIL in our sample may not be the wife of the MIL’s eldest son.¹⁵ *A priori*, it is unclear whether the MIL cares equally about the sex composition of the children of each of her sons and/or daughters, or whether she places more weight over her co-resident sons’ and/or eldest son’s children. To account for these potential differences in sex preferences across grandchildren, we always control for whether the child’s father (the DIL’s husband) is the MIL’s eldest son.¹⁶

4 Results

We first assess the extent to which a woman’s firstborn child’s sex influences her MIL’s and her own mental health, and whether this relationship weakens over time as she has additional children. We also explore potential pathways for these effects. Next, given that the MIL plays a key role in determining the DILs’ work ([Khanna and Pandey, 2024](#)) and family planning related outcomes

¹⁵In fact, the co-resident DIL whom we surveyed is the DIL who is married to the MIL’s eldest son for 56 percent of MILs.

¹⁶Moreover, the birth order of the child’s father does not necessarily invalidate our identification strategy as long as it is uncorrelated with the decision to practice sex-selection for his first birth.

(Anukriti et al., 2020), we explore whether the changes in MIL’s mental well-being when her DIL has a firstborn son are consistent with the changes in her attitudes towards the DIL’s likelihood of working outside the home and of using modern contraception, as well as with actual changes in DIL’s outcomes in these dimensions.

4.1 Effects on Mental Health

Table 2 presents the effects of the sex of the DIL’s firstborn child on the MIL’s mental health. In column 1, we observe that the MIL’s risk of anxiety or depression is 4.7 p.p. lower when her DIL has a firstborn son relative to having a firstborn daughter.¹⁷ This unconditional effect represents a 14 percent decline relative to the risk of anxiety or depression for MILs whose co-resident DILs have a firstborn daughter. The coefficient remains similar as we gradually include household, MIL, and DIL controls in columns 2-4. In our preferred specification in column 4, the magnitude of the DIL’s firstborn son effect on MIL’s mental health is 5.9 p.p. or 18 percent, relative to MILs whose first grandchild is a girl. Finally, column 5 shows that our results are also robust to the inclusion of village fixed effects.

The magnitude of the effect in Table 2 is noteworthy when compared to recent evidence on the effects of other programs or interventions on the mental health of older women in India. For instance, Keskar and Mookerjee (2024) find that a legal reform aimed at improving women’s inheritance rights in India led to a 10 percent decrease in the self-reported risk of depression after age 45 for women who were exposed to the reform before marriage. Furthermore, Guimbeau and Menon (2024) find that the National Social Assistance Program in India, which gives access to public pensions to the elderly below the poverty line, decreases the risk of depression among women by between 5 and 8 p.p., with particular stronger effects among widowed women. Nevertheless, Banerjee et al. (2022) find no significant effect on mental health of a government effort to deliver old age pensions in Tamil Nadu to eligible elderly who had not been receiving it.

On the contrary, Table A.9 shows that the DIL’s firstborn son does not affect her own risk of anxiety or depression. The coefficient of $FirstbornBoy_i$ is precisely estimated and the magnitude

¹⁷We define a woman’s risk of anxiety or depression as a dummy variable for whether she is at risk of either or both of these conditions according to the PHQ-4 scale as described in the Data Section.

is close to zero. There are a number of reasons why the effect of firstborn sex on the grandmother may be different from its effect on the mother. First, note that the self-reported risk of anxiety or depression among DILs (18 percent) is substantially lower than that among the MILs (31 percent) irrespective of the DIL’s fertility outcomes. This could be because elderly women may be less healthy, including in terms of mental health, than younger women due to physical decline. The MILs may also face a greater lack of social support; this is supported by our data which shows that only 51 percent of the MILs have at least one friend in Jaunpur as compared to 67 percent of the DILs in the estimation sample. This consideration is important, as social isolation is positively associated with depression among older adults [Banerjee et al. \(2023\)](#). Consequently, the MILs may be more vulnerable to the negative effects of son preference than the DILs.

Second, the DILs may have a weaker son preference to begin with than their MILs due to higher educational attainment and inter-generational differences in gender attitudes, for instance. While 37 percent of the DILs in our sample have completed class 12, 79 percent of the MILs are illiterate. In terms of son preference, the self-reported ideal proportion of sons among own children is 44 percent for the DILs which is much lower than what the MIL reports as the ideal proportion of sons among her own children (55 percent) and among her grandchildren (51 percent) in our estimation sample. This difference in gender attitudes is also reflected in the fact that MILs in our sample have more conservative attitudes towards domestic violence than the DILs. While 60 percent of MILs strongly agree that a woman should tolerate violence to keep her family together, only 46 percent of the DILs do so.

Third, DILs may have a longer time horizon over which they may be optimizing their fertility decisions than the MILs given that an average MIL is 30 years older than an average DIL. Even if the DIL’s firstborn child is a girl, she can reasonably expect to have a son in a few years given that her fertility is far from complete. Indeed, [Jayachandran \(2017, 2023\)](#) document that the desire to have *at least* one son is the main driver of the skewed sex ratios in India.¹⁸ However, if she does not manage to have her desired number of sons over time, we may also observe negative consequences

¹⁸Indeed, we have suggestive evidence that while in the DIL subsample with at least two children, having *a son* decreases the risk of depression or anxiety by 6.6 p.p, or 24 percent with respect to the control mean of the DIL sample with no sons, (p-value = 0.10), we do not observe any effect of having a son in the DIL subsample with one child. We take this result with caution, given the potential endogeneity between the firstborn’s sex and women’s subsequent desired and realized fertility. Results are available upon request.

for the DIL’s mental health. It is also possible that the negative consequences of having a firstborn girl might manifest later in life for DILs (even if they end up having sons in the future) because firstborn girl families have more girls, on average, than firstborn boy families, and therefore incur greater dowry expenses once the children are older (Anukriti et al., 2021b). Consistent with this hypothesis, Bhat et al. (2024) show that women aged 45 and older who have a firstborn daughter report lower life satisfaction and quality of life.¹⁹ In a similar vein, the negative influence on MIL’s mental health of her firstborn grandchild being a girl may also dissipate over time if her DIL’s subsequent children are male. Our data is consistent with this hypothesis. Table A.10 suggests that the risk of depression or anxiety due to firstborn grandchild being a girl declines over time and is weaker for grandmothers whose first grandchild was born within the last five years versus more than five years ago.

4.2 Heterogeneity Analyses

We examine heterogeneity in the impact of son preference and the realization of the co-residing DIL having a firstborn grandson on MIL mental health. In particular, we test whether MILs who have only one DIL - the co-residing DIL who was also surveyed - experience greater adverse mental health effects when their only DIL does not have a firstborn son. In contrast, MILs with multiple DILs may be less affected by whether or not their son preference is fulfilled by the co-residing DIL, as they can rely on other DILs to fulfill this preference. Columns 1 and 2 of Table A.12 support these hypotheses; the mental health impact of the co-residing DIL having a firstborn son is significantly larger among MILs with only one DIL, reducing the risk of anxiety or depression by 6.1 p.p. (a 19 percent decline). For MILs with multiple DILs, however, the corresponding reduction in adverse mental health outcomes is smaller (1.0 percentage points) and statistically insignificant. Although these coefficients are not significantly different from each other, their difference in magnitude suggests a stronger son preference, and thus a larger effect on mental health, among MILs who have only one DIL at the time of the survey.

In a similar vein, we also explore the extent to which the impact of a firstborn son on MIL mental health outcomes varies by the relative rank of the co-residing DIL, and specifically whether the co-

¹⁹They do not examine the effects on the mother when she is younger.

residing DIL is married to the MIL’s eldest son. As columns 3 and 4 of [Table A.12](#) indicate, the effect of the co-residing DIL having a firstborn son on the MIL’s mental health is significantly larger when the co-residing DIL is also the most senior, i.e., married to the MIL’s eldest son. In contrast, the effect of having a firstborn son on the MIL’s mental health is smaller and not significant when the co-residing DIL is not married to the eldest son, although this coefficient is not statistically significantly different from the corresponding estimate in column 3. Taken together, these findings suggest that the expectations for a DIL to produce a son, and the resulting impacts of a firstborn son on household well-being, vary based on the DIL’s (and, by extension, her son’s) hierarchical status in the household, reflecting predominant Indian norms surrounding primogeniture and the expectation for the eldest male heir to inherit the family land and estate ([Bhalotra et al., 2019](#); [Gupta, 2011, 2014](#)).

4.3 Impacts on Mother-in-Law’s Time Use

Having a firstborn son can also induce changes in women’s time allocation, particularly the time taken to spend on child-rearing, for the MIL and DIL, and especially for women with stronger latent son preference. Column 1 of [Table 3](#) shows that MILs who have a firstborn grandson are also significantly more likely by 4.6 p.p., or 6 percent with respect to MILs with firstborn granddaughters to be engaged in discussions about grandchildren with their co-residents DILs. Additionally, they spend 0.15 more hours per day on childcare relative to MILs whose firstborn grandchild is a girl, representing an 8 percent increase (column 2). The effects in columns 1 and 2 could be driven by her strong (grand)son preference which manifests as gender discrimination in childcare provided by grandmothers.

Column 3 of [Table 3](#) suggests that the MIL spends less time on activities outside the home (such as visiting friends and relatives) in order to allocate more time towards childcare although the coefficient is insignificant at conventional levels (p-value: 0.285). To the extent that a decline in social activities (resulting from a firstborn grandson) has a negative impact on MIL’s mental well-being, the overall positive effect that we observe in [Table 2](#) can be considered a net positive effect on the grandmother from multiple channels.

Another way to interpret the evidence presented in [Table 2](#) and [Table 3](#) is in terms of the litera-

ture on the effects of caring for grandchildren on the mental health of grandparents. Prior evidence on this relationship is inconclusive and depends on the living arrangements between grandparents, parents, and children (Barman and Sahoo, 2024; Leimer and van Ewijk, 2022). Instead of MIL’s mental health and time allocation being jointly determined by the sex of the first grandchild, it is plausible that spending more time on caring for a grandson is a channel for the improvement in MIL’s mental health;²⁰ however, our data and empirical strategy do not allow us to distinguish between these interpretations.

4.4 Implications for Daughter-in-Law’s Labor Market Outcomes

The sex of the firstborn child may also have implications for the mother’s, i.e., the DIL’s labor force participation (LFP) through multiple channels. First, mothers of firstborn sons may have more time available to participate in the labor force relative to mothers of firstborn daughters. This could be driven by co-resident MILs taking over some childcare responsibilities, as we observe in Table 3, which is consistent with the evidence presented in Khanna and Pandey (2024). Furthermore, women who have firstborn sons tend to have fewer children, on average, than women whose first child is a girl (Anukriti et al., 2021a), and therefore may need to spend less time on childcare. The mental health improvements that the MIL experiences from having a firstborn grandson could also lower the elderly care burden on the DIL, further freeing up her time for the labor market.²¹

Second, DILs who have a firstborn son may face less pressure from their MILs to have additional children soon relative to DILs who have a firstborn daughter. DILs of a firstborn son may therefore benefit from their MILs becoming less restrictive, or more approving, of them working outside the home rather than focusing on childbearing (Anukriti et al., 2020). Moreover, DILs with young children may disproportionately benefit from having a firstborn son because MIL approval of DILs working outside the home is especially low when the DIL has younger children (42 percent approval) relative to when the DIL’s children are older (85 percent approval), making the former

²⁰In fact, this could be the reason why we observe a larger effect on MIL’s mental health in Table A.10 from younger grandsons.

²¹Although our surveys lack data on whether DILs with firstborn sons reduce their time spent on elderly care, we have suggestive evidence that these DILs reduce their time caring for other household members besides their children. Results are available upon request.

more “treatable”.²² On the other hand, societies where son preference is strong may also have other conservative gender norms that could prevent women from working outside the home, and the enforcement of such norms might be stronger in households with co-resident MILs (Anukriti et al., 2020). Taken together, the overall effects of having a firstborn boy on the MIL’s approval of her DIL working outside the home and on her DIL’s LFP are *a priori* ambiguous.

We empirically test this second pathway with our data. In Table 4, we show that relative to DILs with a firstborn daughter, DILs with a firstborn son experience a significant 14 percent improvement in the MIL approval of the DIL working outside the home when her children are young (column 2). We do not observe similar effects on the MIL’s approval of her DIL working outside the home before having children (column 1) or when her children are older (column 3). These findings are indicative of the pressures and expectations faced by younger women of reproductive age to give birth to sons and to take care of younger children, which in turn may prevent them from participating in the labor market.

Consistent with this finding, in Panel A of Table 5, we show that having a firstborn son also increases the LFP of young DILs, i.e., those who are younger than 25. Moreover, for this subgroup, we observe increases in the MIL’s hours spent on childcare and her approval of women working outside the home, which are in line with our previous findings. At the same time, we observe that these effects are smaller in magnitude and statistically insignificant for older DILs (Panels B and C). DILs under age 25 experience a 9.7 p.p. or a 31 percent increase in LFP if their first child is a boy relative to if their first child is a girl. Given that the improvements in LFP only manifest for a subset of DILs, it may not be surprising that we do not find any significant increase in LFP for an average DIL from having a firstborn son, as is shown in column 4 of Table 4. In contrast, we do not observe any adjustment in the MIL’s LFP status in response to the sex of the first grandchild (see Table A.11).

Although the evidence on the effects of fertility on female LFP is inconclusive and context-driven (Heath et al., 2024), the positive impact of the firstborn son on the DIL’s LFP is meaningful

²²This underlying difference in MIL approval by the relative age of the DIL’s children potentially reflects the MIL’s beliefs about childcare being the DIL’s primary responsibility when her children are young. Work outside the home would therefore more likely interfere with the DIL’s ability to effectively carry out these primary childcare responsibilities.

considering the low levels of female LFP in India, according to 2023 Periodic Labor Force Surveys (PLFS), the LFP among young women ages 15 to 30 years old is 24 percent, and the substantial social barriers for women’s economic participation such as the burden of unpaid housework and childcare, intra-household constraints, societal disapproval of married women working outside the home, and travel and safety concerns, among other factors (Fletcher et al., 2017; Heath et al., 2024; Jalota and Ho, 2024; Jayachandran et al., 2021).

4.5 Implications for DIL’s Family Planning Outcomes

Prior literature has shown that son preference significantly influences fertility and family planning outcomes (Anukriti, 2018; Jayachandran, 2017). As mentioned earlier, women whose first child is a girl have more children and daughters (in pursuit of a son) due to son-biased stopping rules. The desire to have a son as soon as possible also decreases birth spacing and contraceptive use (Jayachandran and Kuziemko, 2011). Once sex-selection technology becomes available, firstborn girls families are also more likely to selectively abort female fetuses than firstborn boy families (Anukriti et al., 2021a). Consistent with this literature, in column 1 of Table 6, we find that DILs whose first child is a son are 5.2 p.p. or 22 percent more likely to report using a modern contraceptive method at the time of the survey relative to DILs with a firstborn girl. This increase is explained by women who switch from traditional to modern contraceptive methods, as we do not find statistically significant effects of firstborn sex on the DIL’s likelihood of using any contraceptive method as shown in column 2 of Table 6.

To the extent that MILs play an influential role in their DILs’ fertility-related decision-making (Anukriti et al., 2024, 2022, 2020), we utilize our survey data to examine the role of the MIL in driving the relationship between sex of the DIL’s firstborn child and her contraceptive use. Column 3 in Table 6 shows that the DIL’s firstborn son increases the MIL’s likelihood of discussing family planning with her co-resident DIL by 6.8 p.p. or 15 percent with respect to the control mean. Moreover, DIL’s firstborn son increases the MIL’s approval of her co-resident DIL’s use of family planning by 5.7 p.p. or by 9 percent relative to the MILs whose DILs have firstborn girls, as shown in column 4 of Table 6. Interestingly, columns (5) and (6) of the same table indicate that the change in MIL approval is primarily driven by an increase in her approval of her DIL using

methods for limiting births rather than for spacing future births; specifically, having a firstborn grandson increases the MIL’s approval for her DIL’s use of contraceptive methods for limiting births by 7.6 p.p., a 11 percent relative increase with respect to the control mean. These findings are consistent with the predominant norms around sex-based stopping rules and women’s demand for contraceptive use following the birth of a son, coupled with the related heavy reliance on female sterilization relative to other family planning methods in this context (Basu and De Jong, 2010; Oliveira et al., 2014; Government of India, 2022). Our results, which leverage both the direct elicitation of a MIL’s approval of her DIL’s family planning use and fertility combined with direct reports from the DIL herself, are consistent with those in Anukriti et al. (2022), where only the DIL was asked about her beliefs about her MIL’s preferences.

4.6 Robustness Checks

Table A.13 presents a series of robustness checks that test alternative modes of inference for our main outcomes. Panel A and B present these results for MIL and DIL outcomes, respectively. Our main findings are robust to clustering the standard errors at the village level. In addition, we conduct a multiple hypothesis test (MHT) by presenting Anderson (2008) sharpened q-values, which aim to reduce the risk of rejecting a true null hypothesis while considering multiple outcomes, accounting for the false discovery rate (FDR) (McKenzie, 2021). In doing so, we note that our p-values for MIL mental health, MIL hours spent on childcare, the MIL’s approval of the DIL working outside the home when the children are young, and the MIL’s approval of the DIL using FP are larger than when we conduct standard error corrections, but these coefficient estimates are still significant at the 10 percent level.

5 Conclusions

In this study, we document the multiple impacts of son preference on women’s mental health and intergenerational household dynamics in rural India. We show that the birth of a firstborn grandson significantly improves the mental health of MILs. In additional analyses, we show that the impacts of a firstborn grandson are particularly significant for those MILs who have only one DIL and whose co-residing DIL is also married to the MIL’s eldest son. Interestingly, these benefits do not extend

to the mental health of DILs, suggesting that son preference may disproportionately shape older women’s psychological well-being. Our exploration of potential pathways reveals that the birth of a firstborn grandson improves MIL-DIL relationships, particularly in the domains of childcare responsibilities, approval of the DIL’s working, and discussions over family planning and fertility. These shifts in household dynamics also translate into measurable behavioral changes among DILs, including an increase in the use of modern contraceptives and LFP. Together, our results underscore the significant role of intergenerational relationships in shaping women’s outcomes.

Although our study is based in Uttar Pradesh, India, its findings might be relevant to other settings in India and, more broadly, to other contexts where gender social norms are restrictive and where women are compelled to navigate their role and position within extended household settings (Ghosh and Thornton, 2024). Nevertheless, when comparing the mental health effects of son preference in our study with other policies that could potentially impact the risk of anxiety and depression in women (Guimbeau and Menon, 2024; Keskar and Mookerjee, 2024), we note the differences between our sample of MILs, who were exclusively recruited from extended households, with older women from more nationally representative samples in India such as LASI, or other surveys in other Indian states where the older population living alone is representative; in these settings, social isolation may become particularly relevant for mental health (Banerjee et al., 2023).

The findings have important implications for policy, programs, and practice aimed at addressing entrenched gender norms and promoting women’s health and agency. First, the intergenerational effects that we highlight reinforce the need for interventions that explicitly engage older women, such as mothers-in-law, who often act as key gatekeepers of social and familial norms (Anukriti et al., 2022, 2020; Gupta et al., 2015, 2021; Khanna and Pandey, 2024). Programs that foster positive relationships and effective communication between MILs and DILs, such as joint counseling sessions or community-based initiatives, could facilitate shifts in attitudes toward gender equity while also promoting women’s reproductive decision-making. Second, policies addressing son preference, ranging from economic security in old age to shifts in gender attitudes (Jayachandran, 2023), should also prioritize mental health as a critical dimension of well-being by incorporating psychosocial support for women across generations. Finally, programs that seek to strengthen gender-equitable norms can strategically leverage potential moments of normative shifts, such as the birth of a son, as a

means to amplify efforts that advance women's empowerment, with the goal of fostering inclusive and equitable social change.

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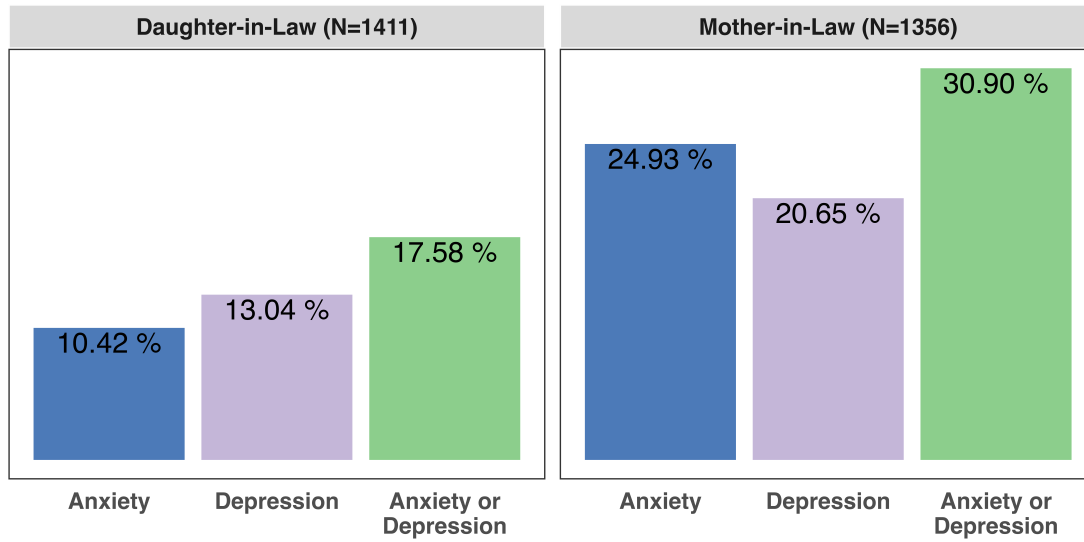
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Figures

Figure 1: Prevalence of anxiety and depression



Notes: The figure presents the prevalence of anxiety and depression in the estimation sample (N = 1411 for DILs and N = 1356 for MILs) based on the PHQ-4 assessment tool. The PHQ-4 captures respondents' risk of adverse mental health outcomes in the past two weeks from the time of the survey. Additional details about how anxiety and depression are defined are provided in [Appendix A](#).

Tables

Table 1: Balance table, combined MIL and DIL samples

	All sample		DIL's first child is a girl		DIL's first child is a boy		Normalized difference
	N	Mean	N	Mean	N	Mean	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Caste: SC-ST	1567	0.329	784	0.301	783	0.358	-0.121
Caste: OBC	1567	0.563	784	0.594	783	0.531	0.127
Household is poor	1564	0.471	783	0.458	781	0.483	-0.049
MIL's age (years)	1572	56.034	785	56.208	787	55.861	0.049
MIL is literate	1572	0.209	785	0.203	787	0.215	-0.030
MIL is widowed	1572	0.196	785	0.200	787	0.192	0.020
MIL owns a cellphone	1567	0.334	782	0.349	785	0.320	0.062
MIL's mobility index	1552	1.693	774	1.705	778	1.680	0.014
MIL has at least one friend in Jaunpur	1567	0.497	783	0.490	784	0.504	-0.027
MIL's domestic violence attitudes index	1548	1.093	774	1.071	774	1.115	-0.026
MIL has visited a health facility last year	1563	0.743	781	0.750	782	0.737	0.031
MIL's social desirability index	1518	8.111	753	8.239	765	7.984	0.139
MIL worked last year	1567	0.407	782	0.421	785	0.392	0.058
DIL is married to MIL's eldest son	1568	0.561	784	0.546	784	0.575	-0.059
DIL's age (years)	1572	26.293	785	26.425	787	26.160	0.091
DIL has completed class 12	1572	0.373	785	0.362	787	0.384	-0.045
DIL owns a cellphone	1572	0.837	785	0.834	787	0.839	-0.011
DIL's mobility index	1515	0.193	761	0.197	754	0.188	0.012
DIL has at least one friend in Jaunpur	1572	0.677	785	0.675	787	0.680	-0.010
DIL's domestic violence attitudes index	1531	0.829	764	0.797	767	0.860	-0.045
DIL has visited a health facility last year	1571	0.729	784	0.764	787	0.694	0.158
DIL's social desirability index	1530	8.178	763	8.228	767	8.128	0.059
DIL worked last year	1571	0.181	785	0.195	786	0.168	0.070
DIL's husband's age (years)	1572	30.107	785	30.205	787	30.009	0.053
DIL's husband's years of schooling	1571	11.248	785	11.175	786	11.322	-0.044
DIL's husband was a migrant for 6+ months	1572	0.452	785	0.465	787	0.440	0.051
Observations for F-test					1359		
F-test of joint significance: p-value					0.118		

Notes: This table presents summary statistics and tests for balance by the sex of the DIL's firstborn child in the combined MIL and DIL full samples. MIL and DIL denote mother-in-law and daughter-in-law, respectively. Column 7 presents normalized differences in variables between DILs whose first child is a girl versus a boy, which are calculated as the absolute differences between the variable means of the two groups, divided by their joint standard deviation. A variable with a normalized difference below 0.25 is considered balanced (McKenzie, 2017). The F-statistic, which is presented at the bottom of the table tests for the joint significance of all covariates for the full sample, is calculated by regressing the firstborn boy dummy on all covariates and then testing whether all coefficients are jointly equal to zero. Variable definitions are provided in Appendix A.

Table 2: MIL mental health outcomes as a function of the sex of the DIL’s firstborn child

	MIL has anxiety or depression				
	(1)	(2)	(3)	(4)	(5)
DIL’s first child is a boy	-0.047*	-0.051**	-0.063**	-0.059**	-0.059**
	(0.025)	(0.025)	(0.025)	(0.025)	(0.026)
Household controls		x	x	x	x
MIL controls			x	x	x
DIL controls				x	x
Village fixed effects					x
Observations	1356	1356	1356	1356	1356
Outcome mean if DIL’s first child is a girl	0.332	0.332	0.332	0.332	0.332

Notes: Each column represents a separate regression. MIL and DIL denote mother-in-law and daughter-in-law, respectively. Household controls include indicators for belonging to a scheduled caste or tribe, belonging to an other backward class, and whether the household is poor. MIL controls include MIL age fixed effects, indicator variables for whether she is literate, a widow, owns a cellphone, worked last year, has a friend in Jaunpur, visited a health facility during the last year, her mobility index, her domestic violence attitudes index, and her social desirability index. DIL controls include DIL age fixed effects, indicator variables for whether she is married to the MIL’s oldest son, has completed class 12, worked last year, and her mobility index. Robust standard errors are presented in parentheses. The list of controls used in the regressions is presented in [Table A.8](#). Variable definitions are available in [Appendix A](#). *p < 0.1, **p < 0.05, ***p < 0.01.

Table 3: MIL’s involvement in childcare as a function of the sex of the DIL’s firstborn child

	MIL-DIL discussion about grandchild	Hours spent on childcare by MIL	Hours spent outside the home by MIL
	(1)	(2)	(3)
DIL’s first child is a boy	0.046** (0.022)	0.149** (0.074)	-0.118 (0.099)
Controls	x	x	x
Observations	1356	1356	1356
Outcome mean if DIL’s first child is a girl	0.787	1.935	1.116

Notes: Each column represents a separate regression. MIL and DIL denote mother-in-law and daughter-in-law, respectively. In each column, we include the same set of controls as in column 4 of [Table 2](#) except for MIL and DIL employment status. These controls include: household controls (indicators for belonging to a scheduled caste or tribe, belonging to an other backward class, and whether the household is poor), MIL controls (MIL age fixed effects, indicator variables for whether she is literate, a widow, owns a cellphone, has a friend in Jaunpur, and has visited a health facility during the last year, her mobility index, her domestic violence attitudes index, and her social desirability index), and DIL controls (DIL age fixed effects, indicator variables for whether she is married to the MIL’s oldest son, has completed class 12, and her mobility index). Robust standard errors are presented in parentheses. The list of controls used in the regressions is presented in [Table A.8](#). Variable definitions are available in [Appendix A](#). *p < 0.1, **p < 0.05, ***p < 0.01.

Table 4: DIL’s labor market-related outcomes as a function of the sex of her firstborn child

	MIL approves of DIL working outside the home			DIL is in the labor force
	Before having kids	When kids are young	When kids are older	
	(1)	(2)	(3)	(4)
DIL’s first child is a boy	0.028 (0.027)	0.055** (0.027)	0.020 (0.019)	-0.010 (0.026)
Controls	x	x	x	x
Observations	1356	1356	1356	1411
Outcome mean if DIL’s first child is a girl	0.600	0.388	0.846	0.430

Notes: Each column represents a separate regression. MIL and DIL denote mother-in-law and daughter-in-law, respectively. In columns 1-3, the outcomes are reported by the MIL, and we include the same set of controls for these regressions as in column 4 of [Table 2](#) except for MIL and DIL employment status. These controls include: household controls (indicators for belonging to a scheduled caste or tribe, belonging to an other backward class, and whether the household is poor), MIL controls (MIL age fixed effects, indicator variables for whether she is literate, a widow, owns a cellphone, has a friend in Jaunpur, and has visited a health facility during the last year, her mobility index, her domestic violence attitudes index, and her social desirability index), and DIL controls (DIL age fixed effects, indicator variables for whether she is married to the MIL’s oldest son, has completed class 12, and her mobility index). In column 4, the outcome comes from the DIL survey and we include the following set of controls: household controls (indicators for belonging to a scheduled caste or tribe, belonging to an other backward class, and whether the household is poor), DIL controls (DIL age fixed effects, indicator variables for whether she is married to the MIL’s oldest son, has completed class 12, owns a cellphone, has a friend in Jaunpur, has visited a health facility during the last year, her mobility index, her domestic violence attitudes index, and her social desirability index), MIL controls (MIL age fixed effects, indicator variables for whether she is literate and is a widow), and DIL’s husband controls (husband’s age, years of schooling, and whether he was a migrant for more than 6 months). Robust standard errors are presented in parentheses. The list of controls used in the regressions is presented in [Table A.8](#). Variable definitions are available in [Appendix A](#). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Heterogeneity in the DIL's labor market-related outcomes by the DIL's age

	Hours spent on childcare by MIL (1)	MIL approves of DIL working outside the home when her kids are young (2)	DIL is in the labor force (3)
Panel A: DIL's age (years) < 25			
DIL's first child is a boy	0.252* (0.141)	0.133*** (0.050)	0.097** (0.049)
Controls	x	x	x
Observations	406	406	415
Outcome mean if DIL's first child is a girl	2.122	0.371	0.308
Panel B: 25 ≤ DIL's age (years) ≤ 27			
DIL's first child is a boy	0.113 (0.118)	0.041 (0.046)	-0.072 (0.046)
Controls	x	x	x
Observations	487	487	494
Outcome mean if DIL's first child is a girl	1.967	0.354	0.492
Panel C: DIL's age (years) > 27			
DIL's first child is a boy	0.141 (0.129)	0.040 (0.049)	-0.017 (0.047)
Controls	x	x	x
Observations	463	463	502
Outcome mean if DIL's first child is a girl	1.750	0.438	0.464

Notes: Each column represents a separate regression. MIL and DIL denote mother-in-law and daughter-in-law, respectively. In columns 1-2, the outcomes are reported by the MIL, while the outcome in column 3 is reported by the DIL. The set of controls that are used in column 1 are the same as those that are included in column 2 of [Table 3](#), except for DIL age fixed effects. The set of controls that are used in columns 2 and 3 are the same as those that are included in columns 2 and 4 of [Table 4](#), respectively, except for DIL age fixed effects. Robust standard errors are presented in parentheses. The list of controls used in the regressions is presented in [Table A.8](#). Variable definitions are available in [Appendix A](#). *p < 0.1, **p < 0.05, ***p < 0.01.

Table 6: DIL's family planning outcomes as a function of the sex of her firstborn child

	DIL has used modern FP (1)	DIL has used any FP method (2)	MIL-DIL discussion about FP (3)	MIL approves of DIL's FP use (4)	MIL approves of FP for limiting births (5)	MIL approves of FP for spacing births (6)
DIL's first child is a boy	0.052** (0.024)	0.026 (0.025)	0.068** (0.027)	0.057** (0.026)	0.076*** (0.025)	0.014 (0.021)
Controls	x	x	x	x	x	x
Observations	1411	1411	1356	1356	1356	1356
Outcome mean if DIL's first child is a girl	0.236	0.687	0.462	0.625	0.687	0.809

Notes: Each column represents a separate regression. MIL and DIL denote mother-in-law and daughter-in-law, respectively, and FP denotes family planning. In columns 1-2, the outcomes are reported by the DIL, while the outcomes in columns 3-6 are reported by the MIL. In addition to the set of controls that are included in column 4 of [Table 4](#), we include the MIL's and DIL's employment status in the last year as controls for the regressions in columns 1-2. The set of controls in columns 3-6 are the same as those included in column 2 of [Table 2](#). Robust standard errors are presented in parentheses. The list of controls used in the regressions is presented in [Table A.8](#). Variable definitions are available in [Appendix A](#). *p < 0.1, **p < 0.05, ***p < 0.01.

ONLINE APPENDIX

Son Preference and Women’s Mental Health in India

S Anukriti, Catalina Herrera-Almanza, Shahadat Hossain, and Mahesh Karra

A Variable Definitions

Outcomes:

1. MIL has anxiety or depression: Indicator variable that takes 1 if a mother-in-law (MIL) is either ‘Depressed’ or ‘Anxious’ based on the PHQ-4 brief questionnaire (see [Table A.1](#)), and 0 otherwise. In the interview, women were asked about their experience over the past two weeks with issues such as a. feeling nervous, b. unable to control worrying, c. having little interest in activities, and d. feeling down and hopeless. Each question is then scored on a scale of 0 to 3, where 0 means ‘Not at all’ and 3 means ‘Nearly every day’. The PHQ-4 score for mental health ranges from 0 to 12, with higher scores indicating greater levels of anxiety or depression: 0-2 indicates minimal symptoms, 3-5 mild symptoms, 6-8 moderate symptoms, and 9-12 severe symptoms. If the combined score of ‘feeling nervous’ and ‘unable to control worrying’ is above 3, we classify the woman as ‘Anxious’. Similarly, for questions ‘having little interest in activities’ and ‘feeling down and hopeless’, if the combined score is over 3, we classify the women as ‘Depressed’.
2. DIL has anxiety or depression: Indicator variable that takes 1 if a daughter-in-law (DIL) is either ‘Depressed’ or ‘Anxious’ based on the PHQ-4 brief questionnaire, and 0 otherwise. The variable construction follows the same steps as ‘MIL has anxiety or depression’.
3. MIL-DIL discussion about grandchildren: MIL-reported indicator variable that takes 1 if the MIL discusses future plans for the grandchildren with her DIL daily or often, and 0 otherwise.
4. Hours spent on childcare by MIL: MIL-reported continuous variable capturing the total hours she spends per day on taking care of the children.
5. Hours spent outside the home by MIL: MIL-reported continuous variable capturing the total hours she spends outside of home per day for outside household chores, visiting friends and relatives, and community and volunteering services.
6. MIL approves of DIL working outside the home: MIL-reported indicator variable that takes 1 if she approves any of her DILs working outside, and 0 otherwise. This response is recorded in three following scenarios: (a) before the daughters-in-law having a child, (b) when the children of daughters-in-law are young, and (c) when when the children of daughters-in-law are old enough.

7. DIL is in the labor force: DIL-reported indicator variable that takes 1 if she was employed or actively looking for work in the last year, and 0 otherwise.
8. MIL is in the labor force: MIL-reported indicator variable that takes 1 if she was employed or actively looking for work in the last year, and 0 otherwise.
9. MIL-DIL discussion about FP: MIL reported indicator variable that takes 1 if she discussed family planning or birth spacing with her DIL sometimes, often, or always in the last year, and 0 otherwise.
10. MIL approves of FP for limiting births: MIL-reported indicator variable that takes 1 when she approves the DIL using family planning for limiting pregnancy, and 0 when she is indifferent or does not approve DIL's FP use for limiting.
11. MIL approves of FP for spacing births: MIL-reported indicator variable that takes 1 when she approves the DIL using family planning for spacing pregnancy, and 0 when she indifferent or does not approve DIL's FP use for spacing.
12. MIL approves of DIL's FP use: MIL-reported indicator variable that takes 1 when she approves of the DIL's use of FP for limiting and spacing births, and 0 otherwise.
13. DIL has used modern FP: DIL-reported indicator variable that takes 1 if the she is currently using or ever used any modern method of family planning to avoid or delay getting pregnant, and 0 otherwise. Modern family planning method includes 'IUD/PPIUD/Multiload for 5 years', 'Injectables', 'Implants', 'Pill', 'Condom', 'Female Condom', and 'Emergency Contraception'.
14. DIL has used any FP method: DIL-reported indicator variable that takes 1 if the she is currently using or ever used any method of family planning to avoid or delay getting pregnant, and 0 otherwise.

Covariates:

1. DIL's first child is a boy: Indicator variable that takes 1 if the DIL's first born child is a boy, and 0 otherwise.
2. Caste: SC-ST: Indicator variable that equals 1 if the MIL/DIL belongs to a Scheduled Caste or a Scheduled Tribe, and 0 otherwise.
3. Caste: OBC: Indicator variable that equals 1 if the MIL/DIL belongs to an Other Backward Class, and 0 otherwise.
4. Household is poor: Indicator variable that equals 1 if, the MIL/DIL's household has a poverty line card (i.e., BPL Card, AAY Card, Red Ration Card, and White Ration Card) or belong to the bottom terciles of the asset index distribution, and 0 otherwise. The asset index is constructed using principal component analysis and the following household variables: indicators for major sources of drinking water (piped, tap water, well), access to toilet facilities (flush, pit, twin-pit), the materials used for the floor and roof of the house, types of cooking fuel used (LPG, dung, and others), whether the household has a separate kitchen, ownership of livestock (cow, goat, chicken), the number of rooms used for sleeping in the household, and land ownership (in acres).

5. MIL's age: MIL-reported variable of her complete age in years on the date of interview, which is included in our analyses as age fixed effects.
6. MIL is literate: MIL-reported indicator variable that takes 1 if the MIL has had at least one year of schooling, and 0 otherwise.
7. MIL is widowed: Indicator variable that takes 1 if the MIL is currently widowed, and 0 otherwise.
8. MIL owns a cellphone: Indicator variable that takes 1 if the MIL owns a cellphone, and 0 otherwise.
9. MIL's mobility index: Continuous variable that ranges between 0 and 6 and is calculated as the sum of six MIL-reported indicator variables for whether she is allowed to visit/go alone the following places: 1) homes of relatives or friends, 2) health facilities, 3) grocery stores, 4) short distances by bus or train, 5) markets, and 6) outside their villages or communities.
10. MIL has at least one friend in Jaunpur: Indicator variable that takes 1 if the MIL has at least one friend outside the household in Jaunpur with whom she discusses personal affairs or private concerns, such as children's illness, schooling, health, work, financial support etc, and 0 otherwise.
11. MIL's domestic violence attitudes index: Continuous variable that ranges between 0 and 7 and is calculated as the sum of seven MIL-reported indicator variables for whether she thinks it is always or sometimes justified for a husband hitting or beating his wife in the following situations: 1) goes out without telling him, 2) she neglects the house or the children, 3) she argues with him, 4) she refuses to have sex with him, 5) she doesn't cook food properly, 6) husband suspects her of being unfaithful, and 7) she shows disrespect for in-laws.
12. MIL has visited a health facility last year: MIL-reported indicator variable that takes 1 if she visited any health clinic or facility last year to receive care for herself, and 0 otherwise.
13. MIL's social desirability index: Continuous variable ranged between 0 to 13 and following [Crowne and Marlowe \(1960\)](#), is calculated as the sum of 13 indicator variables asked to the MIL for the following questions: a) it is sometimes hard for her to go on with her work if she is not encouraged, b) sometimes feel resentful when she don't get her way, c) on a few occasions, she has given up doing something because she thought too little of her ability, d) there have been times when she felt like rebelling against people in authority even though she knew they were right, e) no matter who she is talking to, she is always a good listener, f) there have been occasions when she took advantage of someone, g) she is always willing to admit it when she make a mistake, h) she sometimes try to get even rather than forgive and forget, i) she is always courteous, even to people who are disagreeable, j) she has never been upset when people expressed ideas very different than her own, k) there have been times when she was quite jealous of the good fortune of others, l) she was sometimes irritated by people who ask favors of her, and m) she has deliberately said something that hurt someone's feelings.
14. MIL is employed: Indicator variable that takes 1 if the MIL reports having worked anytime in the last year, and 0 otherwise.
15. DIL is married to MIL's eldest son: Indicator variable that takes 1 if the DIL is married to the eldest son of the MIL, and 0 otherwise.

16. DIL's age: DIL-reported variable of her complete age in years on the date of interview, which is included in our analyses as age fixed effects.
17. DIL has completed class 12: Indicator variable that takes 1 if the DIL has completed at least 12 years of schooling, and 0 otherwise.
18. DIL owns a cellphone: Indicator variable that takes 1 if the DIL owns a cellphone, and 0 otherwise.
19. DIL has at least one friend in Jaunpur: Indicator variable that takes 1 if the DIL has at least one friend outside the household in Jaunpur with whom she discusses personal affairs or private concerns, such as children's illness, schooling, your health, work, financial support etc, and 0 otherwise.
20. DIL has visited a health facility last year: DIL-reported indicator variable that takes 1 if the she visited any health clinic or facility last year to receive care for herself, and 0 otherwise.
21. DIL's mobility index: Continuous variable ranged between 0 to 6 and calculated as the sum of six DIL-reported indicator variables for whether the she is allowed to visit/go alone the following places: 1) homes of relatives or friends, 2) health facilities, 3) grocery stores, 4) short distances by bus or train, 5) markets, and 6) outside their villages or communities.
22. DIL's domestic violence attitudes index: Continuous variable ranged between 0 to 7 and calculated as the sum of seven DIL-reported indicator variables for whether the she thinks it is always or sometimes justified for a husband in hitting or beating his wife in the following situations: 1) goes out without telling him, 2) she neglects the house or the children, 3) she argues with him, 4) she refuses to have sex with him, 5) she doesn't cook food properly, 6) husband suspects her of being unfaithful, and 7) she shows disrespect for in-laws.
23. DIL's social desirability index: Continuous variable ranged between 0 to 13 and following [Crowne and Marlowe \(1960\)](#), calculated as the sum of 13 indicator variables asked to the DIL. The questions parallel those asked to the MIL.
24. DIL's husband's age (years): DIL-reported complete age of her husband in years on the date of interview.
25. DIL's husband's years of schooling: DIL-reported complete years of schooling of her husband.
26. DIL's husband was a migrant for 6+ months: DIL-reported indicator variable that takes 1 if her husband was away from home for at least six months at a time in the last year.
27. DIL is employed: Indicator variable that takes 1 if the DIL reports having worked anytime in the last year, and 0 otherwise.

B Appendix Figures and Tables

Figure A.1: Study area



Figure A.2: Study villages in Jaunpur district, UP

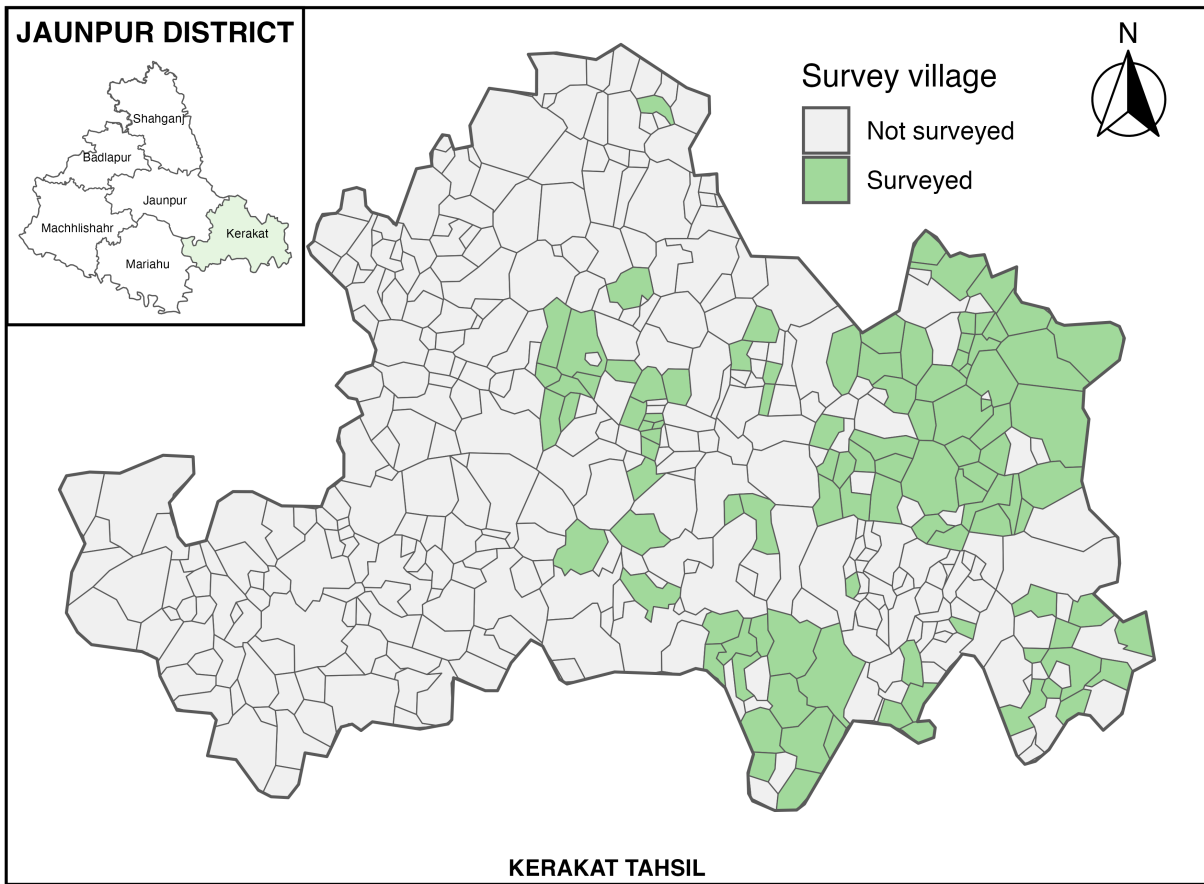
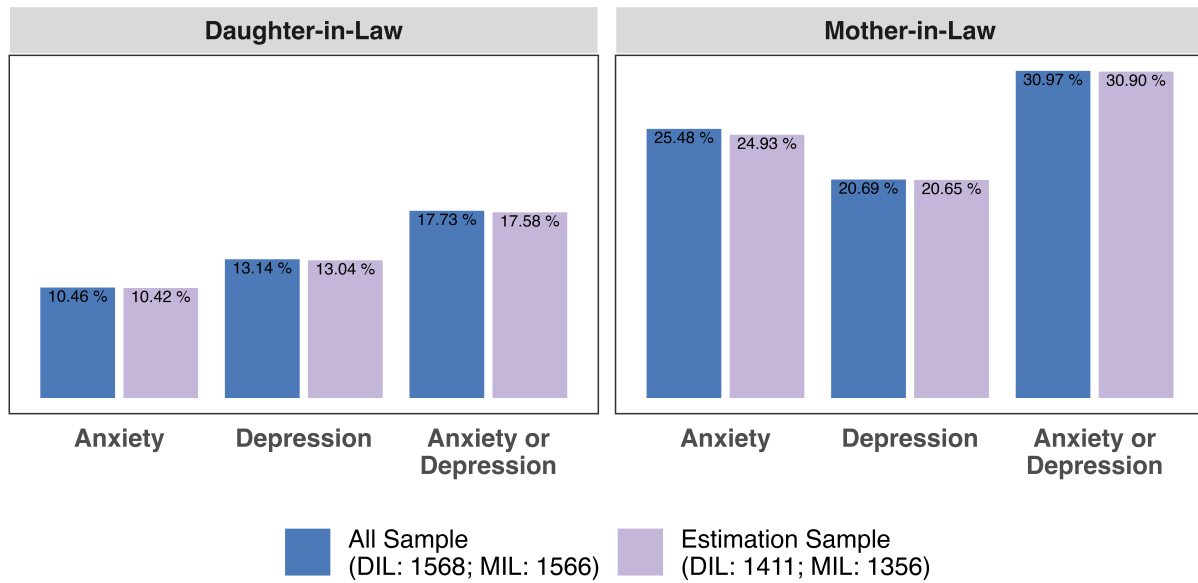


Figure A.3: Prevalence of anxiety and depression: Comparing the full sample vs. the estimation sample



Notes: This figure shows the prevalence of anxiety and depression in the full sample (N = 1568 for daughters-in-law and N = 1566 for mothers-in-law) and the estimation sample (N = 1411 for daughters-in-law and N = 1356 for mothers-in-law) based on the PHQ-4. The PHQ-4 captures respondents' mental health during the past two weeks before the survey. More details about how we define anxiety and depression are available in [Appendix A](#).

Table A.1: PHQ-4 module

Over the last 2 weeks, approximately how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly everyday	Refused
Feeling nervous, anxious, or on edge	0	1	2	3	99
Not being able to stop or control worrying	0	1	2	3	99
Feeling down, depressed, or hopeless	0	1	2	3	99
Little interest or pleasure in doing things	0	1	2	3	99

Notes: This table presents the set of four questions that are included in the PHQ-4 assessment tool to screen for anxiety and depression.

Table A.2: External validity: Comparing DILs in the study sample with women in the DHS sample

	JMDS Baseline		Rural UP		UP		Rural India		India	
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Age (in years)	1572	26.293	32300	27.370	39051	27.552	232394	27.553	299146	27.757
Years of schooling	1572	11.583	32300	7.032	39051	7.372	232394	7.125	299146	7.701
Hindu	1572	0.948	32300	0.872	39051	0.843	232394	0.780	299146	0.769
Scheduled caste or tribe	1567	0.329	32300	0.283	39051	0.269	232394	0.409	299146	0.380
Other backward class	1567	0.563	32300	0.551	39051	0.547	232394	0.384	299146	0.392
Ever used any FP method	1570	0.696	32300	0.812	39051	0.816	232394	0.749	299146	0.752
Using any FP method	1570	0.504	32300	0.467	39051	0.489	232394	0.348	299146	0.362
Wants another child	1572	0.488	32029	0.377	38737	0.381	230912	0.364	297381	0.368
Owns a cellphone	1572	0.837	4736	0.577	5757	0.599	34764	0.572	44916	0.613
Worked last year	1571	0.181	4736	0.175	5757	0.170	34764	0.309	44916	0.293
Husband's age (in years)	1572	30.107	4736	30.797	5757	31.031	34764	32.155	44916	32.427
Husband's years of schooling	1571	11.248	4727	8.702	5743	8.858	34653	8.178	44781	8.594
Husband was a migrant for 6+ months	1572	0.452	4736	0.177	5757	0.160	34764	0.137	44916	0.125

Notes: Columns (1) and (2) present baseline descriptive statistics for the sample of DILs from our survey. Columns (3) to (10) present descriptive statistics for women using data from the 2019-21 India National Family Health Survey (NFHS); the NFHS sample is restricted to 18-35-year-old married women to allow for more direct comparisons with our sample.

Table A.3: External validity: Comparing MILs in the study sample with women in the LASI sample

	JMDS Baseline		Rural UP		UP		Rural India		India	
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
MIL's age (in years)	1572	56.034	3120	56.743	3964	56.412	40995	55.861	63114	55.702
MIL's can read and write	1572	0.209	3120	0.173	3964	0.234	40988	0.297	63106	0.419
Hindu	1572	0.948	3120	0.885	3964	0.842	40991	0.745	63109	0.733
Scheduled caste or tribe	1567	0.329	3120	0.320	3964	0.289	40793	0.396	62595	0.345
Other backward class	1567	0.563	3120	0.451	3964	0.442	40793	0.382	62595	0.384
MIL is widowed	1572	0.196	3120	0.159	3964	0.159	40995	0.177	63114	0.181
MIL has visited health facility last year	1563	0.743	3106	0.527	3948	0.552	40730	0.586	62649	0.609
MIL's number of grandchildren	1572	2.447	3109	6.777	3951	6.308	40690	5.037	62575	4.449

Notes: Columns (1) and (2) present baseline descriptive statistics for the sample of MILs from our survey. Columns (3) to (10) present descriptive statistics using data from the 2017-18 Longitudinal Aging Study in India (LASI); the LASI sample is restricted to 39-85-year-old married women to allow for more direct comparisons with our sample.

Table A.4: Balance table, MIL estimation sample only

	All sample		DIL's first child is a girl		DIL's first child is a boy		Normalized difference (7)
	N (1)	Mean (2)	N (3)	Mean (4)	N (5)	Mean (6)	
Caste: SC-ST	1356	0.331	680	0.300	676	0.362	-0.133
Caste: OBC	1356	0.568	680	0.603	676	0.533	0.142
Household is poor	1356	0.471	680	0.451	676	0.490	-0.076
MIL's age (years)	1356	55.934	680	56.088	676	55.780	0.044
MIL is literate	1356	0.213	680	0.206	676	0.220	-0.035
MIL is widowed	1356	0.193	680	0.207	676	0.179	0.072
MIL owns a cellphone	1356	0.339	680	0.347	676	0.331	0.033
MIL's mobility index	1356	1.716	680	1.743	676	1.689	0.029
MIL has at least one friend in Jaunpur	1356	0.508	680	0.493	676	0.524	-0.062
MIL's domestic violence attitudes index	1356	1.046	680	1.015	676	1.077	-0.038
MIL has visited a health facility last year	1356	0.746	680	0.751	676	0.740	0.027
MIL's social desirability index	1356	8.162	680	8.279	676	8.044	0.130
MIL worked last year	1356	0.419	680	0.418	676	0.420	-0.005
DIL is married to MIL's eldest son	1356	0.560	680	0.538	676	0.581	-0.087
DIL's age (years)	1356	26.246	680	26.347	676	26.145	0.070
DIL has completed class 12	1356	0.369	680	0.354	676	0.383	-0.060
DIL owns a cellphone	1356	0.849	680	0.843	676	0.855	-0.035
DIL's mobility index	1356	0.192	680	0.200	676	0.183	0.023
DIL has at least one friend in Jaunpur	1356	0.679	680	0.672	676	0.686	-0.031
DIL's domestic violence attitudes index	1326	0.824	665	0.785	661	0.864	-0.057
DIL has visited a health facility last year	1356	0.731	680	0.763	676	0.698	0.147
DIL's social desirability index	1327	8.239	663	8.309	664	8.169	0.084
DIL worked last year	1356	0.186	680	0.196	676	0.176	0.050
DIL's husband's age (years)	1356	30.037	680	30.113	676	29.960	0.042
DIL's husband's years of schooling	1356	11.232	680	11.147	676	11.318	-0.051
DIL's husband was a migrant for 6+ months	1356	0.465	680	0.479	676	0.451	0.057
Observations for F-test					1299		
F-test of joint significance: p-value					0.149		

Notes: This table presents summary statistics and tests for balance by the sex of the DIL's firstborn child among the estimation sample of MILs. MIL and DIL denote mother-in-law and daughter-in-law, respectively. Column 7 presents normalized differences in variables between DILs whose first child is a girl versus a boy, which are calculated as the absolute differences between the variable means of the two groups, divided by their joint standard deviation. A variable with a normalized difference below 0.25 is considered balanced (McKenzie, 2017). The F-statistic, which is presented at the bottom of the table tests for the joint significance of all covariates for the full sample, is calculated by regressing the firstborn boy dummy on all covariates and then testing whether all coefficients are jointly equal to zero. Variable definitions are provided in Appendix A.

Table A.5: Balance table, DIL estimation sample only

	All sample		DIL's first child is a girl		DIL's first child is a boy		Normalized difference (7)
	N (1)	Mean (2)	N (3)	Mean (4)	N (5)	Mean (6)	
Caste: SC-ST	1411	0.333	707	0.304	704	0.362	-0.123
Caste: OBC	1411	0.561	707	0.590	704	0.533	0.115
Household is poor	1411	0.468	707	0.448	704	0.487	-0.078
MIL's age (years)	1411	56.063	707	56.264	704	55.861	0.058
MIL is literate	1411	0.217	707	0.214	704	0.220	-0.016
MIL is widowed	1411	0.193	707	0.199	704	0.186	0.034
MIL owns a cellphone	1411	0.338	707	0.351	704	0.325	0.054
MIL's mobility index	1411	1.697	707	1.696	704	1.699	-0.002
MIL has at least one friend in Jaunpur	1411	0.504	707	0.499	704	0.509	-0.018
MIL's domestic violence attitudes index	1396	1.075	700	1.061	696	1.089	-0.017
MIL has visited a health facility last year	1408	0.748	706	0.754	702	0.742	0.026
MIL's social desirability index	1373	8.128	684	8.269	689	7.988	0.153
MIL worked last year	1411	0.414	707	0.423	704	0.405	0.037
DIL is married to MIL's eldest son	1411	0.560	707	0.539	704	0.581	-0.085
DIL's age (years)	1411	26.313	707	26.455	704	26.169	0.098
DIL has completed class 12	1411	0.371	707	0.358	704	0.385	-0.056
DIL owns a cellphone	1411	0.837	707	0.836	704	0.838	-0.006
DIL's mobility index	1411	0.187	707	0.191	704	0.183	0.011
DIL has at least one friend in Jaunpur	1411	0.670	707	0.669	704	0.670	-0.003
DIL's domestic violence attitudes index	1411	0.816	707	0.779	704	0.852	-0.053
DIL has visited a health facility last year	1411	0.735	707	0.767	704	0.703	0.144
DIL's social desirability index	1411	8.181	707	8.255	704	8.107	0.087
DIL worked last year	1411	0.184	707	0.199	704	0.168	0.082
DIL's husband's age (years)	1411	30.127	707	30.223	704	30.030	0.052
DIL's husband's years of schooling	1411	11.225	707	11.171	704	11.278	-0.032
DIL's husband was a migrant for 6+ months	1411	0.445	707	0.450	704	0.440	0.019
Observations for F-test					1356		
F-test of joint significance: p-value					0.122		

Notes: This table presents summary statistics and tests for balance by the sex of the DIL's firstborn child among the estimation sample of DILs. MIL and DIL denote mother-in-law and daughter-in-law, respectively. Column 7 presents normalized differences in variables between DILs whose first child is a girl versus a boy, which are calculated as the absolute differences between the variable means of the two groups, divided by their joint standard deviation. A variable with a normalized difference below 0.25 is considered balanced (McKenzie, 2017). The F-statistic, which is presented at the bottom of the table tests for the joint significance of all covariates for the full sample, is calculated by regressing the firstborn boy dummy on all covariates and then testing whether all coefficients are jointly equal to zero. Variable definitions are provided in Appendix A.

Table A.6: Comparing the full sample with the estimation sample for MILs

	All Sample		Estimation Sample		Normalized difference (5)
	N (1)	Mean (2)	N (3)	Mean (4)	
MIL has anxiety or depression	1566	0.310	1356	0.309	0.002
DIL's first child is a boy	1572	0.501	1356	0.499	0.004
Caste: SC-ST	1567	0.329	1356	0.331	-0.004
Caste: OBC	1567	0.563	1356	0.568	-0.010
Household is poor	1564	0.471	1356	0.471	0.000
MIL's age (years)	1572	56.034	1356	55.934	0.014
MIL is literate	1572	0.209	1356	0.213	-0.011
MIL is widowed	1572	0.196	1356	0.193	0.007
MIL worked last year	1567	0.407	1356	0.419	-0.025
MIL owns a cellphone	1567	0.334	1356	0.339	-0.010
MIL's mobility index	1552	1.693	1356	1.716	-0.013
MIL has at least one friend in Jaunpur	1567	0.497	1356	0.508	-0.022
MIL's domestic violence attitudes index	1548	1.093	1356	1.046	0.028
MIL has visited a health facility last year	1563	0.743	1356	0.746	-0.005
MIL's social desirability index	1518	8.111	1356	8.162	-0.028
DIL is married to MIL's eldest son	1568	0.561	1356	0.560	0.002
Hours spent outside the home by MIL	1567	0.996	1356	1.055	-0.033
Hours spent on childcare by MIL	1567	1.986	1356	2.019	-0.024
MIL-DIL discussion about grandchildren	1566	0.791	1356	0.806	-0.037
MIL-DIL discussion about FP	1562	0.478	1356	0.495	-0.033
MIL approves of DIL's FP use	1506	0.660	1356	0.653	0.014
MIL approves of FP for limiting births	1508	0.727	1356	0.723	0.009
MIL approves of FP for spacing births	1508	0.818	1356	0.815	0.009
MIL approves of DIL working outside the home:					
<i>Before she has kids</i>	1565	0.611	1356	0.614	-0.006
<i>When kids are young</i>	1565	0.418	1356	0.419	-0.002
<i>When kids are older</i>	1565	0.854	1356	0.856	-0.007

Notes: This table presents summary statistics for the variables used in our MIL regressions for the full sample and the estimation sample. MIL and DIL denote mother-in-law and daughter-in-law, respectively, and FP denotes family planning. Column 5 presents the normalized differences, which are calculated as the absolute difference between the variable means for the two samples, divided by their joint standard deviation. A variable with a normalized difference below 0.25 is considered balanced (McKenzie, 2017). Variable definitions are available in [Appendix A](#). *p < 0.1, **p < 0.05, ***p < 0.01.

Table A.7: Comparing the full sample with the estimation sample for DILs

	All Sample		Estimation Sample		Normalized difference (5)
	N (1)	Mean (2)	N (3)	Mean (4)	
DIL has anxiety or depression	1568	0.177	1411	0.176	0.004
DIL's first child is a boy	1572	0.501	1411	0.499	0.003
Caste: SC-ST	1567	0.329	1411	0.333	-0.008
Caste: OBC	1567	0.563	1411	0.561	0.003
Household is poor	1564	0.471	1411	0.468	0.006
DIL's age (years)	1572	26.293	1411	26.313	-0.007
DIL has completed class 12	1572	0.373	1411	0.371	0.003
DIL worked last year	1571	0.181	1411	0.184	-0.006
DIL owns a cellphone	1572	0.837	1411	0.837	-0.001
DIL's mobility index	1515	0.193	1411	0.187	0.008
DIL has at least one friend in Jaunpur	1572	0.677	1411	0.670	0.017
DIL's domestic violence attitudes index	1531	0.829	1411	0.816	0.009
DIL has visited a health facility last year	1571	0.729	1411	0.735	-0.014
DIL's social desirability index	1530	8.178	1411	8.181	-0.002
DIL's husband's age (years)	1572	30.107	1411	30.127	-0.005
DIL's husband's years of schooling	1571	11.248	1411	11.225	0.007
DIL's husband was a migrant for 6+ months	1572	0.452	1411	0.445	0.015
DIL is in the labor force	1572	0.424	1411	0.423	0.002
DIL has used modern FP	1570	0.255	1411	0.257	-0.004
DIL has used any FP method	1570	0.696	1411	0.696	0.000

Notes: This table presents summary statistics for the variables used in our DIL regressions for the full sample and the estimation sample. MIL and DIL denote mother-in-law and daughter-in-law, respectively, and FP denotes family planning. Column 6 presents the normalized differences, which are calculated as the absolute difference between the variable means for the two samples, divided by their joint standard deviation. A variable with a normalized difference below 0.25 is considered balanced (McKenzie, 2017). Variable definitions are available in [Appendix A](#). *p < 0.1, **p < 0.05, ***p < 0.01.

Table A.8: List of covariates used in analysis

Covariates for all regression	Controls for MIL outcomes	Controls for DIL outcomes
DIL's first child is a boy	x	x
Caste: SC-ST	x	x
Caste: OBC	x	x
Household is poor	x	x
MIL's age	x	x
MIL is literate	x	x
MIL is widowed	x	x
MIL owns a cellphone	x	
MIL's mobility index	x	
MIL has at least one friend in Jaunpur	x	
MIL has visited a health facility last year	x	
MIL's domestic violence attitudes index	x	
MIL's social desirability index	x	
DIL is married to MIL's eldest son	x	x
DIL's age (years)	x	x
DIL has completed class 12	x	x
DIL's mobility index	x	x
DIL owns a cellphone		x
DIL has at least one friend in Jaunpur		x
DIL has visited a health facility last year		x
DIL's domestic violence attitudes index		x
DIL's social desirability index		x
DIL's husband's age		x
DIL's husband's years of schooling		x
DIL's husband was a migrant for 6+ months		x
Additional covariates for mental health and family planning outcomes		
MIL was employed last year	x	x
DIL was employed last year	x	x

Table A.9: DIL’s mental health outcomes as a function of the sex of her firstborn child

	DIL has anxiety or depression				
	(1)	(2)	(3)	(4)	(5)
DIL’s first child is a boy	0.004 (0.020)	0.004 (0.020)	0.006 (0.020)	0.003 (0.021)	0.004 (0.022)
Household controls		x	x	x	x
MIL controls			x	x	x
DIL controls				x	x
Village fixed effects					x
Observations	1411	1411	1411	1411	1411
Outcome mean if DIL’s first child is a girl	0.174	0.174	0.174	0.174	0.174

Notes: Each column represents a separate regression. MIL and DIL denote mother-in-law and daughter-in-law, respectively. Household controls include indicators for belonging to a scheduled caste or tribe, belonging to an other backward class, and whether the household is poor. DIL controls include DIL age fixed effects, indicator variables for whether she has completed class 12, owns a cellphone, worked last year, has a friend in Jaunpur, is married to the MIL’s oldest son, and has visited a health facility during the last year, her mobility index, her domestic violence attitudes index, and her social desirability index. MIL controls include MIL age fixed effects, indicator variables for whether she is literate, worked last year, is a widow, and her mobility index. Robust standard errors are presented in parentheses. The list of controls used in the regressions is presented in [Table A.8](#). Variable definitions are available in [Appendix A](#). *p < 0.1, **p < 0.05, ***p < 0.01.

Table A.10: Changes in the effect of the sex of the DIL's firstborn child on the MIL's mental health outcomes over time

	MIL has anxiety or depression				
	(1)	(2)	(3)	(4)	(5)
DIL's first child is a boy	-0.064** (0.029)	-0.069** (0.029)	-0.076*** (0.029)	-0.066** (0.030)	-0.076** (0.031)
DIL's first child is a boy x First child born before 2020	-0.026 (0.032)	-0.030 (0.032)	-0.048 (0.032)	-0.050 (0.033)	-0.039 (0.034)
Household controls		x	x	x	x
MIL controls			x	x	x
DIL controls				x	x
Village fixed effects					x
Observations	1356	1356	1356	1356	1356
Outcome mean if DIL's first child is a girl & born before 2020	0.356	0.356	0.356	0.356	0.356
Outcome mean if DIL's first child is a girl & born in/after 2020	0.309	0.309	0.309	0.309	0.309
<i>p-values</i> : DIL's first child is a boy = DIL's first child is a boy x First child born before 2020	0.279	0.274	0.431	0.683	0.355

Notes: Each column represents a separate regression. MIL and DIL denote mother-in-law and daughter-in-law, respectively. Household controls include indicators for belonging to a scheduled caste or tribe, belonging to an other backward class, and whether the household is poor. MIL controls include MIL age fixed effects, indicator variables for whether she is literate, a widow, owns a cellphone, worked last year, has a friend in Jaunpur, and has visited a health facility during the last year, her mobility index, her domestic violence attitudes index, and her social desirability index. DIL controls include DIL age fixed effects, indicator variables for whether she is married to the MIL's oldest son, has completed class 12, worked last year, and her mobility index. Robust standard errors are presented in parentheses. The list of controls used in the regressions is presented in [Table A.8](#). Variable definitions are available in [Appendix A](#). *p < 0.1, **p < 0.05, ***p < 0.01.

Table A.11: MIL’s labor market outcomes as a function of the sex of the DIL’s firstborn child

	MIL is in the labor force
	(1)
DIL’s first child is a boy	0.015 (0.026)
Controls	x
Observations	1356
Outcome mean if DIL’s first child is a girl	0.428

Notes: Each column represents a separate regression. MIL and DIL denote mother-in-law and daughter-in-law, respectively. Controls include the same set of controls as those included in Table 3. Robust standard errors are presented in parentheses. The list of controls used in the regressions is presented in Table A.8. Variable definitions are available in Appendix A. *p < 0.1, **p < 0.05, ***p < 0.01.

Table A.12: Heterogeneity in MIL mental health outcomes by the number and relative rank of DILs

	MIL’s number of DIL		Eldest DIL	
	Only DIL (1)	2+ DIL (2)	DIL is eldest (3)	DIL is not eldest (4)
DIL’s first child is a boy	-0.061** (0.030)	0.010 (0.050)	-0.057* (0.034)	-0.030 (0.038)
Controls	x	x	x	
Observations	963	393	759	597
Outcome mean if DIL’s first child is a girl	0.327	0.345	0.325	0.341
<i>p-value</i> for difference between subgroups	0.191		0.582	

Notes: Each column represents a separate regression. MIL and DIL denote mother-in-law and daughter-in-law, respectively. All columns include the same set of controls as those in column 4 of Table 2. Robust standard errors are presented in parentheses. The list of controls used in the regressions is presented in Table A.8. Variable definitions are available in Appendix A. *p < 0.1, **p < 0.05, ***p < 0.01.

Table A.13: Robustness checks: Standard error adjustments and multiple hypothesis testing

Panel A	MIL has anxiety or depression	Hours spent on childcare by MIL	MIL approves of DIL working outside the home			MIL approves of DIL's FP use
			Before having kids	When kids are young	When kids are older	
	(1)	(2)	(3)	(4)	(5)	(6)
DIL's firstchild is a boy	-0.059	0.149	0.028	0.055	0.020	0.057
<i>Robust (p-value)</i>	(0.020)	(0.044)	(0.309)	(0.042)	(0.305)	(0.028)
<i>Clustered (p-value)</i>	(0.016)	(0.042)	(0.285)	(0.050)	(0.257)	(0.046)
<i>Anderson (2008) Sharpened q-value</i>	(0.071)	(0.071)	(0.115)	(0.071)	(0.115)	(0.071)
Panel B	DIL has anxiety or depression	DIL is in the labor force	DIL has used any FP method			
	(7)	(8)	(9)			
DIL's firstchild is a boy	0.004	-0.010	0.026			
<i>Robust (p-value)</i>	(0.851)	(0.714)	(0.294)			
<i>Clustered (p-value)</i>	(0.839)	(0.723)	(0.251)			
<i>Anderson (2008) Sharpened q-value</i>	(1.000)	(1.000)	(1.000)			

Notes: p-values are presented in parentheses. MIL denotes mother-in-law, DIL denotes daughter-in-law, and FP denotes family planning. *Robust* represents p-values from robust standard errors. *Clustered* represents p-values based on standard errors clustered at the village level. *Anderson (2008) Sharpened q-value* presents sharpened q-values that are computed using the [Anderson \(2008\)](#) approach; this correction allows for the correction of false discovery rates (FDR) when testing multiple outcomes. Panel A and Panel B correct for [Anderson \(2008\)](#) sharpened q-values for MIL and DIL regressions separately. Columns 1 and 6 include the same set of controls as those that were included in column 4 of [Table 2](#). Columns 2-5 include the same set of controls as those that were included in [Table 3](#). Columns 7 and 9 include the same set of controls as those that were included in [Table A.9](#). Column 8 includes the same set of controls as those that were included in column 4 of [Table 4](#). The list of controls used in the regressions is presented in [Table A.8](#). Variable definitions are presented in [Appendix A](#).