Marriage, motherhood and women's employment in rural India.

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Abstract

This study investigates the impact of marriage and childbirth on women's labour market participation in rural India. We employ a novel approach using Life History Calendar (LHC) data to analyze women's labour market trajectories from age 15 onwards in the absence of panel data. Our event study models reveal that marriage leads to a significant and sustained increase in women's labour supply, particularly in informal agricultural work. This increase is more pronounced among women from poorer households and those with working mothers. Notably, childbirth does not negatively impact labour supply, contrasting with findings from developed countries. We attribute these results to early marriage and motherhood, low levels of economic development, and the prevalence of informal employment. Our research highlights the crucial role of socioeconomic context in shaping the impact of life events on women's labour market outcomes in developing economies.

1 Introduction

Marriage and childbirth profoundly shape women's labor market trajectories, particularly in developing countries. A large fraction of gender inequality in labour markets in middle and high-income countries can be explained by marriage and child penalties (Juhn and McCue, 2017; Kleven et al., 2023). While extensive research in high and middle-income countries has documented a 'male marriage premium'(Antonovics and Town, 2004)[1] and substantial 'child penalties' for women Kleven et al. (2023); Berniell et al. (2023), the impact of these life events on women's labour market outcomes in low-income settings remains understudied.

Data constraints like unavability of long-term panel or administrative data research exploring impact of marriage on women's work in developing countries is limited. Furthermore, vast differences in family formation and structures, gender norms, and labour markets raise doubts about applying theories and findings from high-income settings to low-income contexts. Even though other issues related to marriage, like choice (Allendorf and Pandian, 2016), migration, timing, asset transfer (Quisumbing and Hallman, 2005) and decision-making (Banerji and Deshpande, 2021) after marriage, have been explored in the literature, there is scant literature on the impact of marriage on work in developing countries.

On the other hand, there is growing evidence of the impact of childbirth and fertility on women's work in developing countries. Recent evidence using instrumental variable and pseudo-event studies in developing countries has shown that the level of economic development and formality in the economy are key determinants of whether and to what extent motherhood impacts women's labour market outcomes (Aaronson et al., 2021; Agüero

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[1]Male marriage premium is the improvement in labour market outcomes including an increase in wages observed among men after marriage.

et al., 2020; Kleven et al., 2023). Also, these two life events - marriage and childbirth - are closely linked, with childbirth following closely after marriage in most developing countries. However, they have rarely been jointly studied to ascertain each event's impact separately.

This paper addresses this knowledge gap by leveraging unique retrospective data to estimate the causal effects of marriage and first childbirth on women's labour market participation and work characteristics. Given the lack of long-term panel data in our setting, we employ the Life History Calendar (LHC) method to collect retrospective information on women's labor market participation and key life events from age 15 onward. We use an event study framework to estimate the impact of marriage and childbirth on various labour market outcomes like workforce participation, type and sector of work (Kleven et al., 2019). Since marriage and childbirth often occur close together, we implement a joint event study approach following Kleven et al. (2023) to address this temporal proximity. Additionally, extensive robustness and heterogeneity analyses are conducted to explore the underlying mechanisms.

Our analysis is based on data from rural India and offers a starkly different context compared to developed countries where these topics have been extensively explored. India's workforce accounts for about 16 percent of the global workforce, of which the rural workforce constitutes more than three-quarters. Rural India is a mostly informal, agriculture-dependent economy as opposed to the formal non-agricultural economy of developed countries. About 87 percent of the rural workforce in India are in informal employment which includes self and casual wage employment in agriculture. Marriage and childbirth occur substantially earlier in life in rural India than in high and middle-income countries. India is mostly a patrilocal society where women migrate after marriage, and gender norms are stricter.

We collected retrospective data in two states in India, Karnataka and Rajasthan, which are located in southern and northern India. The rural population of these two states is over 100 million. Rural Karnataka and Rajasthan have 95 and 90 per cent of women working in the informal sector [2].

Our findings from the joint event study reveal a significant increase in labour market participation following marriage, with no significant impact observed for the first childbirth. This rise in participation after marriage is primarily driven by increased paid work, particularly informal work and unpaid contributions within family farms or enterprises. Notably, the increase in paid work is more pronounced among women from poorer households and those with working mothers. Early marriage also appears to be associated with a larger participation jump. Importantly, no significant changes are observed in any work category (paid, unpaid, formal, informal) following childbirth over the five-year period.

We attribute these results to several factors: the early occurrence of marriage and childbirth, low levels of economic development, and the prevalence of informal, flexible employment in rural India. The average age of marriage is a decade or more earlier than in most developed countries, and given the low levels of income and lack of social security, contributing to economic activity is important to obtain resources for the household. A simple cohort analysis of women's labourforce participation in rural India corroborates our results. It shows a sharp jump between the pre and post-marriage age groups (Chawla and Singh, 2024; Abraham, 2023). Additionally, some correspondence-style studies have shown that women who are working before marriage face a marriage market penalty in terms of less interest from male suitors (Afridi et al., 2023; Dhar, 2021) pointing to low laborforce participation before marriage. We also argue that specialization theory (Becker,

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[2]These estimates refer to a number of workers excluding those self-employed without any written contract. They are based on 2013-14 survey as reported in GOI (2015) (Table 3.5)

1981), commonly used to explain the division of labour upon marriage, holds limited explanatory power in the rural Indian context.

Our findings of no impact of childbirth on women's labour market outcomes align with recent studies suggesting the absence of a motherhood penalty in contexts with low levels of development and largely informal economies (Agüero et al., 2020; Aaronson et al., 2021; Kleven et al., 2023). Informal sector agricultural jobs are conducive to managing child care responsibilities, providing both temporal and spatial flexibility (Berniell et al., 2023; Schmieder, 2021; Gautham, 2022) as opposed to fixed-hour, formal sector jobs in offices or factories (Kleven et al., 2023; Aaronson et al., 2021). More than 90 percent of jobs in rural India are informal and often home-based with flexible hours, and most are in the agricultural sector, making it possible for women to keep working even after childbirth.

The explanations for motherhood penalty – skill depreciation due to caregiving breaks (Gangl and Ziefle, 2009), selecting care-compatible jobs (Fuller and Hirsh, 2019), reduced work effort (Anderson et al., 2003), employer discrimination (Correll et al., 2007; Bedi et al., 2022), are primarily relevant in formal, developed market settings and hold little explanatory power in the context of a mostly informal, agrarian economy which is our study setting.

Our paper makes three key contributions to the existing literature. First, we expand the understanding of the impact of marriage on women's labour market participation in a patrilocal, early-marriage, rural developing country setting. Most existing research on marriage and labour market outcomes has focused on high-income countries and primarily analyses men's outcomes (Antonovics and Town, 2004; McConnell and Valladares-Esteban, 2021; Waldfogel, 1998; Killewald and Gough, 2013; Lundberg and Rose, 2002). In South Asia, where patrilocality dictates women move to their husbands' homes after marriage, traditional household panel surveys become unsuitable for tracking women's

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labour market changes. Studies have used cross-sectional data to track the participation of married women, but they cannot track work participation over the lifetime of an individual (Afridi et al., 2018). Additionally, since marriage is universal cross-sectional studies are not able to compare married and unmarried women over the lifecycle [3]. We overcome these limitations by employing retrospective data collected through the Life History Calendar (LHC) method. This helps us create a panel with information about women's work status over their working age. We can hence offer unique insights into how marriage influences women's labour participation in this understudied context.

Second, we contribute to the literature on the impact of childbirth on women's labour market outcomes in low-income, informal economies. Existing event-study research on childbirth primarily focuses on high and middle-income countries (Angelov et al., 2016; Kleven et al., 2019; Berniell et al., 2023). We extend event-study analysis to a contrasting environment – an informal, agriculture-based economy with strong gender norms. Studies using other methods have proposed instruments like twin-births (Rosenzweig and Wolpin, 1980; Bronars and Grogger, 1994), infertility shocks (Agüero and Marks, 2011), sibling sex mix (Angrist and Evans, 1996), IUD failure (Gallen et al., 2023) and IVF treatment success (Lundborg et al., 2017) to investigate the impact of fertility on women's labour market outcomes. Some of these instruments have recently been used to study the relation between fertility and labour market outcomes in developing countries (Aaronson et al., 2021; Agüero et al., 2020). They find results similar to ours - at low levels of development, fertility has no impact on women's economic activity. However, they do not study the joint impact of marriage and childbirth. Notably, Kleven et al. (2023) uses a pseudo-event study and jointly estimates the impact of marriage and childbirth across various developing coun-

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[3]Women who marry late or in some instances do not marry or are separated/widowed are substantially different in characteristics than married women that one cant compare the two and separate the impact of marriage from other aspects.

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tries. Their results are also consistent with what we find. However, their data limitations in India prevent them from precisely estimating the marriage effect, which our study achieves through the LHC method.

Third, we contribute to the literature on the low levels of women's labour force participation in India by investigating how key life events impact participation in rural India. The extensive literature on women's labour market participation in India has investigated a range of topics, including social norms (Jayachandran, 2021), structural transformation (Lahoti and Swaminathan, 2016), supply side (Neff et al., 2012; Klasen and Pieters, 2015), demand side (Chatterjee et al., 2015; Afridi et al., 2022; Deshpande and Kabeer, 2024), labour market rigidities (Das et al., 2015), safety (Siddique, 2022), measurement (Abraham et al., 2023; Kapur et al., 2021; Hirway and Jose, 2011) and labour market transitions (Sarkar et al., 2019; Deshpande and Singh, 2021; Anukriti et al., 2020). However, the impact of marriage and childbirth has rarely been studied systematically. Most studies in India use cross-section observational data and include a binary for the presence of children in the household to investigate the impact of childbirth. Das and Zumbyte (2017) examine how the presence of a young child affects the labour supply of urban married women. They find that younger children in the household are negatively associated with women's labour supply. However, such analyses do not necessarily capture the causal impact of having the child. More recently, Deshpande and Singh (2021) investigated the impact of motherhood on labour market participation. They use entropy balancing to compare new parents with non-parents of similar demographic and socioeconomic characteristics. They do not find any immediate effect of childbirth in line with our results. Our study goes further by investigating both marriage and childbirth together and using panel data without the need for matching across households. Our findings shed light on how marriage and childbirth influence women's labour market participation in a low-development, informal setting, of-

fering valuable insights for policymakers and researchers focusing on gender dynamics in developing economies.

The paper is organized as follows: Section 2 discusses the data used in the study and the Life History Calendar (LHC) method. Section 3 describes the event study methodology, and Sections 4 and 5 discuss results and heterogeneity, respectively. In section 6, we present a discussion of theories that explain division of labour within households and family formation and their applicability in rural India context.

2   Data

This study utilizes data from the India Working Survey (IWS) 2020, conducted across two Indian states: Karnataka (south) and Rajasthan (west). The IWS 2020 employed a detailed survey instrument to examine the multifaceted influence of social identities (caste, gender, religion) on labour market participation, employment patterns, and worker remuneration. Beyond labour market outcomes, the IWS collected information on diverse aspects including household living standards, time spent on household production activities, occupational history, decision-making, social networks, and experiences of discrimination.

The IWS employed a stratified multistage sampling design, aiming for a state-representative sample of approximately 4,000 households per state. However, due to disruptions caused by COVID-19 in March 2020, the final sample comprised 3,646 households (85% rural) and 5,951 individuals (3,371 women, 2,580 men) across both states[4].

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[4]The survey covered 135 villages across 13 districts in the two states.

2.1 Life History Calendar (LHC) Data

To capture long-term, retrospective data on life events and occupational history, the IWS employed a Life History Calendar (LHC) for respondents aged 18-47. A total of 3,078 individuals (1,766 women, 1,312 men) across 2,065 households participated in the LHC. LHC is a method where respondents provide autobiographical information across various domains and for a specified period determined by the research question (Morselli et al., 2019; Freedman et al., 1988). Typically, a chronological time frame is presented graphically to the respondent or information is collected around specific personal events such as childbirth, death, and marriage or around major public events (Glasner and Van der Vaart, 2009). A key advantage of LHC is that the method provides visual and temporal cues that generate more accurate recall of events than conventional surveys aiming to collect retrospective data (Freedman et al., 1988). Inconsistencies in information can also be easily detected and immediately corrected by using major anchoring events (Glasner and Van der Vaart, 2009).

In addition to labour market participation, the LHC collected data on various domains potentially impacting labour outcomes, including life cycle events (marriage, childbirth), household structure, spouse's occupation, and income/health shocks. The LHC data is structured as a yearly panel, allowing the construction of an annual panel dataset with information on the respondent for a maximum of 32 years (age 15 to 47). The data obtained included years of education, year(s) of marriage(s), year(s) of childbirth(s), and annual data on employment status, employment type, spouse's employment, household structure (nuclear/joint), residence location (relative to natal residence), and exposure to income/other shocks.

The LHC captured detailed labour force information – employment status (regular salaried work, self-employment in agriculture/non-agriculture, casual wage work (agriculture/non-

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agriculture), contributing family worker), or out of the workforce (unemployed, studying, attending to domestic responsibilities). Self-employment and casual wage work are categorized as informal employment due to the absence of contracts or social security benefits. Contributing family workers, who are unpaid and lack control over the enterprise, are considered part of the informal labourforce. Salaried workers are categorized as formal workers (acknowledging that some salaried jobs may not offer formal benefits). This employment information is available for each individual in the sample for every year from age 15 to their current age.

The LHC approach has been applied extensively in social sciences to study various phenomena, including community stress (Ensel et al., 1996), intimate partner violence (Yoshihama et al., 2005), vulnerability (Morselli et al., 2016), employment transitions (Manzoni, 2012), and occupational mobility (Solga, 2001). Studies have compared the LHC with the traditional survey approach and found that data quality is often superior in the former method (see Morselli et al. (2016) for an overview). This is mainly due to features of LHC that aid recall of specific events and the interactive nature of the calendar making it easy to spot discrepancies in responses. Manzoni (2012) compare determinants of labour market transitions in Germany using two different survey designs: retrospective data (German Life History Study) and panel survey data (German Socio-Economic Panel) and find similar results in terms of the determinants of labour market events.

High-quality panel data is required to implement standard event study approaches implemented in the literature. However, such data is available only in select developed countries and not in most developing countries, including India. Kleven et al. (2023) implemented a pseudo-event study approach using matching techniques and cross-section data to estimate marriage and child penalties across various countries. However, several strong as-

sumptions must be made to implement pseudo-event studies [5]. Using life-history modules to generate panel data is another alternative to implementing an event-study using pseudo panel data. LHC offers valuable insights into the timing of life events (e.g., first marriage), their relative position to the current time, and their duration/recurrence. The challenges of LHC data collection include reliance on participants' memory and willingness to share life experiences. Recalling events way back in the past might lead to selectivity in recall, distortion or exaggeration of certain events. We designed our module taking these aspects into consideration and focused on significant events to reduce bias.

3   Event study methodology

We investigate the impact of two key life events - marriage and first childbirth - on women's work participation using an event study method (Kleven et al., 2019; Berniell et al., 2021; Angelov et al., 2016). We investigate the dynamics of the probability of being employed as a function of event time:

$$Y_{is\tau}^g = \sum_{j \neq -1} \beta_j^g.I[j = \tau] + \sum_k \alpha_k^g.I[k = age_{is}] + \sum_y \gamma_y^g.I[y = s] + \varepsilon_{is\tau}^g \tag{1}$$

where event time is denoted by τ (τ=0 represents the year of the event), $Y_{is\tau}^g$ is the outcome of interest for individual i of gender g in year s and at event time τ. As independent variables, we include a full set of event time, age, and calendar year dummies in the baseline specification. We omit the event time dummy at τ=-1, implying that the event time dummies measure the impact of event time on the probability of the individual i being

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[5]One example of assumption is the timing of marriage. Lacking information on the timing of marriage in cross-sectional data, the pseudo-event studies use binary data for marriage in joint event studies of marriage and childbirth. This, however, does not capture the impact of the timing of marriage

employed relative to the year before the event ($\tau = -1$). The age dummies controls non-parametrically for underlying life cycle trends in employment. The calendar year dummies control non-parametrically for time trends - any year-specific effects that impact everyone. We capture the effect of event time when controlling for age and year, as there is variation in the age at which women were married or had their first child. In our baseline specification, we include data for the period beginning 5 years before the event to 5 years afterwards, so τ varies from -5 to +5. These models are separately estimated for men and women for each event. We cluster the standard errors at the individual level. Similar event study models have been used to investigate childbirth penalties in developed countries (Kleven et al., 2019) and in Chile (Berniell et al., 2021).

As in Kleven et al. (2019), we specify equation (1) in levels. We convert the estimated level effects into percentages by calculating $P_\tau^g = \alpha_\tau^g / E[\hat{Y}_{is\tau}^g | \tau]$, where $\hat{Y}_{is\tau}^g$ is the predicted outcome when omitting the contribution of the event dummies, i.e., $\hat{Y}_{is\tau}^g = \sum_k \alpha_k^g . I[k = age_{is}] + \sum_y \gamma_y^g . I[y = s]$. Hence, P_τ captures the event's year τ effect as a percentage of the counterfactual outcome absent the event. Men are used as a control group to provide further credibility for our estimated long-run effects.

An important issue is that marriage and childbirth are closely linked in India. Childbirth in India almost never precedes marriage and usually follows soon after marriage. Over half of all women have their first child within two years of marriage (Table 2). This raises important questions on whether the event of marriage imposes labour market impacts on women over and above those imposed by parenthood. Does the impact of marriage capture some of the anticipated impact of motherhood, or does the impact of marriage confound the impact of childbirth? To fully address the temporal proximity of marriage and motherhood, we jointly estimate the impact of marriage and first childbirth following Kleven et al. (2023). We include both the marriage and childbirth event time dummies to estimate the

events jointly.

$$Y_{is\tau_m\tau_c}^g = \sum_{m\neq -1} \beta_m^g . I[m=\tau_m] + \sum_{c\neq -1} \beta_c^g . I[c=\tau_c] + \sum_k \alpha_k^g . I[k=age_{is}] + \sum_y \gamma_y^g . I[y=s] + \varepsilon_{is\tau}^g$$
(2)

where τ_m represents time relative to marriage (τ_m=0 is year of marriage) and τ_c represents time relative to childbirth (τ_c=0 is the year of childbirth). The employment outcome of individual i at marriage event time τ_m and child event time τ_c is regressed over event-time dummies for each event, age and year dummies. The coefficients β_m^g and β_c^g measure the employment effect of marriage and childbirth, respectively, relative to the year before the corresponding event. Similar to the baseline model, we scale the estimated employment effect by a counterfactual employment level. The counterfactual is calculated as an average predicted outcome when omitting the contribution of both marriage and childbirth coefficients.

The identifying assumption for the event studies might not hold if the timing of marriage or childbirth is impacted contemporaneously by labour market outcomes. For instance, an income shock like a drought could delay marriage for girls and be associated with their labour market outcomes in places like India, where marriage is accompanied by payment of dowry by the girls' families. The Covid shock, for example, resulted in an earlier age of marriage in many states in India, according to multiple reports Jejeebhoy (2021). A similar shock, on the other hand, could encourage married women to have children. But as argued by Berniell et al. (2021), individuals cannot control the exact timing of childbirth. In addition, in the Indian setting, with social pressure to get married by a particular age and have a child within a few years of marriage, the timing of marriage and childbirth is primarily controlled by social norms and not necessarily by labour market conditions.

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Identifying short-term effects in an event study model relies on the smoothness assumption, which posits that other relevant characteristics impacting labour market outcomes change gradually over time compared to changes in the event in question. However, the identification of the long-term effects requires stronger assumptions. In particular, we need to assume that after controlling for other aspects, the outcomes in the counterfactual situation of no marriage or no childbirth do not follow any trend before the event. As we shall see, in the event studies in this paper, we find that the pre-event trends are parallel - there are no significant differences between the men's and women's trajectory of workforce participation before the event. Also, the post-event effects are persistent following a sharp effect at the time of the event, indicating a lack of dynamics in the data later on. Motherhood penalty event study estimates have been validated using instruments for fertility – sibling sex mix (Kleven et al., 2019), IUD failure (Gallen et al., 2023) and IVF treatment success (Lundborg et al., 2017) in other contexts.

To assess robustness, we estimate models with additional controls for individual and household characteristics (e.g., number of children, household structure - co-residence with parents, in-laws, spouse, and other household members in the household for each year), time-invariant characteristics (e.g., education, caste/religion), and Primary Sampling Unit (PSU) fixed effects.

The absence of heterogeneous treatment across time/cohorts is vital to the credibility of staggered event study designs (Goodman-Bacon, 2021; De Chaisemartin and d'Haultfoeuille, 2020; Callaway and Sant'Anna, 2021; Borusyak et al., 2021). Heterogeneity in the timing of childbirth has been used by Melentyeva and Riedel (2023) to show biases in the conventional child penalty studies, and they suggest estimating the effects separately by cohorts to overcome these biases. We implement this additional check of robustness in our analysis.

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4 Results

4.1 Descriptive Results

We begin our analysis by presenting key descriptive results. Our analytical sample is restricted to only rural areas. In our sample, overall education levels are low, with women on average less educated than men (Table 1). A little less than half the women (44 per cent) and over a quarter of men (28 per cent) are illiterate. 73 per cent of women have not completed secondary education, whereas the corresponding number for men is 61 per cent. About a quarter of the respondents are from lower caste (Scheduled Caste (SC)), about 16 per cent from Scheduled Tribe (ST), nearly half are classified officially as Other Backward Class (OBC), and about 9 per cent from the higher caste. At 87 per cent, rural areas are over-represented in our sample.

Women typically marry and have children at a younger age than men but enter the workforce later (Table 2). Around half the women in our sample married by 18, whereas the median male marriage age is 22. On average, women have their first childbirth at 20 years, compared to 25 for men [6]. The average gap between marriage and first childbirth is two years for both genders. Among those who ever participate in the workforce, men typically join just before turning 18, while women enter on average after 19. This delayed women's labour force entry applies to both paid employment and contributing family work.

The context of marriage and childbirth differs significantly between Indian and developed countries, where most motherhood penalty studies have been conducted. Marriage and childbirth are substantially earlier in India and several developing countries as compared to developed countries (Table A1). The median marriage age in India and several

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[6]Age at these events for women in our sample aligns with national statistics from the National Family and Health Survey (NFHS 2015-16), indicating an average marriage age of 18.1 years and first childbirth at 20.6 years in rural India

South Asian and African countries falls between 16-21 years, whereas first marriages in richer countries occur much later, between 28-33 years. Marriage and childbirth are universal in India, whereas many choose not to marry or not have children in developed countries(Singh et al., 2023; Bloome and Ang, 2020; Rindfuss et al., 2022)[7]. Nearly all families in lower- and middle-income countries have children after marriage, unlike in several developed countries (Kleven et al., 2023). The gap between marriage and first childbirth is shorter, and women experience first childbirth early in their lifetime. The median age at first birth in poorer countries is in the early twenties, compared to nearly a decade later (around 30 years old) in wealthier nations[8].

India is also substantially different from developed countries and even some other developing countries in terms of women's labourforce participation, level of informality and dependence on agriculture for livelihood. Women's labourforce participation is notably low in India (20 percent vs. close to 50 percent in most other countries). India also has a significantly higher informal employment share than most developed countries. Nearly 90 percent or more women in South Asia and some African nations work informally (lacking social security or contracts), while this proportion is less than 5 percent in wealthier countries. Generally, informality decreases with increasing per capita GDP. Similarly, the share of working women in agriculture is substantially higher in poorer countries. Over half of working women in South Asian nations are engaged in agriculture, whereas this number falls below 1 per cent in developed countries.

Given this starkly different context, we find a distinct impact of marriage and childbirth on women's employment than those obtained in developed country settings. In our sample of rural individuals, women experience a sharp jump in workforce participation in the years

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[7]In the sample, almost everyone is married by the age 25.

[8]These differences are starker when we examine rural India, from where our sample is, as compared to the overall country.

after marriage, from 27 percent in the year preceding marriage to an average of 49 percent in the first five years of marriage. This employment is primarily as contributing family workers or informal agricultural work (Table 3). The corresponding change is smaller for men, from 88 to 94 per cent. Among men, the share engaged in paid work increases while those in contributing family work decreases after marriage. For women, the reverse is seen, with contributing work increasing from 36 percent pre-marriage to 41 percent after marriage. Formal work among working women is already low pre-marriage at 9 per cent and drops to 6 per cent post-marriage. There is an increase in self-employment and agricultural paid work among women who do paid work.

Women also experience a jump in workforce participation after first childbirth, but it is far smaller in magnitude (Table 4) compared to the increase seen after marriage. Women's workforce participation increases from 45 percent one year before childbirth to an average of 51 percent in the first five years after childbirth. Men's involvement, which is already high, increases by only two percentage points. There is an increase in paid work participation for both men and women and a slight decline in contributing family work. The extent of formal work sees a minor increase for both men and women, while within informal work, self-employment sees a small increase.

4.2 Impact of life events on participation in employment

In this section, we present the estimates of the impact of marriage and childbirth on labour market outcomes for men and women. We start by showing the impact of each event separately, estimates of equation 1, for the full sample and by excluding families who have their first child within two years of marriage to help disentangle the impact of the two events as done by Berniell et al. (2022); Kleven et al. (2023). We next consider the joint estimate of the two events (estimating equation 5).

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We estimate Equation 1 and 5 separately for men and women. We present all results using figures for simplicity. The y-axis in the figures in this section shows the estimates of P_τ, i.e., the scaled event time coefficients at each point of time relative to the event. These can be interpreted as the proportionate change in participation compared to the year before the event ($\tau = -1$), having controlled non-parametrically for age and time trends. The figures include 95 per cent confidence interval bands around the event year coefficients.

At the time of marriage, women experience a sharp increase in participation in work by more than 50 per cent, while men experience no significant change in participation rates after marriage (Figure 1). This holds true even after excluding families who had children within two years of marriage, indicating that the impact of marriage might not necessarily be confounded with motherhood. In the years following the initial increase, the levels do not fall back; instead, there is a gradual increase from this initial jump. In the fifth year of marriage, the participation rates for women are double what they were one year before marriage, while the corresponding rate for men has barely changed compared to the year before marriage. The parallel trends assumption holds - the labour force participation of men and women evolve almost parallel until marriage.

One year after first childbirth, women experience a significant increase in participation in work by about 10 per cent in the first year and increasing in later years, while men experience no significant change in participation rates after marriage (Figure 2). This impact loses significance, and the magnitude reduces for the sample excluding families with children within two years of marriage. In addition, the parallel trends assumption pre-childbirth does not hold in both samples. Women's labour participation differs significantly from men's before childbirth before first childbirth. Women experience a substantial increase pre-childbirth, potentially driven by the impact of marriage, whereas men see no significant pre-trend. This indicates that the impact of childbirth might be confounded with

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marriage. The joint event study will help disentangle the impact of marriage and childbirth.

The joint event study shows no significant impact of first-child birth on women's participation in the five years after childbirth compared to the year before childbirth. Marriage leads to a sharp increase in the participation rate of marriage in the year of marriage and continues over the next five years compared to the year before marriage (Figure 3). Women's labour force participation increases by 74 per cent in the year of marriage compared to one year before marriage, and by five years after marriage it is more than double that of before marriage. In the year of childbirth, there is a small decline of 5 per cent in the participation rate of women, but this is not statistically significant. Women's participation increased in the fourth and fifth years after childbirth, but this is not statistically significant. Men's participation does not change as a result of either of the events. There are no pre-trends before both events - women's and men's participation in the labour market evolves parallel, and there are no significant differences between them.

Paid work and contributing family work (unpaid work) both increase after marriage, but there are no statistically significant changes in the participation of women after childbirth (Figure 4). Both paid and unpaid work participation experience sharp jumps upon marriage. The next few years after marriage sees a further increase in paid work, whereas unpaid work stagnates after the initial jump. Paid work witnesses a statistically insignificant increase two years after childbirth, whereas contributing family work witnesses a statistically insignificant decline.

Figure 5 shows the evolution of informal and formal employment rates among men and women. In the year of marriage, women's participation in informal work increases significantly, but formal work participation experiences no significant change. Men's participation in both types of work witnesses no significant change in any year post-marriage. Women experience an immediate increase in participation in informal work by 82 per cent

in the year of marriage compared to the year before marriage. Within informal work, participation in self-employment and casual work witnesses a sharp increase in the year of marriage and continues in the five years after marriage (Panel c and d in Figure 5). Most of this increase in women's participation after marriage is seen only in the agricultural sector and not the non-agricultural sector. There is no significant difference in the pre-marriage trends in informal and formal work for both men and women. Informal employment rates experience a statistically insignificant increase after childbirth. Formal, self-employment and casual work do not experience significant changes after childbirth. (Figure A1).

4.3 Robustness

We perform several robustness tests on these results.

4.3.1 Balanced Sample

One concern for our identification strategy is that the sample is not balanced, i.e., the individuals we do not observe the same individuals every year. This is because we have different numbers of years of data pre and post-events depending on the age at which events occurred in respondents' lives and the respondent's current age. For example, for a respondent who married at 18, we have only 3 years of information prior to marriage as we collect information starting from the age of 15. For someone 22 years of age at the time of the survey and married at 20, we have information for seven years before marriage and only two years after marriage.

To account for this, we could use a balanced sample. Such a sample would have individuals we have information on for at least five years before and after the event. This would restrict our sample to individuals who got married or had children at 20 or older. This would change the sample's size and composition substantially since most women in

our sample married before 20, and a large proportion gave birth to their first child before 20. So, we instead first check on predetermined variables and then limit the sample to only respondents for whom we have information for all five years post the events.

Following Berniell et al. (2021), we show that predetermined characteristics of women and men - for instance, parents' education and childhood socioeconomic status - do not change across the event time periods. The predetermined characteristics are smooth around the event time and are stable across event time (Figure A2). Further, we find that if we restrict our sample to only respondents for whom we have information for all five years after the event, our results do not change (Figure A3).

4.3.2   Additional Controls

Following Kleven et al. (2019) the baseline model includes only age and year fixed effects in addition to the event dummies as independent variables. To test robustness of our estimates to inclusion of other variables we estimate models with additional controls. These include controls for individual and household characteristics (e.g., number of children, household structure - co-residence with parents, in-laws, spouse, and other household members in the household for each year), time-invariant characteristics (e.g., education, caste/religion), and Primary Sampling Unit (PSU) fixed effects. Results from this analysis are similar to those of our baseline model - marriage leads to an increase in women's participation whereas childbirth has no significant impact.

5   Heterogeneity in Impact

In order to understand the mechanisms through which the change in labour participation happens, we explore whether the impact varies across different individual and household

characteristics.

To do this we estimate the results of the following interaction model

$$Y^g_{is\tau_m\tau_c} = \sum_{m\neq-1} \beta^g_m.I[m=\tau_m] + \sum_{c\neq-1} \beta^g_c.I[c=\tau_c] + \sum_k \alpha^g_k.I[k=age_{is}]$$
$$+ \sum_y \gamma^g_y.I[y=s] + \delta.Z_i + \mu_m.Z_i.I[m=\tau_m] + \mu_c.Z_i.I[c=\tau_c] + \varepsilon^g_{is\tau}$$
(3)

where Z_i is the vector of individual and household controls and we include interaction terms between event time dummies (τ_m and τ_c) and select individual and household attributes in Z. Z includes age at the time of event, women's education, current age of the respondent, social group of the respondent, wealth status of the household (below or above median), employment status of the women's mother during her childhood, household structure at the time of the event and spouse's education. The coefficients on these interaction terms μ_m and μ_c can be interpreted as the heterogeneous impact in the particular event time of the individual/household attribute Z_i on employment outcome. We present the results in the form of margin plots of these coefficients.

5.1 Impact of marriage by work status of women's mother

Women whose mothers were reported as working in their lifetime were far more likely to experience an increase in work participation than women whose mothers were not working, even after controlling for a range of other factors (Figure 6). Before marriage, the participation rates of the two groups are not statistically different, but one year after marriage,

they differ. Women whose mothers have worked experience a sharp jump the year after marriage and have significantly higher participation rates than women whose mothers did not work. Both samples of women (whose mothers worked and did not work) experienced no significant change in participation upon childbirth and a small increase a few years after childbirth.

5.2 Impact of life events by household wealth levels

We categorise households below the median and at or above the median asset index.[9] Figure 7 shows the differential impact of life events among these two groups. Before the events, there was no statistically significant difference in the participation rates of women between the two groups. Both groups experience an increase after marriage and a lower and insignificant increase after childbirth. However, upon marriage, the magnitude of the increase is significantly higher for the poorer group. From the second year after marriage, participation rates among poorer households are significantly higher than among women from richer households. After childbirth, differences in participation in the two groups are statistically insignificant.

5.3 Impact by age at the time of life events

Figure 8 compares the impact of life events on women's participation in the labour market based on their age at the time of marriage. Women who were married at or before 18 years of age, and those who were married later experience a jump in participation on marriage,

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[9]The survey collected information on amenities available with each household (fridge, washing machine, television, car, mixer, tractor, etc.) as well as details of the household structure (number of rooms, type of material used for walls, flooring and roof). We used a principal component analysis to combine these indicators and constructed an asset index for each household

but the increase in magnitude was larger for women who got married earlier[10] The participation rates are similar before marriage and differ significantly in the third and fourth years of marriage. For women who have their first child before 21, there is a trend of increase in participation after childbirth, but this is insignificant, whereas, for mothers who have their first child at 21 or later, the trend is for a decrease in participation in the years after childbirth.

5.4 Impact of life events by location

There is significant heterogeneity in the extent, not necessarily the direction, of the impact of life events in the two states A5. Women in both states experience an increase in participation on marriage but the magnitude is far higher in Karnataka (the relatively less conservative gender norms state) than Rajasthan. Women in Karanataka experience a 100 per cent jump in year of marriage and this increases to about 250 per cent five years after marriage as compared to year before marriage. On the other hand, Rajasthan experiences a jump in women's participation of around 70 per cent in year of marriage and this increase remains stable in the next five years. On childbirth, women in Karnataka experience a significant decline in year of childbirth and insignificant changes in next few years as compared to year before childbirth. In Rajasthan there are no significant changes in women's participation after childbirth.

We also investigate heterogeneity in the impact of women's education, age cohort, household structure at the time of marriage, gender of the first child and spouse's education level. Though there are some differences along these parameters, there are no significantly different trends in changes in participation upon marriage based on these characteristics.

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[10]For women married before 18, we have information on their labour market participation only for a maximum of two years prior to marriage as we collect employment information on individuals only from 15 years of age.

Notably, across most of the heterogeneous groups, we observe that there is a significant increase in work participation after marriage. What differs between different groups is the magnitude of that increase. Women from poorer households, whose mothers worked and who married earlier experienced a larger increase in participation after marriage. Examining the heterogeneity of the impact of childbirth, we observe similar patterns, but differences between groups are muted.

6 Discussion

This paper investigates the impact of key life events on women's labour outcomes in rural India. We find a consistent, sharp jump in women's work participation upon marriage that continues even five years after marriage across all groups of women. Both paid work and contributing family work increase after marriage. Informal paid work (self-employment and casual work) increased, but formal work participation does not change significantly after marriage. First childbirth has no significant impact on women's work participation.

6.1 Impact of marriage on labour market outcomes

The specialization theory by Becker (1981) has been used extensively to explain the division of labour within a household, especially in developed country settings. The theory hypothesizes that couples pursue a joint, household-level strategy in which they divide labour to maximize household well-being, with each partner spending more time in the activities in which she holds the comparative advantage. To maximize household income, the couples allocate more time and energy to the male partner to market activities, while the female partner focuses on domestic activities. Whereas this intra-household specialization in market activities leads men to become more productive than single men (explaining why

men earn a marriage premium), specialization in domestic activities makes women less productive in employment and therefore, pay a penalty.

Is this specialization model useful for understanding the impact of marriage in a poor informal economy like rural India? Contributing through economic activity is important in resource-scarce households. Gorman (2000) shows that married men and women consider pay a more important job characteristic than unmarried men and women. This might make women join the workforce or make more effort to get higher pay by looking for better-paying jobs. For men, the literature suggests that married men earn more than single men, even after accounting for selection issues (Casale and Posel, 2010; De Hoon et al., 2015; Antonovics and Town, 2004). For women, the empirical evidence in developing countries is scarce on this topic. Even in developed countries, the impact on women's labour market outcomes of marriage is less established. Recent literature in developed countries has actually found a marriage premium for women (Juhn and McCue, 2017; McConnell and Valladares-Esteban, 2021; Waldfogel, 1998; Killewald and Gough, 2013) and even in Colombia (Coavas Blanquicetta and Gómez Duarteb, 2016). This goes counter to the prediction of the specialization theory.

In the rural Indian context, two additional aspects could impact labour market outcomes on marriage - the early age of marriage and the informal (agricultural) economy. The average age at marriage for women in our sample is 18 (median is 17) (Table 2). This is almost a decade earlier than the age of marriage in developed and Latin American countries (Table A1). Due to the widespread practice of patrilocality, girls move after marriage to the husband's home and are given responsibilities to manage the family and their own lives. An important need in rural households is labour resources. Newly married women contribute to this by working outside the household or contributing to family farms. This is evident in our results that show a higher jump on marriage in work participation among

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poorer households than richer households. Indian rural economy is more than 90 per cent informal and mostly dependent on agriculture. Agricultural work, whether on own or others' farms, is associated with ease of entry and is more compatible with doing household chores alongside, compared to salaried or non-agricultural wage work. Hence, agriculture becomes an important entry point for women into the labour market.

Another possibility is that norms about women's work and mobility restrict unmarried women from working. An unmarried girl is more constrained in mobility and working outside the home to maintain her and her family's "honour". Upon marriage, this constraint relaxes a bit, and she is "allowed" to work in a household or on other farms to support the household. Unfortunately, we do not have any direct evidence through opinion surveys or data to investigate this possibility fully. Recent literature uses correspondence-style studies in online marriage matching platforms to show that women who work before marriage are less likely to attract male suitors than those who do not work before marriage (Dhar, 2021; Afridi et al., 2023). Afridi et al. (2023) shows that this marriage market penalty is higher among less educated women. These findings might explain the low work participation levels before marriage among women.

Our results are also validated by a simple cohort analysis of women's labour force participation in rural areas. Using national representative survey data from 2022-23 Periodic Labour Force Survey (PLFS), Chawla and Singh (2024) show that there is a sharp jump in participation in rural areas between the cohort 15-19 (pre-marriage age) to 20-24 (post-marriage age)[11]. Less than 10 per cent of the 15-19 age group women are part of the labour force, whereas this number is close to 25 per cent for the 20-24 age group. Using cross-sectional data from 1983 to 2018 Abraham (2023) also finds an inverted U-shape between

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[11]Since marriage in India in universal and most women get married by 20, we assume that 15-19 age group is mostly unmarried women whereas 20-24 age group consisted of mostly married women. The conclusions hold even if we look at the next cohort, the 25-29 age group, as it also experiences a jump in participation.

age and participation rates for women. Participation increases with age up to 40-44 age group and then declines. These results align with the jump in participation observed in the event study after marriage.

6.2 Impact of childbirth on labour market outcomes

Several theories attempt to explain the motherhood penalty observed in developed economies. These include skill depreciation due to care giving breaks (Gangl and Ziefle, 2009; Aisenbrey et al., 2009), selection into lower-paying but care-compatible jobs (compensating differentials theory) (Fuller and Hirsh, 2019; Goldin, 2014), reduced work effort (Anderson et al., 2003), and employer discrimination against mothers (Correll et al., 2007; Bedi et al., 2022). Additionally, gender norms (Moriconi and Rodríguez-Planas, 2021) and family policies (Budig et al., 2012, 2016; Halldén et al., 2016) influence mothers' labour market participation. Finally, the level of development and economic structure are crucial factors that further determine how motherhood impacts labour outcomes (Agüero et al., 2020; Agüero and Marks, 2011; Aaronson et al., 2021; Godefroy, 2019). Notably, most of this research focuses on the formal, non-agricultural country context like the US or European countries. The present study sheds light on the applicability of these theories in the unique context of rural India, characterized by informality and dominance of agricultural work.

The theory of human capital Becker (1985) predicts that work experience is a form of on-the-job training and the loss and non-accumulation of human capital during child-related employment breaks or reduced working hours leads mothers to be less productive and bear a motherhood penalty (Gupta and Smith, 2002; Budig and England, 2001). In a mostly agricultural, informal economy where women are largely involved in menial physical labour, the role of human capital and loss of experience due to breaks is limited, so we expect this mechanism to have a limited impact on mothers.

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Mothers might prefer to work in "mother-friendly" jobs that offer flexible hours, fewer travel demands, and other benefits, and employers might pay lower wages for these jobs, leading to the motherhood penalty (Budig and England, 2001; Jones et al., 2023). Mothers might move to more flexible jobs from more fixed-hour jobs, and if the economy offers more flexible jobs, the impact of motherhood on women's labour market outcomes would be limited (Berniell et al., 2023, 2021). On the other hand, informal jobs offer flexibility regarding the number of work hours, when, where, how, and to what extent one can engage in these jobs. Additionally, given limited human capital requirements, the costs of entry and exit from such types of jobs are low to non-existent. For example, women can choose to participate in daily wage work on others' farms for a few days during harvest season or choose to work on a daily basis. The skills required for many daily wage jobs can be gained easily. Daily wages are more or less unrelated to workers' experience and other individual attributes.

The 'New Home Economics' of Becker (1981) Mincer (1962) and others argue that mothers may be less productive on the job than non-mothers because they are tired from home duties or because they are "storing" energy for anticipated work at home. However, there is little research evidence to show whether and to what extent this theory plays a role (Budig and England, 2001).

Employers might prefer men and non-mothers in recruitment, placing mothers in less rewarding jobs, or promoting and paying them less. This has been confirmed using experimental methods in formal labour markets in urban India (Bedi et al., 2022) and several developed world contexts (Correll et al., 2007; Wuestenenk and Begall, 2022). This explanation, however, may not be relevant in an informal economy.

The final theory we discuss is related to the economy's structural transformation (Agüero et al., 2020; Kleven et al., 2023; Goldin, 1994). At low levels of development, the economy

is close to subsistence levels, and most of the population is working in agriculture or the informal sector. In such economies, women in most households must participate in economic activity for sustenance. With development, the structure of the labour market changes - jobs in manufacturing and services sectors grow and tend to be more formal (Herrendorf et al., 2014). These jobs have fixed hours, higher human capital requirements and are located away from home, making them less conducive compared to agriculture and informal jobs in performing childcare and household responsibilities. Goldin's U-shaped hypothesis (Goldin, 1994) documents a change in women's participation in the labour market with structural changes in the economy but does not directly take childcare responsibilities into account.

Recent literature in developing countries shows that there is no significant impact of motherhood on labour supply at low levels of development (Agüero et al., 2020; Agüero and Marks, 2011; Aaronson et al., 2021; Godefroy, 2019; Kleven et al., 2023). This holds true even when examining historical data for developed countries (Kleven et al., 2023; Aaronson et al., 2021). Agüero et al. (2020) find that self- employment, working from home, occupational segregation, and seasonal work account for very little of the family penalty in low-income countries. Heath (2017) also provide suggestive evidence that demand for greater flexibility drives women's switch to self-employment. Kleven et al. (2023) analyze child penalties in 134 countries using pseudo-event studies and find that child penalties are negatively associated with agriculture while share of industry, services, formalization, salaried work and urbanization are positively associated with child penalties. In Nicaragua, Behrman and Wolfe (1984) find that women's participation in employment is less affected by the presence of young children than in developed countries with the presence of informal employment arrangements and family-based childcare explaining the mitigated impact. (Berniell et al., 2023) show that in Chile, mothers in informal

jobs find the flexibility needed for family-work balance and the fall in women's employment is mainly explained by declining salaried employment. Using Mexican census data Schmieder (2021) finds no negative employment effects of an instrument-induced increase in fertility and instead mothers move to the informal sector.

One reason for this might be that as time spent with a child is a "luxury good" (Guryan et al., 2008; Dotti Sani and Treas, 2016), households - and mothers - spend less time in childcare in developing countries, reducing the time cost of children (Aaronson et al., 2021). Along similar lines Heath (2017) develops a theoretical model in which a woman can make either time or monetary investments in a child. The model predicts that children decrease women's leisure time but depending on the relative effectiveness of time versus monetary investments in children, women either increase their labour supply and use the earnings to focus on financial investments in children or decrease their labour supply to invest time into children. As long as the returns to monetary investments in children are high, households might find it valuable for both parents to work outside the home. In rural India, given the low education level of mothers, households likely decide that investing in children through monetary investments is more effective than time investments. In India, we find that a rise in women's education is accompanied by a rise in her returns to home production thereby constraining her participation in employment. This is aligned with similar findings in other papers that find a U-shaped relationship between women's education and their time spent on home production Afridi et al. (2024)

In the rural Indian context, women on average, have low levels of education and are mainly engaged in physical tasks in agriculture that provide flexibility in work hours. The employment is seasonal and requires little training and there is relatively low impact on skills or productivity due to absence from work. Agricultural employment is also conducive with care responsibilities. These employment characteristics could explain our results of

null impact of childbirth on women's economic activities.

Our paper has a few limitations that we discuss. In retrospective data, there are concerns of inaccurate recall affecting the results. We address this by carefully trained enumerators to pictorially depict the timeline of key life events and pay extra attention to data close to the life events to minimise errors. Our estimations using younger women in our sample with shorter recall periods also show similar patterns to the overall sample. This points towards less likelihood of recall error. The descriptive cohort analysis discussed in section 6.1 using national data also points towards a jump in participation after the marriage age, validating our results. However, we cannot fully rule out the possibility of recall error without access to long-term panel data.

Another explanation for the jump in labour participation post-marriage is that women drop out of the labour market the year before marriage in anticipation of the event. This could be due to the stigma of working outside or to prevent association with strangers. However, our event study graphs show there is no statistically significant change in women's participation in the years before marriage.

We lack wage or hours of work data to investigate the change in the intensive margin of work. It is possible that after marriage, the participation rate increases and stays the same post-childbirth but with a reduced number of hours. Most of the literature on the motherhood penalty in developed countries investigates changes in wages. Given the nature of our recall-based data, we did not ask for wage or hours information as it would not have been reliable.

7 Conclusion

Using a unique dataset on the lifetime histories of women, this paper contributes to the nascent literature on life events and women's employment in developing countries. Our study evaluates the impact of major life events - marriage and childbirth - on women's labour market participation in rural India. We find that labour market participation increases drastically upon marriage, and women do not face a 'motherhood penalty' in terms of participation in employment.

The rural Indian context is similar to low-income countries with high levels of informal employment dominated by the agricultural sector. Literature in these settings has found the non-existence of child penalty (Agüero et al., 2020). At the same time, there are important differences along several dimensions including an early age of marriage and childbirth, and conservative social norms. Further, norms of mobility and labour market participation among unmarried women and married women differ with relatively higher constraints on participation among the former group.

Although we do not find a 'motherhood penalty' and there is no apparent conflict between employment and childbirth, the continuation of women in employment immediately after childbirth could reflect distress. Several aspects of our study confirm this. First, the increase in employment after marriage which continues even after childbirth is largely in informal employment, i.e. self-employment or casual wage work. Formal employment, i.e. regular salaried employment is unchanged. Second, the increase is larger among poorer households. These suggest that for most women, paid work is imperative not an option.

The organisation of the rural labour market and the types of employment - informal and agricultural, allows for the joint production of reproductive and productive work. However, the demand for women's reproductive work entails a compromise on the quality of the paid

work that they engage in. Not surprisingly, joint production also entails a compromise on childcare. Chowdhury et al. (2021) find early weaning among 59 % of working mothers with exclusive breastfeeding is more likely among those in home-based work, which was the least paying among occupations. Chari et al. (2019) find that India's workfare scheme, the National Rural Employment Guarantee Programme (NREGA) was associated with increased newborn mortality among the sample of women eligible to participate in the programme. Employment during pregnancy and early childbirth compromise maternal and foetal health. Qualitative studies among NREGA workers describe the costs of this employment in terms of compromised childcare as outweighing the benefits, even describing employment as 'disempowering' (Nair et al., 2014). Our findings suggest a nuanced and contextual understanding of how life events affect women's employment patterns. In particular, a lack of motherhood penalty is not always cause for celebration.

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Table 1 Summary Descriptives at τ=-1

	Gender of Respondent		
	Men	**Women**	**Total**
	%	*%*	*%*
Education			
Not Literate	27.9	45.8	38.9
Primary or below	15.4	15.4	15.4
Middle	18.0	14.0	15.6
Secondary	16.1	14.2	14.9
Higher Secondary	10.6	6.6	8.2
Above Higher Secondary	12.1	4.0	7.1
Caste			
SC	24.4	25.9	25.3
ST	15.5	15.8	15.7
OBC	51.6	50.5	50.9
Others	8.4	7.8	8.1
State			
Karnataka	54.5	61.8	59.0
Rajasthan	45.5	38.2	41.0
Total	1312	1766	3075

Source: India Working Survey

Table 2 Age of respondent at various life events

	Men			Women		
	Mean	Median	SD	Mean	Median	SD
Respondents age	35.09	35	6.47	32.59	32	7.18
Age at marriage	22.65	22	4.79	18.1	17	3.27
Age at first childbirth	25.23	25	4.52	20.01	20	3.25
Gap between marriage and childbirth	2.64	2	2.39	2.13	2	2.3
Age at entry in workforce	17.82	15	4.55	19.27	17	5.43
Age at entry in paid work	19.11	17	5.35	20.22	18	6.27
Age at entry as contributing worker	17.12	15	4.01	19.32	18	5.23

Source: India Working Survey (IWS)

Note: The table presents age of the respondent at various key life events in the rural sample. The average age for the events are conditional on that respondent experiencing the event. For example, the average age of entry into workforce is calculated only among those individuals who ever enter the workforce.

Table 3 Labor market participation before and after marriage

	Men				Women			
	One year before marriage ($\tau=-1$)		Average from marriage to five years after childbirth ($\tau=0$ to $\tau=5$)		One year before marriage ($\tau=-1$)		Average from marriage to five years after marriage ($\tau=0$ to $\tau=5$)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Work force	0.88	0.32	0.94	0.25	0.27	0.45	0.49	0.5
Distribution of workers								
Paid work	0.86	0.34	0.91	0.29	0.64	0.48	0.59	0.49
Contributing family work	0.14	0.34	0.09	0.29	0.36	0.48	0.41	0.49
Distribution of paid workers								
Formal paid work	0.13	0.34	0.14	0.34	0.09	0.29	0.06	0.23
Informal paid work	0.87	0.34	0.86	0.34	0.91	0.29	0.94	0.23
Distribution of paid workers in informal sector								
Casual paid work	0.5	0.5	0.46	0.5	0.71	0.46	0.69	0.46
Self employed	0.5	0.5	0.54	0.5	0.29	0.46	0.31	0.46
Distribution of paid workers across sectors								
Agricultural paid work	0.53	0.5	0.54	0.5	0.67	0.47	0.74	0.44
Non-agricultural paid work	0.47	0.5	0.46	0.5	0.33	0.47	0.26	0.44

Source: India Working Survey (IWS)
Note: The table presents proportion of individuals who participate in the workforce and various forms of work one year prior to marriage and the average participation from the year of marriage to five years after marriage for men and women.

Table 4 Labor market participation and household structure before and after first childbirth

	Fathers				Mothers			
	One year before first childbirth (τ=-1)		Average from childbirth to five years after childbirth (τ=0 to τ=5)		One year before childbirth (τ=-1)		Average from childbirth to five years after childbirth (τ=0 to τ=5)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Work force	0.94	0.23	0.97	0.18	0.45	0.5	0.51	0.5
Distribution of workers								
Paid work	0.91	0.29	0.93	0.25	0.57	0.5	0.59	0.49
Contributing family work	0.09	0.29	0.07	0.25	0.43	0.5	0.41	0.49
Distribution of paid workers								
Formal paid work	0.12	0.32	0.13	0.34	0.05	0.22	0.07	0.25
Informal paid work	0.88	0.32	0.87	0.34	0.95	0.22	0.93	0.25
Distribution of paid workers in informal sector								
Casual paid work	0.48	0.5	0.45	0.5	0.7	0.46	0.68	0.47
Self employed	0.52	0.5	0.55	0.5	0.3	0.46	0.32	0.47
Distribution of paid workers across sectors								
Agricultural paid work	0.54	0.5	0.55	0.5	0.76	0.43	0.71	0.45
Non-agricultural paid work	0.46	0.5	0.45	0.5	0.24	0.43	0.29	0.45

Source: India Working Survey (IWS)
Note: The table presents proportion of individuals who participate in the workforce and various forms of work one year prior to first childbirth and the average participation from the year of childbirth to five years after childbirth for men and women.
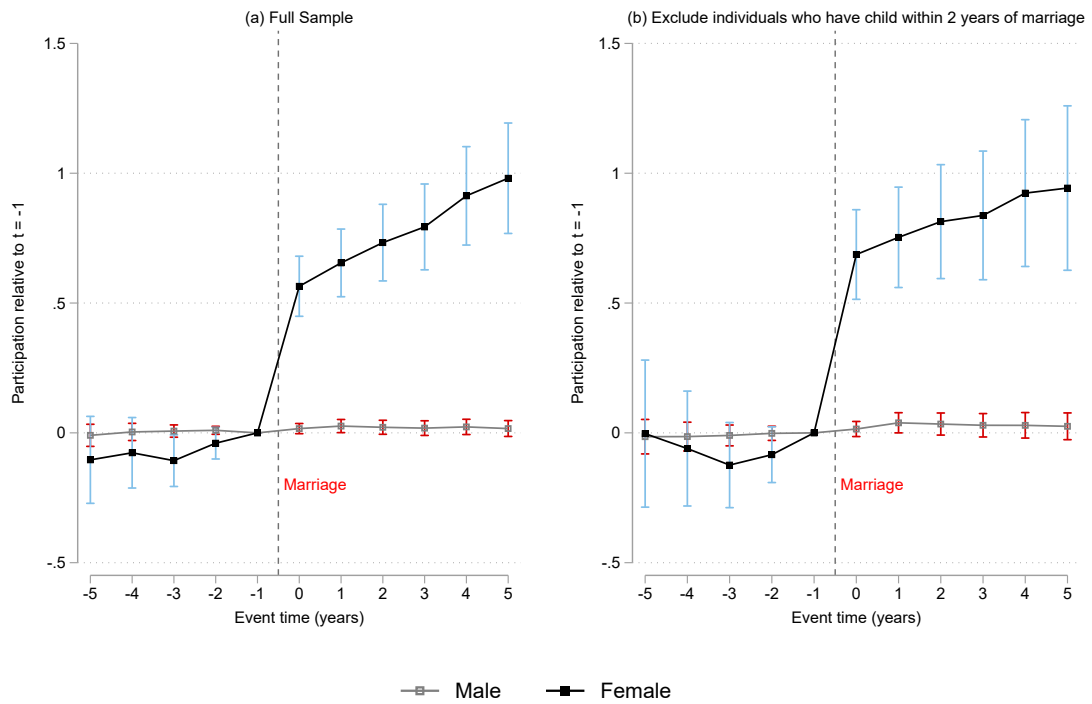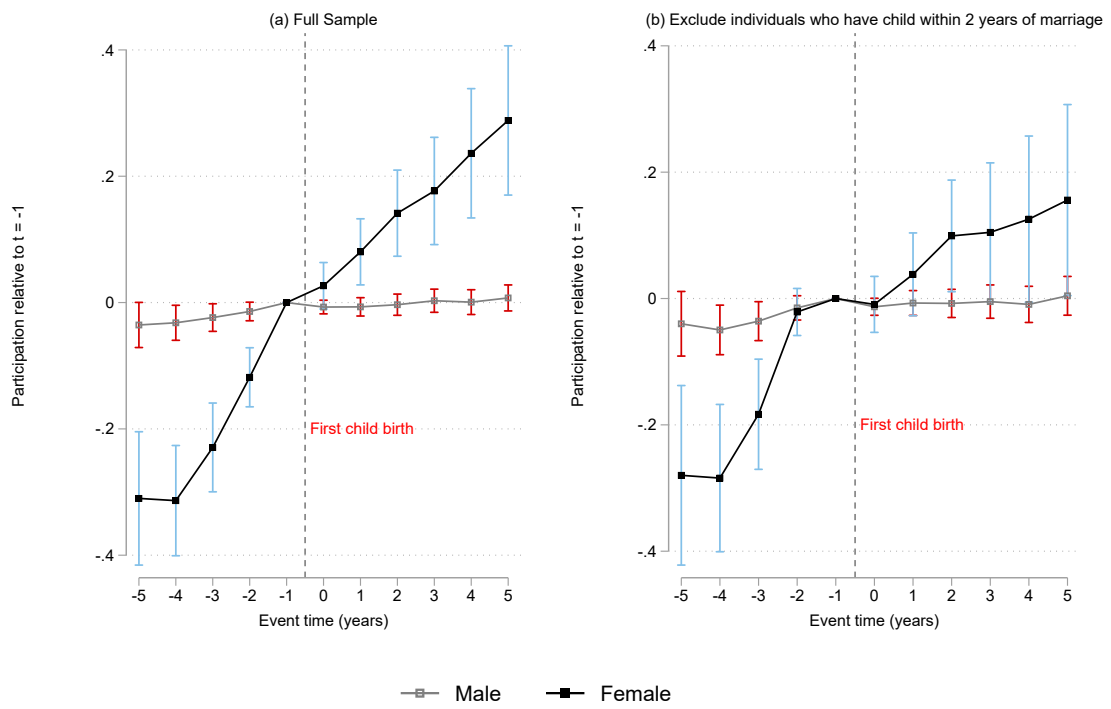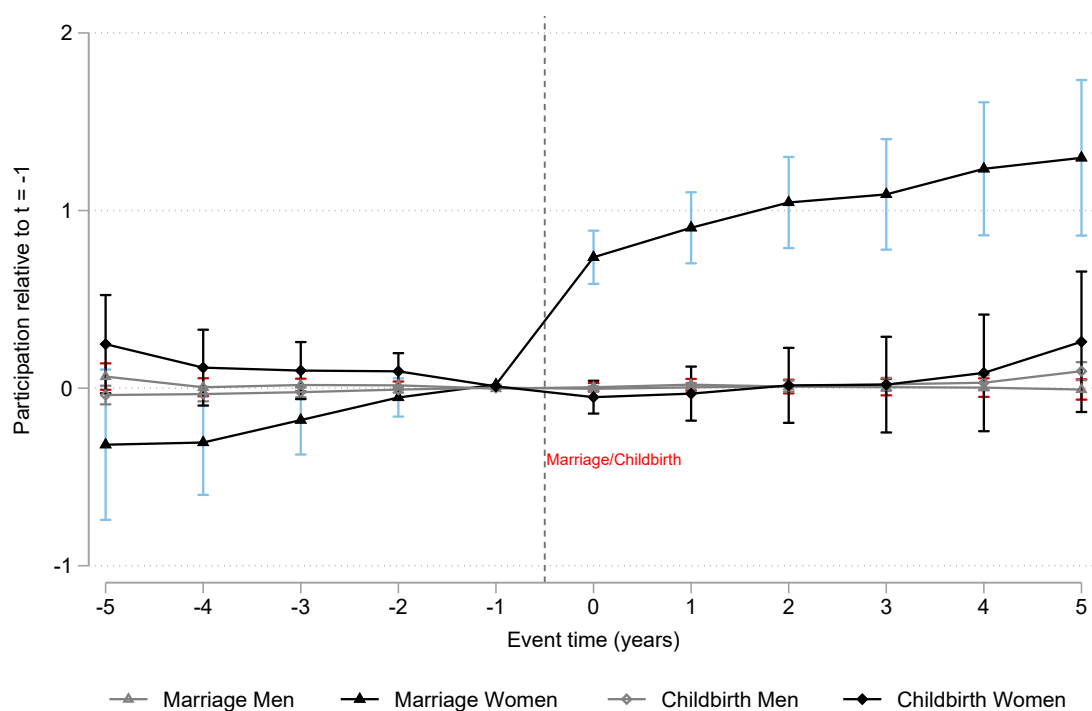
Figure 1: Impact of marriage on overall work force participation

Note: The figure shows, for men and women separately, the estimated impacts of marriage on overall work participation rates. The Y-axis is the scaled coefficients P_τ that measure the impact of marriage as a percentage of the counterfactual outcome relative to the year before marriage. Calendar-year and age-in-year fixed effects are controlled in the regression. Calculations are based on data from the India Working Survey(IWS). Standard errors are clustered at the individual level.

Figure 2: Impact of first childbirth on overall work force participation

Note: The figure shows, for men and women separately, the estimated impacts of first childbirth on overall work participation rates. The Y-axis is the scaled coefficients P_τ that measure the impact of childbirth as a percentage of the counterfactual outcome relative to the year before childbirth. Calendar-year and age-in-year fixed effects are controlled in the regression. Calculations are based on data from the India Working Survey(IWS). Standard errors are clustered at the individual level.
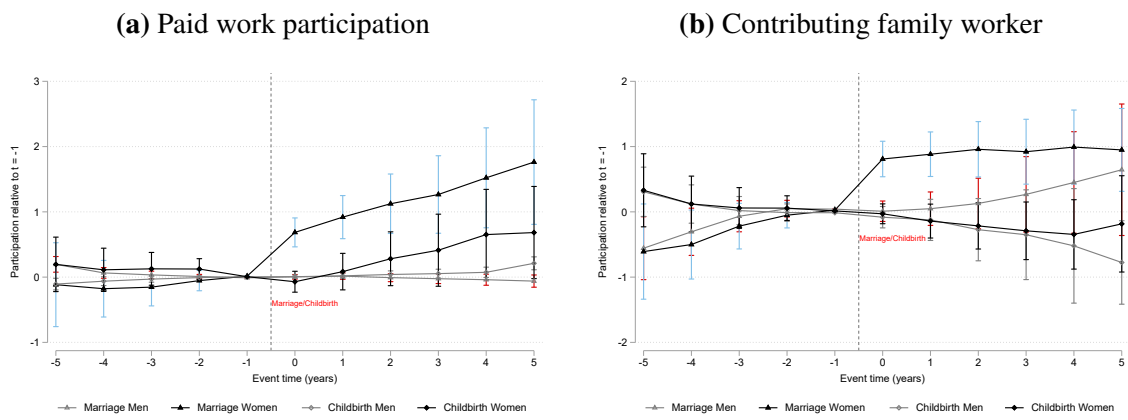
Figure 3: Impact of marriage and first childbirth on overall workforce participation

Note: The figure shows, for men and women separately, the estimated impacts of marriage and childbirth on overall work participation rates. The Y-axis is the scaled coefficients P_τ that measure the impact of marriage and childbirth as a percentage of the counterfactual outcome relative to the year before marriage and childbirth, respectively. Calendar-year and age-in-year fixed effects are controlled in the regression. Calculations are based on data from the India Working Survey(IWS). Standard errors are clustered at the individual level.

**(a)** Paid work participation   **(b)** Contributing family worker

Figure 4: Impact of marriage and first childbirth in paid and contributing family work participation

Note: The figure shows, for men and women separately, the estimated impacts of marriage and childbirth on paid work participation rates (a) and participation as contributing family workers (b). The Y-axis is the scaled coefficients P_τ that measure the impact as a percentage of the counterfactual outcome relative to the year before marriage and childbirth. Refer to Figure 3 for the list of controls. Calculations are based on data from the India Working Survey(IWS). Standard errors are clustered at the individual level.
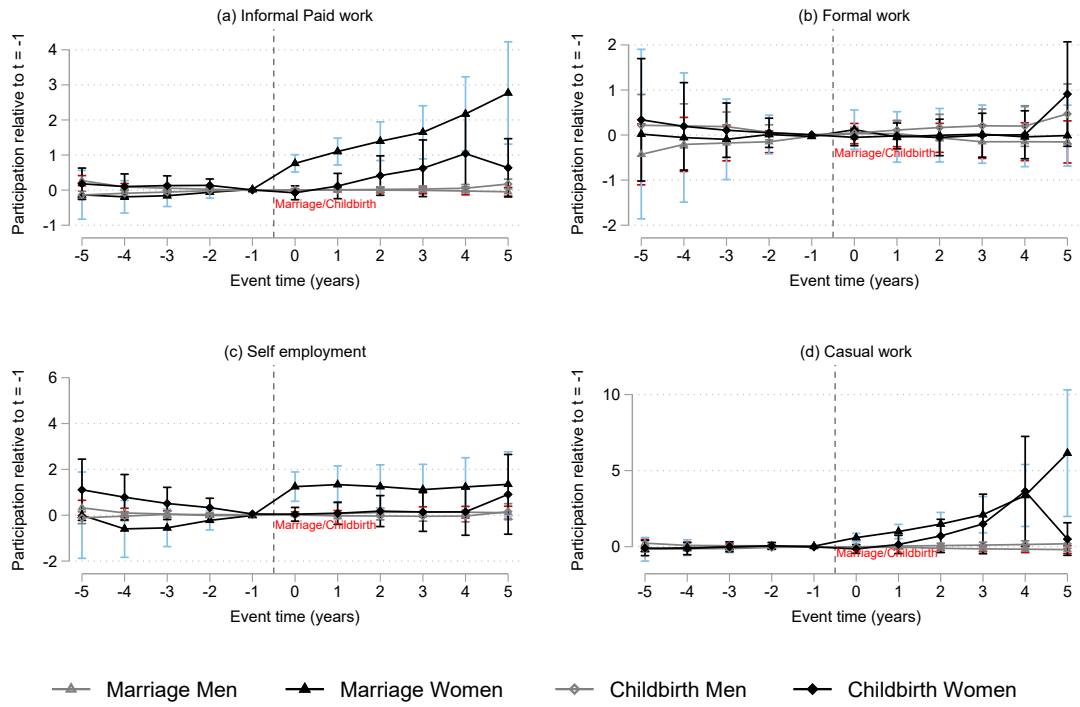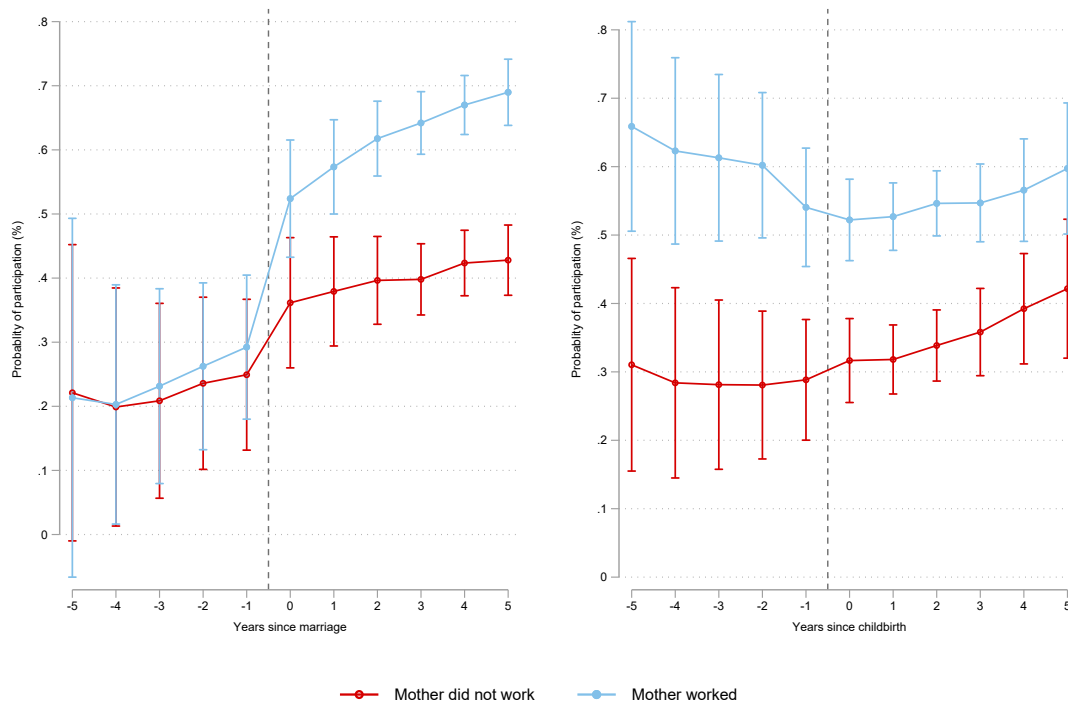
Figure 5: Impact of marriage and first childbirth on type of employment

Note: These figures show, for men and women separately, the estimated impacts of marriage on type of work. The Y-axis is the scaled coefficients P_τ that measure the impact of marriage as a percentage of the counterfactual outcome relative to the year before marriage and childbirth. Refer to Figure 3 for the list of controls. Calculations are based on data from the India Working Survey(IWS). Standard errors are clustered at the individual level.
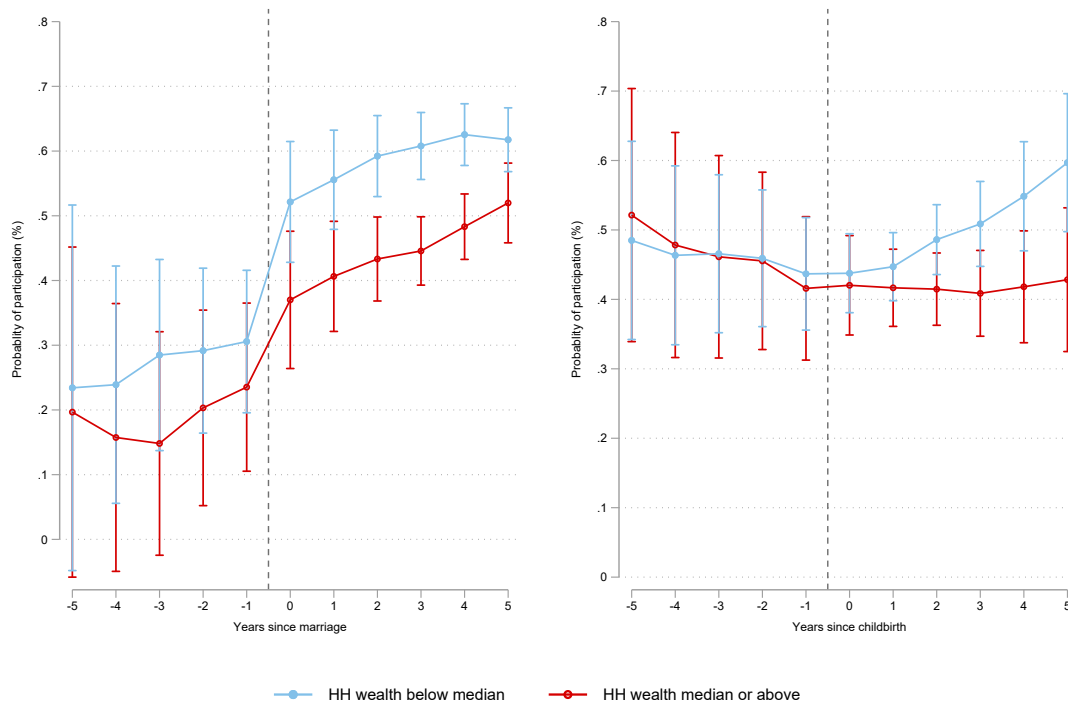
Figure 6: Impact on women's labour market participation of marriage and childbirth by work status of women's mother

Note: These figures show the estimated marginal effects of women's mothers' work status on women's participation rate in the labour market from five years before marriage/childbirth to five years after marriage/childbirth. In addition to the controls mentioned in notes of Figure 3, this model includes interactions of event time with the various controls. Calculations are based on data from the India Working Survey (IWS). Standard errors are clustered at the individual level.
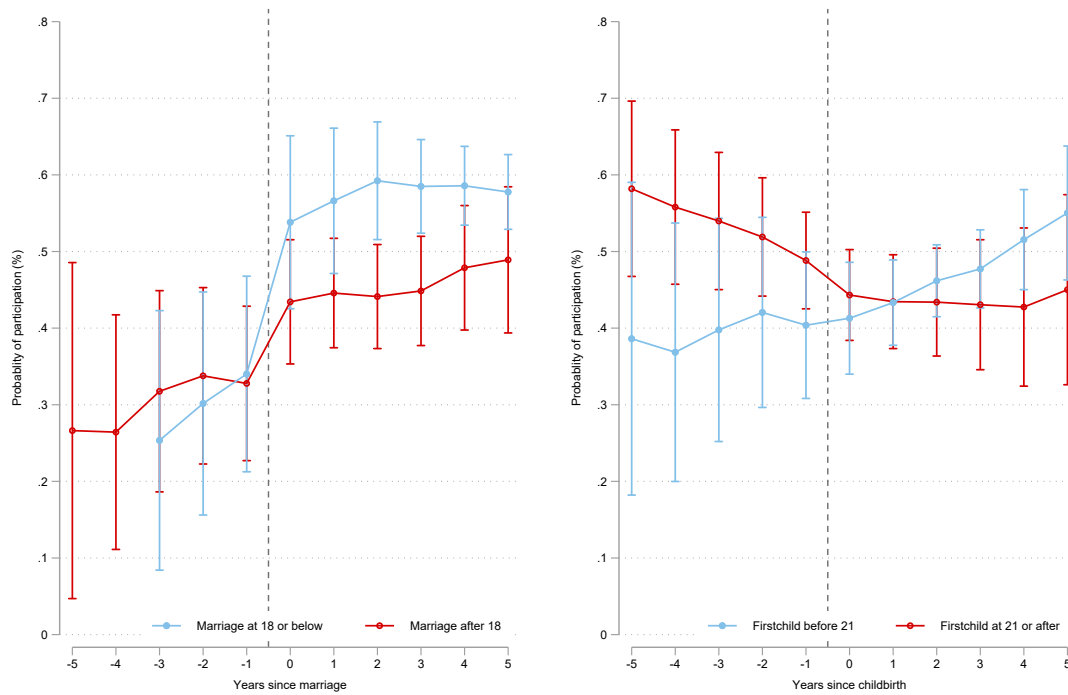
Figure 7: Impact on women's labour market participation of marriage and childbirth by household wealth level

Note: These figures show the estimated marginal effects of marriage and first childbirth on women's participation rate in the labour market from five years before marriage/childbirth to five years after marriage/childbirth. In addition, to the controls mentioned in notes of Figure 3, this model includes interactions of event time with the various controls. Calculations are based on data from the India Working Survey (IWS). Standard errors are clustered at the individual level.

Figure 8: Impact on women's labour market participation of marriage and childbirth by women's age at the time of the event

Note: These figures show the estimated marginal effects of age at the time of the event on her participation rate in the labour market from five years before marriage/childbirth to five years after marriage/childbirth. In addition to the controls mentioned in notes of Figure 3, this model includes interactions of event time with the various controls. Calculations are based on data from the India Working Survey (IWS). Standard errors are clustered at the individual level.

Appendix

A   Appendix

Table A1 Age at key events and employment statistics across select countries

Countries	Median age at first marriage (25-49 years)	Median age at first birth	Female employment to pop ratio (15+)	Female informal employment (% of total female employment)	Employment in agriculture, female (% of female employment)
South Asia					
Bangladesh	16	18.3	30.5	96.6	63.4
Pakistan	20.4	22.8	21.8	92.2	73.2
Nepal	17.9	20.4	78.4	87.3	75.9
India	18.9	21.2	20.2	89.4	57.2
East and S.E Asia					
China	26.3*	26.9*	59.7	37.2	24.2
Indonesia	20.8	22.9	48.8	81.6	30.1
Africa					
Nigeria	19.1	20.4	44.2	95.0	25.6
South Africa	27.2*	21.2	34.5	43.9	3.9
Ghana	20.7	22.6	60.2	78.8	26.3
Tanzania	19.2	19.8	77.7	95.9	69.1
Latin America					
Brazil	27.1*	26.9*	46.1	36.5	4.7
Chile	26.7*	28.5*	46.7	27.9	4.9
Developed countries					
US	28.6	30	53.3		0.8
Germany	32.1*	29.9*	52.7		0.9
Denmark	32.9*	29.8*	53.8		0.9

Notes: * refers mean age figures when median age were unavailable. Median age of marriage and first child birth refer to those from 15-49 age group. The median age is obtained from the latest year for which Demographic and Health Surveys data is available for the country, except for the United States. Mean age at marriage and child birth unless otherwise mentioned is obtained from UNECE. Median age at first birth for US is obtained from US Census 2019. Age of marriage and first birth for China is reported from (He et al., 2019). Employment to population ratio (female) and employment in agriculture is from World Development Indicators for the latest year. Female informal employment is the share of informal employment in total employment (SDG Indicator 8.3.1) obtained from ILO. For China data on female informal employment is reported from Liang et al. (2016).
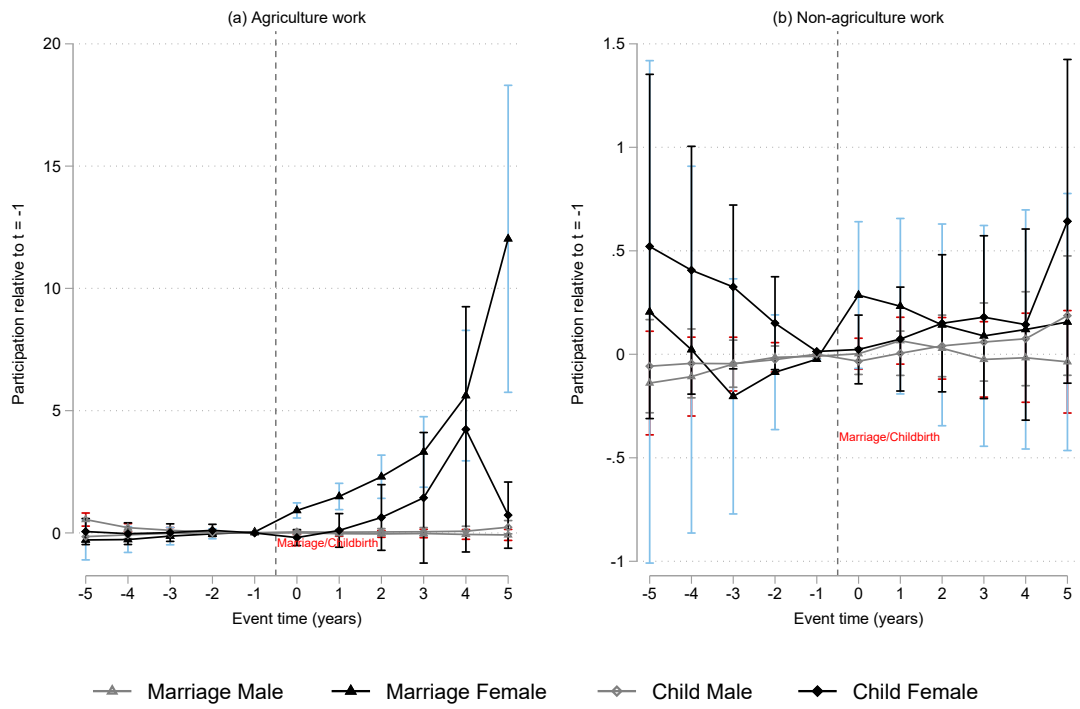
Figure A1: Impact on sector of employment

Note: This figure shows, for men and women separately, the estimated impacts of marriage/childbirth on the work participation rate for each sector of work. The Y-axis is the scaled coefficients P_τ that measure the impact of the event as a percentage of the counterfactual outcome relative to the year before the event. Refer to Figure 3 for the list of controls. Calculations are based on data from the India Working Survey(IWS). Standard errors are clustered at the individual level.
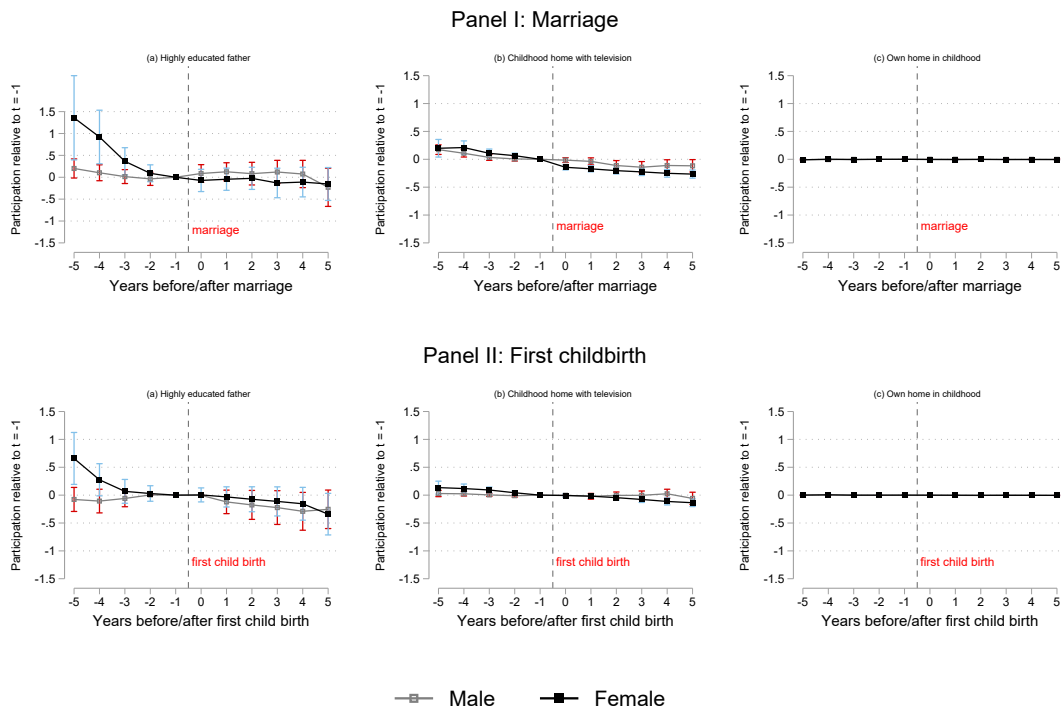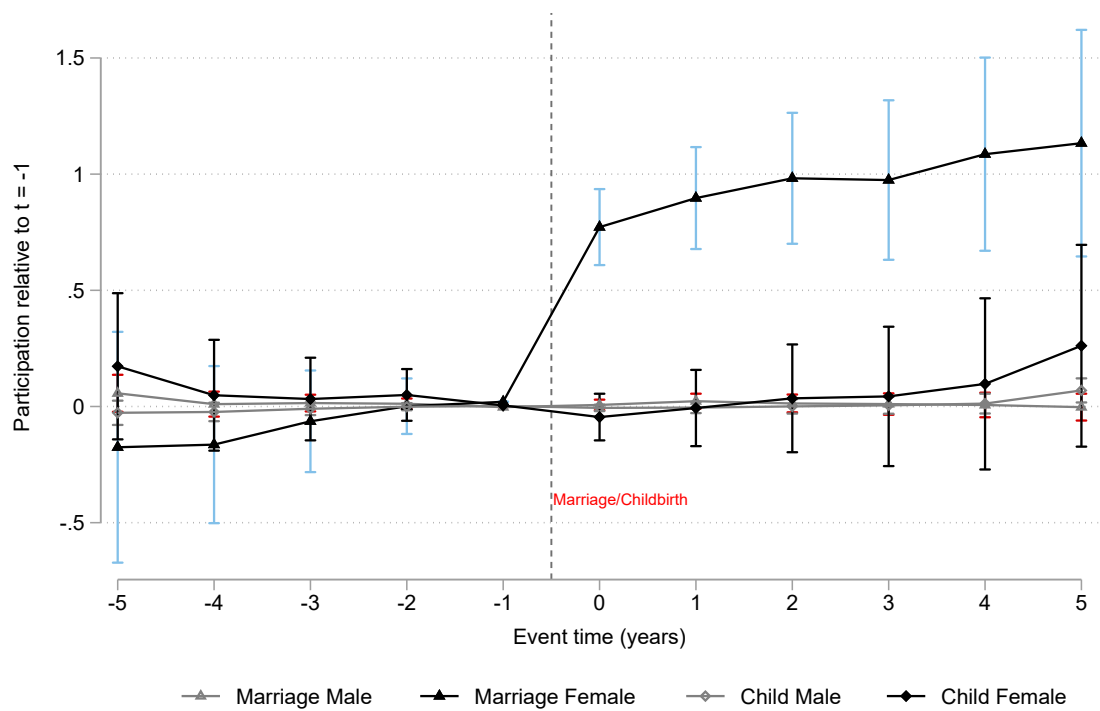
Figure A2: Impact on predetermined variables

Figure A3: Impact of life events on workforce participation - sample with all five years information post marriage and childbirth
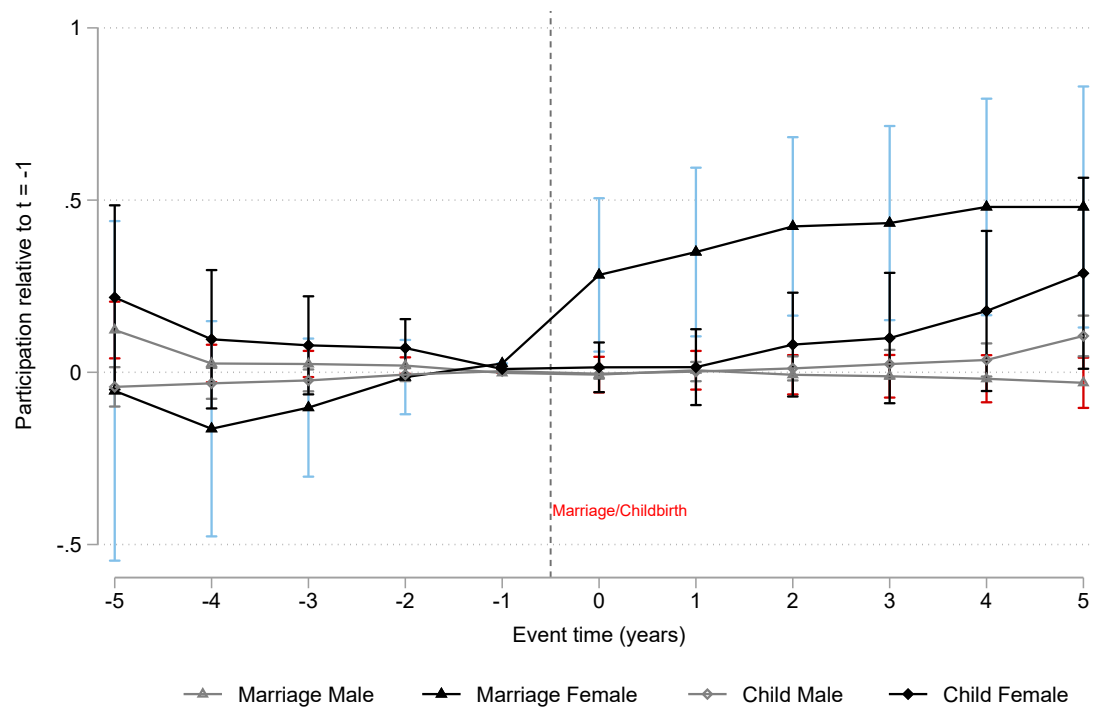
Figure A4: Impact of life events on workforce participation - model with additional controls
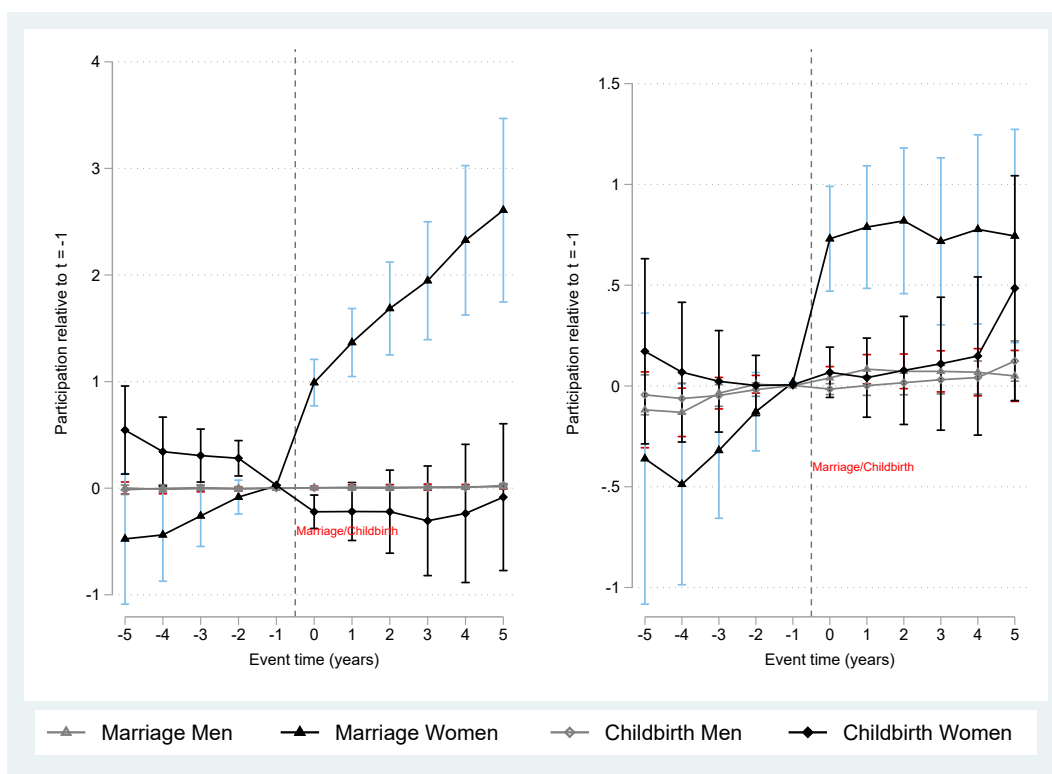
Figure A5: Impact of life events on workforce participation - Karnataka and Rajasthan