Young Brides and Social Ties [*]

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Abstract

Despite an increase in female education, female labor force participation remains low in India. Combining a nationally representative household survey with an instrumental variable strategy, I establish that delay in marriage reduces female labor force participation. By restricting the sample to uneducated women, I am able to establish that this adverse effect is solely driven by education. Increase in spousal earnings with a delay in marriage suggests that the income effect makes women who marry later to withdraw from the labor market. However, I also find that delay in marriage results in a decline in the woman's freedom to go out. Moreover, I find that education tends to reinforce this adverse effect, suggesting that education may bring backlash.

Keywords: female labor force participation, education, marriage timing, instrumental variable

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1 Introduction

In India, female labor force participation has declined over the years despite improvement in female educational attainment, decline in fertility and overall economic growth (Bosworth and Collins, 2008; Kijima, 2006; Pieters, 2010). In contrast to almost half of the world's female population participating in the labor market (Ki-Moon, 2013), only 32.6 percent of the women in India report being part of the labor force (Afridi et al., 2016). Given that participation in the labor market is an essential determinant of intra-household bargaining power, with implications for female and child well-being (Qian, 2008; Anderson and Eswaran, 2009; Afridi et al., 2012), it is important to understand the abysmally low labor force participation of women.

An important trend, which may explain this phenomenon, is the increasing age at marriage (UNFPA, 2005). Delay in marriage by impacting several aspects of a woman's life may potentially have implications for female labor force participation. Field and Ambrus (2008) show that delaying marriage has a causal effect on the woman's educational attainment. Higher educational attainment may then affect the woman's labor market outcomes by changing her knowledge, preferences, and bargaining power (Glewwe, 1999; Christiaensen and Alderman, 2004; Gakidou et al., 2010; Banerjee et al., 2013). Education can potentially bring backlash toward the woman's autonomy from the husband's family (Mitra and Singh, 2007). More empowered women are likely to face backlash as a result of social identity norms (Gangadharan et al., 2016; Benjamin et al., 2010). isIt is also likely marriage market matching itself may imply that women who marry later may marry into households which are systematically different than the average household (Fisman et al., 2006; Sivasankaran, 2014). For instance, attaining education may enable a woman to marry into a financially better-off, but her mobility may be restricted to maintain family honor (Still, 2011). Constraints on the freedom to go out can lead to implications for several aspects of the woman's life, labor force participation being one of them. Finally, the age at which the woman enters the husband's home can itself have direct effects on her autonomy and in turn, her labor market outcomes. Attitudes and value orientations can play a crucial role in explaining acceptance toward demographic transition (Aassve et al., 2011). For instance, older brides may face more questions

about their chastity from the husband's family, and therefore, they may meet restrictions on their freedom to go out. Gender norms by constraining the mobility of women can severely restrict their labor force participation (Field et al., 2010).

This paper estimates the effect of delay in marriage on female labor force participation using nationally representative, cross-sectional data from a household survey in India. To identify the causal effect of delay in marriage, I borrow the econometric framework proposed by Field and Ambrus (2008), who instrument the woman's age at marriage by her age at menarche. The observation that marriage closely follows menarche motivates the use of this instrument, as shown by Figure 1. In the developing world, parents become anxious to marry off their daughter once she has attained puberty amid concerns about her chastity. To isolate education as a mediating channel, I use a subsample analysis approach. I restrict the sample to only those women who have never attended school. In this sample, variations in the age at marriage are not associated with change in educational attainment, thereby allowing me to isolate the education channel.

I report several interesting findings. A one year delay in marriage increases educational attainment by 12.5% but decreases the probability of working by 4.8%. I also find that marriage timing does not affect the likelihood of working in the uneducated sample, suggesting that education solely drives this result. Delay in marriage also increases the husband's education and earnings. Predictably, the woman's educational attainment reinforces these effects. These findings suggest that a more educated woman by getting married to a better-earning man may not need to work for pay. However, among working women, delay in marriage increases the hourly wage rate. Therefore, increase in the husband's earnings cannot completely explain why a woman would choose not to work despite being able to earn more. Unless she does not *want* to work and by virtue of being more educated, she may enjoy greater bargaining power and therefore, she may *choose* not to work. Following this line of reasoning, I find that delay in marriage decreases the participation of the woman in intra-household decision-making and in her freedom to go outside. I cannot directly observe the woman's willingness to work, but these findings suggest that the factors driving the decline in labor force participation could be more than just the income effect of marrying

better-earning husbands. Further, I find that delay in marriage leads to the woman spending more time cooking and helping her children with homework but decreases the probability of her going out for grocery shopping. This may be attributed to the finding that delay in marriage decreases the woman's overall freedom to go outside. Moreover, education reinforces this adverse effect. Overall these results suggest that education by bringing either the liability of maintaining family modesty or a backlash toward the woman's mobility may lead to a decline in female labor force participation.

India is not the only country where female labor force participation has stagnated despite overall growth, fertility decline, and rising female education (Klasen and Pieters, 2015). In the Middle East and North Africa, one can observe vast and persistent gender gap in employment despite rising female education levels in many countries. This paradoxical relationship has been partly ascribed to conservative social attitudes toward's women's work in the region (Gaddis and Klasen, 2014). As context, India is both a useful and an important place to unpack the puzzling relationship between education and labor force participation. India currently has an advantageous demographic dividend which is credited for about a third of East Asia's higher per capita growth rates in the period between 1965 and 1990 (Bloom and Williamson, 1998; Bloom et al., 2011). However, this may alone may not be enough. High and rising female employment levels contribute to greater productivity growth (Bank, 2011) and have been critical in sustaining East Asia's high economic growth rates (Klasen and Lamanna, 2009; Young, 1995).

This paper contributes to several interesting lines of research. First, I add to the literature explaining the puzzling relationship between female education and labor force participation (Klasen and Pieters, 2015; Afridi et al., 2016). Second, several studies have established the human capital outcomes of delay in marriage of women (Field and Ambrus, 2008; Debnath and Sekhri, 2014; Chari et al., 2017). I add to this literature by analyzing the labor market and social capital outcomes of delay in marriage of women. Third, I disentangle education as a channel mediating the effect of delay in marriage on labor force participation.

The rest of this paper is organized as follows: Section 2 discusses the data used and provides

the summary statistics. Section 3 explains the empirical strategy and Section 4 reports the results. I conclude in Section 5.

2 Data

The analysis of this paper uses data from India Human Development Survey 2005 (IHDS). The IHDS is a nationally representative survey of rural and urban Indian households in all twenty-eight states and five union territories. The IHDS sampled married women between the age of 15 to 49, and also administered a separate health and education questionnaire that includes questions on marriage, reproductive history, and gender relations. I restrict the sample to 31,265 women who are married only once and exclude women who marry above the age of 40. Further, I analyze a sub-sample of women who never attended school consisting of 13,329 women.

Table 1 provides descriptive statistics on the full sample and the uneducated sample on a number of household characteristics (household size, caste, religion, wealth, distance from natal family, female education) and individual characteristics (age, height, education, age at marriage, age at cohabitation, age at menarche, mobility, decision-making, time use, work). I create a decision-making index that summarizes the woman's self-reported say in household decision-making – whether she reports participating in decisions about expensive household purchases, what to cook, how many children to have, what to do when children are ill and whom the children should marry. I also create a mobility index which summaries the woman's ability to go alone to the local health center, the local store or visit relatives and friends.

3 Analytical strategy

3.1 Conceptual framework

Age at marriage can have implications for work outcomes of a woman through several pathways, including educational attainment. For instance, delay in marriage would enable a woman to spend

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a higher number of years in school, which may then affect her earning ability as well as her bargaining power. Such a woman not only is more capable of working for pay, but she may also have a greater say in decisions regarding her work. Alternatively, education may enable a woman to get married to a man with more education and therefore, better earnings. Having a better-earning husband, in turn, may reduce the need for her to work for pay. Similarly, education may enable a woman to marry into a household which is financially better off. Not only is the need for her to work reduced but such a household may also require her to maintain family honor and therefore, her freedom to step outside the house may be restricted. It is also possible that older brides being more educated may face more backlash toward their autonomy, and be denied the freedom to work among other things. Another plausibility is that a more educated woman who enjoys greater bargaining power may be more capable of choosing not to work if she so wishes. Finally, age at marriage may itself have a direct age effect on the woman's mobility, and in turn, her work outcomes. The age at which she enters the husband's household may impact the relations she forges with the household members and the community members around her. The husband's family may have concerns about the safety of the woman as well as about her chastity. Another factor to consider could be that older brides may have to migrate geographically farther from their natal home, which may also have implications for her mobility.

3.2 Empirical strategy

Broadly, my objective is first to establish the overall effect of the age at marriage on labor force participation, and then to disentangle education as the mediating channel. I consider the following regression model:

$$y_i = \alpha + \beta MarriageAge_i + \gamma X_i + \varepsilon_i \tag{1}$$

where y_i is the outcome variable and $MarriageAge_i$ denotes the age at which woman i got married, X_i is a set of individual (age, height, year of birth) and household (caste, religion, district

of residence) level controls, and ε_i is the error term. Robust standard errors clustered at the PSU level.

The empirical challenge here is that age at marriage is likely to be correlated with the error term in equation 1. For instance, women who marry early may be pre-disposed to poor financial conditions, and therefore, they may be compelled to work for a living. To overcome this issue, I borrow the econometric framework used by Field and Ambrus (2008). I use age at menarche as an instrumental variable for age at marriage. Age at menarche is a relevant instrument given that marriage closely follows menarche in the developing world, as shown in Figure 1.

To isolate education as a mediating channel, following Field and Ambrus (2008) and Chari et al. (2017), I repeat the main specification for a subsample of women who have zero years of schooling. I am able to establish the education channel for this subsample of women since age at marriage will have no impact on their educational attainment. By comparing effect size between the two samples (full sample and uneducated sample), I will be able to examine the size and direction of the education channel as a complement to the direct age effect.

3.3   Validity of the instrumental variable strategy

In the developing world, women face social pressure to marry right after the onset of menarche (Ortner, 1978; Dube, 1997). In this section, I perform empirical checks to further test the validity of age at menarche as a suitable instrumental variable for age at marriage.

Table 2 presents the results from the regression of women's age at marriage on age at menarche. Column (1) reports the estimates for the full sample. The coefficient on age at menarche is 0.43, and it is statistically significant at 1% level of significance. The F statistic for this regression is 268.23, which mitigates concerns about weak instrument (Stock and Yogo, 2002).

As per biological research, genetic factors are the strongest predictors of adolescent maturation (Campbell and Udry, 1995), suggesting that age at menarche should be exogenous. However, there could be several factors which may pose threats to the validity of age at menarche as an instrument for age at marriage. For instance, exposure to extreme environmental factors at the time of birth

can impact age at menarche. The agriculture sector employs the majority of Indians, and it is heavily dependent on weather. Extreme weather conditions at the time of birth may, therefore, impact the woman's natal family's household income. An adverse shock to the household income can potentially lead to malnutrition, however temporary it may be. Sudden changes in nutrition during childhood can affect the onset of maturation (Bosch et al., 2008). Furthermore, extreme malnutrition during childhood can even have long-lasting effects on health (Eleni et al., 2003). A woman's health status can potentially impact her earning ability. Similarly, geographical factors such as temperature, rainfall, altitude, etc., also affect the onset of puberty (Nazian and Piacsek, 1976; Lehrer, 1986). To address such concerns over exposure to extreme weather and geographical conditions, I include year of birth and district of residence fixed effects as additional regressors in the regression of age at menarche on age at marriage.[1]

Other factors that could impact the onset of puberty are exposure to endocrine-disrupting chemicals and sex composition of peer group (Vandenbergh, 1967; Vandenbergh et al., 1975; Mucignat-Caretta et al., 1995). Hard physical labor during childhood can also affect the onset of puberty, and in general, the health status of a woman (Pellerin-Massicotte et al., 1987; Bronson, 1987). As discussed above, this could mean that age at menarche is endogenous. However, children who work in India are not involved in physical labor such as construction. Hence, strenuous physical labor during early childhood is unlikely to be a threat to the validity of the instrumental variable. Nevertheless, I add height, which is considered a good proxy for nutrition during childhood, as an additional regressor in the regression of age at marriage on age at menarche.

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[1]I can control for the district where the woman resides after getting married, and not her natal district since the data do not provide information about the location of the natal family. However, this is not likely to be a problem since most marriages in India occur within the same district, so the district of residence of the married woman is a good proxy for her natal district (**?**).

4 Results

I start by examining the effect of age at marriage on education and work outcomes of women. Table 3 presents the OLS and IV estimates. It also reports the baseline mean of each of the dependent variables as well as the Kleibergen-Paap F-statistic that tests the strength of the instrumental variable without assuming iid standard errors.

Table 3 shows that a one-year delay in marriage increases educational attainment by 0.58 years (12.5%) and decreases the probability of working by 0.01 percentage points (4.8%). Annual earnings increase by 426.75 units (16.1%) and hourly wage increases by 0.61units (9%) among working women with a one year delay in marriage. All estimates are significant at 1%.

Next, I examine the effect of delay in marriage on spousal characteristics. Table 4 shows that a one year delay in marriage increase the husband's educational attainment by 0.5 years (3.9%) and the husband's earning by 3.5%. A one year delay in marriage also increases the educational attainment of the husband's sisters by 0.42 years (2.4%). It also increases the probability of the husband's household owning land by 0.014 (0.03%) and increases the asset index by 0.096 units (5.2%). All estimates are significant. To analyze how education may mediate these effects, I repeat the above regressions for a sample restricted to only uneducated women. As reported in Panel B of Table 5, the effect size for all estimates is smaller in the uneducated sample. This finding indicates that education is driving the effect of delay in marriage on husband's education and earnings, female education in the husband's household, assets and land ownership.

I also look at the effect of delay in marriage on the time use of the woman. Table 5 shows that a one year delay in marriage leads to an increase in the time spent by the woman on cooking by 0.05 hours (1.3%), an increase in the probability of the woman helping her children with homework by 0.011 percentage points (7.5%) and a decrease in the probability of the woman going out for grocery shopping by 0.016 percentage points (2.7%). In Panel B, I report the estimates for the above regressions repeated for the uneducated sample. The effect size for all estimates is smaller in the uneducated sample. This finding indicates that education is driving the effect of delay in marriage on the increase in time spent on cooking, the decrease in the likelihood of the woman

helping her children with homework, and on the decrease in the likelihood of the woman going out for grocery shopping.

In Table 6, I present the effect of delay in marriage on the woman's mobility and say in decision-making. A one year delay in marriage decreases the mobility and decision-making indices of the woman by 0.034 and 0.102 standard deviations, respectively. In Panel B, I report the estimates for the uneducated sample. Column 1 shows that the effect on mobility is smaller both in size and significance, indicating that education reinforces the decrease in mobility due to delay in marriage. As reported in Column 2, the effect of delay in marriage on decision-making is higher in the uneducated sample, indicateing that the education channel counteracts the decrease in decision-making due to delay in marriage. I also estimate the effect of delay in marriage on marriage migration and the probability of working for pay for both full and uneducated samples. As shown in Column 3, a one year delay in marriage increases the distance from the natal family by 0.128 standard deviations. This effect is higher in the uneducated sample, indicating that education counteracts the increase in marriage migration due to delay in marriage. In Column 4, I report the effect of delay in marriage on working on pay. Delay in marriage does not affect the likelihood of working for pay in the uneducated sample, indicating that the decrease in working for pay due to delay in marriage is completely driven by education.

5 Conclusion

Combining a nationally representative household survey from India with an instrumental variable strategy that relies on the links between age at menarche and age at marriage, I establish that delay in marriage reduces female labor force participation. By restricting the sample to uneducated women, I can isolate educational attainment as a mediating channel. I find that the adverse effect of delay in marriage on labor force participation is solely driven by education.

A woman who marries later not only is more educated herself but her husband is also more educated and has better earnings. The husband's sisters are likely to have attained more education.

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The husband's home is more likely to own land, have more assets, but it is also likely to be located farther from the woman's natal family. Increase in desirable spousal characteristics with a delay in marriage suggests the possibility of the women who marry later withdrawing from the labor market due to income effect. However, I also find that a delay in marriage results in decline in the woman having a say in intra-household decision-making as well as in the freedom to go out. The latter reflects a change in the woman's time-use, as evidenced by a decline in going out for grocery shopping but a rise in the number of hours spent cooking and in the likelihood of helping children with homework. These results combined with the finding that a delay in marriage increases the hourly wage rate for working women suggest that the income effect may not entirely explain the decline in female labor force participation. Moreover, I find that education tends to reinforce the adverse effect of delay in marriage on the mobility of the woman, explaining the decline in labor force participation.

Overall, these results contribute to the existing literature explaining the puzzling relationship between female educational attainment and labor force participation in India. The finding that higher educational attainment may be met with a backlash toward the woman's autonomy or that it may bring greater liability of maintaining family honor points to a need for better social conditioning.

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FIGURE 1: Age at Marriage by Age at Menarche
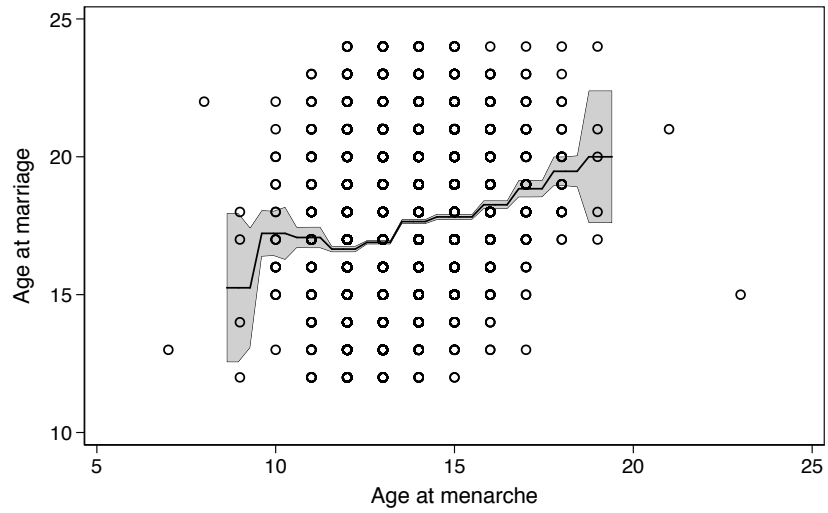
kernel = rectangle, degree = 0, bandwidth = .5, pwidth = .75
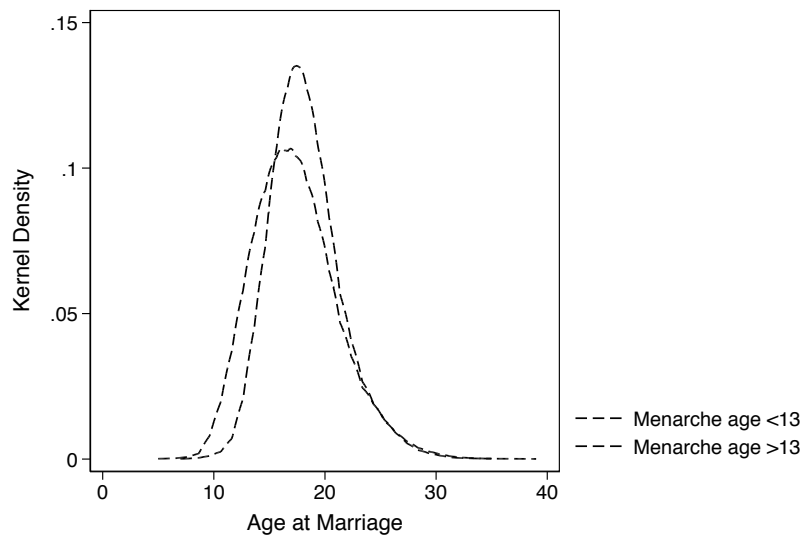
Note: Data used from IHDS-2005.

TABLE 1: Summary statistics

	(1) Full sample	(2) Uneducated	(3) Educated	(4) t $_\Delta$
Household characteristics				
Household hold size	5.54	5.71	5.39	-0.31***
	(2.44)	(2.49)	(2.38)	
Caste is unreserved	0.32	0.21	0.41	0.20***
	(0.47)	(0.41)	(0.49)	
Religion is hindu	0.81	0.81	0.81	-0.00
	(0.39)	(0.39)	(0.39)	
Assets per person	2.66	1.85	3.29	1.40***
	(1.80)	(1.29)	(1.90)	
Land ownership	0.42	0.48	0.37	-0.10***
	(0.49)	(0.50)	(0.48)	
Married financially upward	0.19	0.17	0.21	0.04***
	(0.39)	(0.38)	(0.41)	
Distance from natal village	2.82	2.79	2.84	0.05**
	(2.24)	(2.15)	(2.31)	
Female education	4.47	1.74	6.57	4.81***
	(6.98)	(5.45)	(7.28)	
Woman characteristics				
Age	32.99	34.08	32.14	-1.90***
	(8.00)	(7.91)	(7.96)	
Height	151.59	150.85	152.17	1.29***
	(6.05)	(5.97)	(6.04)	
Education	4.65	0.00	8.19	8.19***
	(4.81)	(0.00)	(3.44)	
Age at marriage	17.51	16.09	18.64	2.48***
	(3.59)	(3.23)	(3.43)	
Age at cohabitation	17.91	16.76	18.82	2.01***
	(3.14)	(2.58)	(3.23)	
Age at menarche	13.74	13.69	13.78	0.10***
	(1.31)	(1.26)	(1.35)	
Works for pay	0.23	0.35	0.15	-0.20***
	(0.42)	(0.48)	(0.36)	
Hourly wage	7.45	5.02	11.80	6.60***
	(10.90)	(3.87)	(16.60)	
Spousal education	6.79	3.86	9.03	5.08***
	(4.88)	(4.12)	(4.18)	
Husband's earnings	9.87	9.43	10.26	0.82***
	(1.10)	(0.96)	(1.08)	
Time spent cooking	3.26	3.36	3.19	-0.16***
	(1.59)	(1.54)	(1.61)	
Helps with homework	0.33	0.15	0.48	0.32***
	(0.47)	(0.35)	(0.50)	
Does grocery shopping	0.59	0.59	0.59	-0.00
	(0.49)	(0.49)	(0.49)	
Cash-in-hand	0.83	0.82	0.84	0.02***
	(0.37)	(0.38)	(0.36)	
Mobility index	0.00	-0.10	0.09	0.19***
	(1.00)	(1.04)	(0.96)	
Decision-making index	0.01	-0.08	0.11	0.16***
	(3.67)	(3.80)	(3.54)	

Data used from IHDS (2005).
The table shows the mean and standard deviation of individual and household characteristics for all the analysis samples.

TABLE 2: The effect of age at menarche on age at marriage

| | (1) | (2) |
	Full sample	Uneducated sample
Age at menarche	0.43***	0.48***
	(0.016)	(0.023)
Mean	17.70	16.53
R sq	0.29	0.24
F	268.23	148.17
Observations	31261	13317

Data used from IHDS (2005).
The table shows the results of the first-stage regressions for each of the analysis sample. All regressions include district, caste and religion fixed effects, and control for the woman's age and height. Robust standard errors clustered at the primary sampling unit.

TABLE 3: Effect of marriage timing on education and work

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Education		Paid work		Earnings		Wage rate	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Age at marriage	0.469***	0.579***	-0.005***	-0.011**	420.748***	426.752**	0.790***	0.614**
	(0.010)	(0.051)	(0.001)	(0.005)	(44.775)	(175.907)	(0.087)	(0.257)
Mean	4.65	4.65	0.23	0.23	2644.36	2644.36	7.45	7.45
R sq	0.44	0.44	0.24	0.24	0.06	0.06	0.40	0.40
Kleibergen-Paap F		688.98		699.88		699.88		243.70
Observations	30887	30887	31265	31265	31265	31265	7305	7305

Data used from IHDS (2005).
The table presents the reuslts of OLS and IV regressions in which the dependent variable is mobility index of the woman. All regressions include caste fixed effects and district fixed effects, and control for the mother's age and height. Robust standard errors clustered at the primary sampling unit.

TABLE 4: Effect of marriage timing on spousal characteristics

	(1)	(2)	(3)	(4)	(5)
	Spouse education	Spouse earnings	SIL education	Land ownership	HH assets
Panel A: Full sample					
Age at marriage	0.503***	0.035***	0.415***	0.014**	0.096***
	(0.056)	(0.013)	(0.090)	(0.006)	(0.020)
Mean	3.86	9.43	1.74	0.48	1.85
R sq	0.30	0.45	0.18	0.30	0.39
Kleibergen-Paap F	635.48	454.51	644.23	699.88	699.88
Observations	28804	19215	28470	31265	31265
Panel B: Uneducated sample					
Age at marriage	0.219***	0.008	0.213**	0.005	0.015
	(0.073)	(0.016)	(0.105)	(0.008)	(0.019)
Mean	3.86	9.43	1.74	0.48	1.85
R sq	0.15	0.41	0.12	0.30	0.35
Kleibergen-Paap F	356.87	286.54	374.69	408.43	408.43
Observations	12158	8908	12289	13329	13329

Data used from IHDS (2005).
The table presents the reuslts of OLS and IV regressions in which the dependent variable is mobility index of the woman. All regressions include caste fixed effects and district fixed effects, and control for the mother's age and height. Robust standard errors clustered at the primary sampling unit.

TABLE 5: Effect of marriage timing on time use

	(1) Cooking	(2) Homework	(3) Shopping
Panel A: Full sample			
Age at marriage	0.045**	0.011*	-0.016***
	(0.022)	(0.006)	(0.006)
Mean	3.36	0.15	0.59
R sq	0.38	0.25	0.32
Kleibergen-Paap F	698.97	724.18	704.62
Observations	31140	29713	31110
Panel B: Uneducated sample			
Age at marriage	0.040	-0.004	-0.013*
	(0.030)	(0.006)	(0.008)
Mean	3.36	0.15	0.59
R sq	0.38	0.28	0.32
Kleibergen-Paap F	410.39	410.90	406.65
Observations	13261	12857	13282

Data used from IHDS (2005).
The table presents the reuslts of OLS and IV regressions in which the dependent variable is mobility index of the woman. All regressions include caste fixed effects and district fixed effects, and control for the mother's age and height. Robust standard errors clustered at the primary sampling unit.

TABLE 6: Effect of marriage timing on mobility, decision-making, migration, and work

	(1)	(2)	(3)	(4)
	Can go alone	Has say	Marriage migration	Paid work
Panel A: Full sample				
Age at marriage	-0.034***	-0.102**	0.128***	-0.011**
	(0.012)	(0.047)	(0.035)	(0.005)
Mean	0.00	0.01	2.82	0.23
R sq	0.23	0.35	0.12	0.24
Kleibergen-Paap F	699.88	699.88	692.53	699.88
Observations	31265	31265	30988	31265
Panel B: Uneducated sample				
Age at marriage	-0.030*	-0.209***	0.224***	-0.001
	(0.018)	(0.066)	(0.047)	(0.007)
Mean	-0.10	-0.08	2.79	0.35
R sq	0.25	0.39	0.11	0.32
Kleibergen-Paap F	408.43	408.43	403.91	408.43
Observations	13329	13329	13227	13329

Data used from IHDS (2005).
The table presents the reuslts of OLS and IV regressions in which the dependent variable is mobility index of the woman. All regressions include caste fixed effects and district fixed effects, and control for the mother's age and height. Robust standard errors clustered at the primary sampling unit.