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Do Compulsory Schooling Laws Affect Fertility Behaviors and Marriages? Evidence from India

Sandipa Bhattacharjee*

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Abstract

This paper exploits an education policy in India generated by a 2010 schooling reform to examine the effect of education on women's family planning decisions. The key element of the reform was that it required students to complete eight years of primary education (age 6-14 years). I employ an instrumental variable difference-in-difference approach that measures the exogenous variation in treatment intensity in different states across birth cohorts of women measured by birth year and birth months. The reform led to an increase in total years of education, a delay in the age at first marriage, a postponement of sexual activity, and reduced fertility beginning at the age of 22. I also examine the potential mechanisms through which increased education affects fertility. The findings suggest early use of modern contraceptives, reduction in the marital education gap, increased literacy, and utilization of healthcare services contribute to reduced fertility. These results are consistent with the increased empowerment of women influencing their fertility decision thereby highlighting the importance of the government's efforts to promote education through policy initiatives.

Keywords: education, fertility, India

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JEL Codes: I25, J13, J18

1 Introduction

Adolescent childbearing has significant negative effects on maternal and child well-being, including a reduction in labor force participation and earnings, leading to a perpetuation of intergenerational poverty cycles ([Angrist and Evans, 1996](#); [Duflo, 2001](#)). Consequentially, reducing teenage childbearing and promoting quality education for young women is essential in achieving the United Nations' Millennium Development Goals (MDGs) of reducing poverty, improving maternal health, and empowering women. Development economists and institutions have emphasized the pivotal role of investment in female education as a development tool in many developing countries to address fertility, health, and human capital formation ([Ainsworth, Beegle, and Nyamete, 1996](#); [Schultz, 1994](#)). In 2000, the United Nations Girl's Education Initiative (UNGEI) was established with the explicit objective that young women have access to high-quality education to reduce birth rates among low-income individuals. The World Bank Group has also reinforced its adoption of the United Nations' Sustainable Development Goals (SDGs) in 2020, emphasizing the importance of gender equality, empowering girls and women, removing financial barriers to girls' education, preventing child marriage, improving access to reproductive health services, reducing birth rates, and enhancing skills and employment opportunities for adolescents and young women. Given the renewed emphasis on reducing population growth and fertility through education, it is crucial to examine educational interventions for reducing birth rates, the lasting impacts of these interventions on fertility among women, and the mechanisms through which such a relationship may occur.

This paper exploits a natural experiment through an education policy in India generated by a 2010 schooling reform to examine the effect of education on fertility and related behavior. The key feature of the reform was that it required students to complete eight years of primary education (age 6-14 years). The breadth and scope of the reform allow for the use of a nationally representative sample of households throughout India. I use data from two rounds of the National Family Health Survey (NFHS) - waves 4 and 5 conducted in India, which generates a large sample of approximately 1,200,000+ Indian women born between 1965 and 2006. The survey provides state and district-level information for India on women's reproductive health and fertility outcomes, marriages, and other associated behaviors. The effect of the reform's implementation is distributed across the birth cohorts of women, with different states implementing it at different times. This provides an opportunity to investigate the impact of the reform on Indian women in their teenage and

consecutive years. To account for the variation in the staggered implementation timing of the reform across different states, an instrumental variable difference-in-difference (IV-DID) approach is used, thereby exploiting the continuity in the transition from untreated birth cohorts of women to treated cohorts in different states. This allows for an evaluation of the causal effect of the reform on fertility outcomes for Indian women by evaluating the impact of the compulsory schooling reform as an exogenous variation in education.¹

The effect of increased education and understanding its impact on declining fertility outcomes (teenage pregnancy, age at first birth, contraception use, etc.) has been studied in both developed and developing country settings. However, the magnitude of the relationship between the two channels varies across countries and there is an ongoing debate as to what extent the effects are causal because of potential reverse causality and selection of unobservable factors. The effect tends to be larger in the developing country contexts. The impact is more powerful in curbing the population and fertility levels, improving health outcomes, and promoting equitable economic opportunities for women. There exists positive evidence of lowered fertility rates with the rise in education in Indonesia (Duflo, 2001), Nigeria (Osili and Long, 2008), Kenya (Chicoine, 2012), and overall Sub-Saharan Africa (Mahy and Gupta, 2002; Vogl, 2022). However, the work in developed country settings in California and Texas by McCrary and Royer (2011) has found less robust results using exogenous variation in school starting-age rules. Black, Devereux, and Salvanes (2008) use variations in compulsory schooling laws in the U.S. and Norway to estimate the effect in two very different institutional environments and find a reduced incidence of teenage childbearing.

The work in this paper is the first to study the 2010 Indian education policy thereby complementing the literature by reviewing the relationship between female education and fertility behaviors causally from a developing country perspective. This paper also makes a significant contribution in exploring the different mechanisms through which increased education impacts fertility. First, the *“incarceration effect”*, (also called the *“institution effect”*) proposed in Black et al. (2008) where educational participation reduces the time available for childbearing so that the decision to become a parent is postponed. Second, the *“human capital effect”*; increased education results in an increase in current and expected future human capital, and this higher level of human capital could change fertility decisions. Third, the *“knowledge effect”*, which suggests that

¹I do not use a regression discontinuity approach as it is unsuitable, given the reform’s impact on education is dispersed across several birth cohorts of women in different states of India at different times.

better-educated women have more knowledge about contraception and family planning. Lastly, the “*autonomy effect*” indicates how an increase in a woman’s education results in increased selectivity when searching for a partner, improved marriage characteristics, and women’s say in domestic decision-making thereby affecting fertility outcomes. The above four effects suggest that in developing countries, education serves as a powerful tool that impacts women’s fertility levels naturally and mechanically by causing them to delay marriages and subsequent childbearing as they pursue their education. Due to this, their reproductive lifespan is likely to be shortened creating a positive effect on women empowerment. The later sections describe these mechanisms in more detail and discuss possible outcomes and channels to distinguish between them.

The findings in this paper illustrate how the Indian schooling reform led to an increase in total years of education and that it substantially affected the fertility outcomes of women. The reform led women to delay their marriages and lowered the percentage of women who began their first sexual intercourse at the age of 15. I did not find any significant decline in fertility during women’s teenage years, suggesting that the “*incarceration effect*” is not the significant cause of fertility decline. However, as age increases, there is growing evidence of a consistent decline in total fertility that becomes more pronounced, eventually lowering a woman’s fertility by 0.189 births at the age of 25, highlighting the “*human capital effect*”. The reform’s effects exhibit heterogeneity within different castes and among the urban and rural communities with similar levels of education which highlights important implications for addressing the persisting problem of caste-based inequalities in India not studied in this paper.

With the comprehensive scope of the Indian education reform and the availability of large and rich representative data provided by the NFHS, this study enables me to uniquely investigate a thorough analysis of the potential mechanisms behind the observed decline in fertility outcomes following the implementation of the reform. I find an increased probability of “*knowledge effect*” about the use of contraception before having their first child, utilization of health care services, and exposure to mass media about family planning and fertility practices. These findings indicate that the policy reform, which has led to higher levels of education, has empowered women to make independent decisions regarding contraceptive use, health care, and family planning. Additionally, there is evidence suggesting increased empowerment among Indian women following the reform, associated with a higher probability of undergoing HIV/AIDS testing. This result is consistent with

the findings of [Mocan and Cannonier \(2012\)](#) from an underdeveloped country setting demonstrating that access to contraception alone is not enough to reduce fertility for women. However, I find no evidence suggesting that the reform influenced the likelihood of a woman ever having a pregnancy terminated.

The 2010 schooling reform that increased women’s education in India may also lead to an increasing emphasis on selecting and marrying a partner with desirable traits. [Lavy and Zablotsky \(2011\)](#) describe this as positive assortative matching between partners, which may affect their fertility decisions through the characteristics of their spouses. I find evidence that the reform led to a change in the age and education difference between a woman and her husband. The effect of the reform in reducing the average marital education gap was significantly high thereby highlighting increased “*autonomy effect*”. Although the NFHS does not collect individual income data, the increase in total years of education led to increased household wealth, and possibly to greater empowerment within the household with the Indian women having a final say on household purchases, spending earnings, or making decisions about their health care.

There could be possible endogeneity concerns about the reform because of its staggered implementation across different states. The unobserved state-specific characteristics in the pre-reform period could affect selection into treatment and adoption timing which could thereby bias the 2SLS estimates. I deal with this issue by performing some robustness checks, including the pre-policy state-level characteristics that might be correlated with the adoption of the policy. In a pair of regressions, I incorporate the average state-level GDP growth rate and GDP per capita as a proxy for educational investments in a state. My findings verify that the policy implementation is not driven by the pre-policy state-specific indicators. By using state-specific linear time trends in the birth cohort, I demonstrate that the model is not capturing a general change that is occurring throughout the population, but rather an effect that is isolated to Indian women who were treated by the reform.

The paper proceeds as follows. The literature on education and fertility behaviors is studied and discussed in detail in section 2. The 2010 compulsory schooling reform is explained in greater detail in section 3. The data used in this paper is described in section 4. The empirical model and instrument used to estimate the effect of the reform on education and fertility behavior and marriage characteristics are presented in section 5. The results are discussed in section 6. Section

7 concludes and discusses some of the limitations of this paper.

2 Related Literature

Education about delaying marriage and childbirth is a crucial and critical tool to address the environmental, sustainability, and social issues created by the growing population (Kim, 2023; Mena and McLindon, 2023). Literature has used various approaches, such as family fixed effects, regression discontinuity, and instrumental variable methods, to isolate exogenous changes in education in determining the causal effect. A balance of evidence suggests the positive and negative consequences of childbearing with increased education.

For example, studies have examined the impact of variations in the length of schooling laws (Leon et al., 2004) in the U.S., the timing of school construction in Indonesia and Nigeria (Breierova and Duflo, 2004; Osili and Long, 2008), government military rule of Arabs in Israel (Lavy and Zablotsky, 2011), or compulsory schooling laws in Kenya, Germany, Canada, Turkey and Poland (Chicoine, 2012; Cygan-Rehm and Maeder, 2013; DeCicca and Krashinsky, 2020; Kırdar, Dayıoğlu, and Koç, 2018; Milovanska-Farrington and Farrington, 2023) regarding the likelihood of adolescent childbearing and the negative effects of education on fertility. These studies have provided more conclusive evidence indicating that educated women tend to have fewer children than their uneducated counterparts.

Another set of studies presents a range of mixed to negative findings on the association between higher education and increased fertility rates. Research on compulsory schooling reforms in the U.S., Great Britain, and Northern Ireland suggests that higher education delays the first birth, shifting away from teenage motherhood (Black et al., 2008; Silles, 2011). Conversely, studies in Norway, Italy, and the U.K. indicate that higher education may not necessarily impact completed fertility because women can catch up for the initial reduction in births at later ages (Fort, 2009; Geruso and Royer, 2018; Monstad, Propper, and Salvanes, 2008). Analyzing birth data in California and Texas, McCrary and Royer (2011), finds little evidence linking compulsory schooling laws to education-induced fertility changes. In 8 European countries, more education is associated with fewer childless women and a higher average number of children per woman (Fort, Schneeweis, and Winter-Ebmer, 2016). Braakmann (2011) demonstrates that extended education due to schooling reform significantly increases the number of births due to enhanced marital stability. Notably,

estimated effects may vary across countries, sub-populations, or education levels, as education influences fertility through different channels with varying importance. This paper aims to identify and explore different potential mechanisms comprehensively.

In the Indian context, [Drèze and Murthi \(2001\)](#) emphasized women’s education as a key determinant of fertility differences across Indian districts. [Sen, Surana, and Basant \(2023\)](#) explored educational gaps between Muslims and Hindus, highlighting the increasing contribution of family size with varying education levels and advocating for education promotion to address caste and religion-based educational disparities. [Magill and Wilcox \(2007\)](#) demonstrated that women’s education reduces fertility rates, even in tribal areas, underscoring the role of education in addressing population growth and inequality. Investigating national trends around the Right to Education Act (RTE), [Shah and Steinberg \(2019\)](#) found positive impacts on school attendance and infrastructure, marking a significant educational reform. This paper pioneers the study of the RTE Act’s effect on fertility and associated behaviors, offering insights into the potential reorientation of India’s educational structure for improved economic outcomes and women’s fertility. Using an instrumented difference-in-differences methodology, I exploit policy exposure variations across Indian states and birth cohorts, examining the diverse pathways through which increased education influences fertility.

3 Compulsory Schooling Law: The Right to Education (RTE) Act

India’s vision towards the momentum of providing widespread access to education has consistently suffered from several challenges. In 2000, UNESCO reported that only 86% of Indian children attended primary schools, and the survival rate to grade 5 was a mere 47%. With the worldwide push for expanded access through the Education for All Initiative (UNESCO (2000a)) and following the MDGs of the United Nations, India initiated a campaign to achieve universal access to schooling. The passage of the RTE Act followed a complicated process, as outlined in Appendix A. However, the key features of the Act for this research paper are summarized here.

In 2002, the 86th amendment to the Indian constitution introduced Article 21(a), which stipulated that “the State shall provide free and compulsory education to all children of the age of

six to fourteen years in such manner as the State may, by law, determine.”² The RTE Act was initially presented to the parliament in 2006 but was rejected due to the lack of funds and the private school lobby.³ Nevertheless, the RTE Act was approved by the Union Cabinet in 2008 and became a national law as it passed through the Lower and Upper Houses of the Indian parliament in July and August 2009. The law came into effect across India, except in Jammu and Kashmir, starting from April 1, 2010. The RTE Act is considered a landmark reform in the Indian education system and has been hailed as a significant step towards promoting social justice and equity in education in India.

After the national announcement of the law in 2009, the states in India implemented the RTE in their state legislatures. However, the timing of the implementation varied across states. Appendix Table A1 provides information on the enactment of the RTE guidelines and rules by each state. The RTE Act was not passed in the state of Jammu and Kashmir until October 2019 due to political reasons and debate on reorganizing the state into a Union Territory. The Act was eventually implemented in the state in May 2020 once the status was revoked under Article 370.⁴

The Act establishes education as a fundamental right for every child aged 6-14 by providing “*free and compulsory*” eight years of primary education. The term “*free education*” implies that a child who is admitted to the school by his/her parents is entitled to receive an education without being charged any fee or expenses or charges. The expenses covered under the RTE Act include direct costs such as school fees, as well as indirect costs such as uniforms, textbooks, mid-day meals, and transportation. This allows the child to complete their primary education without any stress or any financial obligation that could otherwise hinder their ability to pursue education. However, for schools that are not supported by the government, this exemption does not apply to children. Private schools are entitled to reserve 25% of seats for children as per the RTE guidelines. The RTE Act prohibits schools and individuals from collecting any capitation fee or subjecting the child or

²Source: <https://dsel.education.gov.in/rte>

³Source: <https://timesofindia.indiatimes.com/india/Centre-buries-Right-to-Education-Bill/articleshow/1748745.cms>

⁴I exclude the state of Jammu and Kashmir from my analysis for several reasons. First, the state implemented the reform ten years later than the national law due to its special political status. Second, the birth years analogous to the interview year age in the NFHS-4 data do not allow me to use the individuals to be treated by the reform. Third, NFHS-5 data lacks observations based on women’s birth cohorts who were affected by the policy adoption timing. Fourth, including this state for my analysis even as a control state doesn’t change the results (not shown in the paper) due to the low number of observations available.

his or her parents or guardians to any screening procedure while admitting a child. It also provides provisions for a child not to be held back or expelled until the completion of primary education. If a child is subjected to any screening procedures leading to the violations of the provisions of the RTE Act could result in punishment as per subsection 13 of the Act. Officials are charged with a fine that may extend to ten times the capitation fee, and up to Rs 25,000 (\$300 approx.) for the first contravention and Rs 50,000 (\$600 approx.) for each subsequent contravention.⁵

The RTE Act includes the provision of “*compulsory education*” by all children aged 6-14 years to complete elementary education which is monitored by government officials and local authorities to ensure that the child is properly admitted and attending school. If a child of this age group has not been admitted to school or cannot complete elementary education, then the government is responsible for admitting them to a class appropriate to their age. In the situation when a child is admitted to an age-appropriate class, then they are entitled to receive special training within a prescribed time limit so that they are at par with students at the same level. The Act mandates regular surveys in all neighborhoods to identify eligible children who lack access to education. However, the Act does not specify any penalties for non-compliance with its provisions by parents or teachers.⁶ The educational challenges in India are persistent and long debated at the central and state levels thereby imposing duties and responsibilities to address the weaknesses and deficiencies in the Indian education system. However, due to the varying economic and developmental stages of different states, the implementation of the RTE Act has shown considerable variation, as observed in their research by [Shah and Steinberg \(2019\)](#). Additionally, there also exists substantial heterogeneity at the district level in terms of compliance with RTE regulations, regardless of the economic status of the district or state.

4 Data

Data for this study is taken from cross-sectional, population-based data from a multi-round survey of National Family Health Survey (NFHS) waves 4 and 5 conducted in 2015–16 and 2019–2021.

⁵Source: <https://vikaspedia.in/education/policies-and-schemes/right-to-education/right-of-children-to-free-and-compulsory-education-act-2009-right-to-education-act>

⁶Critics of the policy to punish parents had said that it was much more important to fight the root causes of absenteeism – such as poverty and lack of access – rather than put all the onus on parents. Source: <https://thewire.in/education/parents-should-be-punished-if-kids-dont-go-to-school-says-government-panel>

The previous three rounds of NFHS were conducted in 1992–93, 1998–99, and 2004–05.⁷ NFHS is India’s largest household survey for health planning and policy formulation in the country. It is conducted by the Ministry of Health & Family Welfare (MoHFW), Government of India.⁸ NFHS-4 and NFHS-5 used a stratified two-stage sampling design to get a representative sample from the country. In total from both waves, a total sample of approximately 1,200,000+ women of 15–49 years and 1,000,000+ men of age group 15–54 years were interviewed through separate questionnaires using a computer-assisted personal interviewing method.⁹

Figure 1 shows the timeline of events per the data available. The respondents to be affected by the 2010 RTE Act implemented in states have to be 14 years old or less than that in 2010 to not drop out of school. To assign appropriate treatment to each respondent, I take into account their birth cohort (measured by birth month and birth year) based on the RTE state rules as shown in Appendix Table A1. For example, respondents surveyed in NFHS-4 or NFHS-5 were of age 15-49. So, individuals surveyed in 2021 (current age: 15-49) to be affected by the policy in 2010 (must be of age 14 or less in 2010) are the individuals in the age group 15-25 (in the survey year 2021) with their corresponding birth years as 1996-2006 as per the NFHS-5 survey data. The control group is all the respondents with ages greater than 14 years in a state where the policy was implemented and can drop out of school with fewer years of education. NFHS-4 and NFHS-5 provide extensive information on key indicators related to maternal and child health services, nutrition, fertility, reproductive health, quality of family planning services, domestic violence, and infant and child mortality.¹⁰

Table 1 reports the summary statistics for the sample used in this paper.¹¹ On average, women

⁷I do not use NFHS-1,2 and 3 because the birth year of all the women for these data sets is not affected by the RTE Act. Even though women surveyed in these waves can be a part of the control group. However, I chose to eliminate these waves to have a proper balance of data in the treatment as well as the control group. Furthermore, NFHS-3 could not be used as it does not provide information on the district of the respondent.

⁸Every wave of the NFHS data collected has two specific objectives. First, to provide health, demographic and household-level family data for policy purposes. Second, to shed light on the context of health and family welfare issues.

⁹I only used the dataset for women for my analysis in this paper as the fertility outcomes in the women’s questionnaire are more detailed than the men’s questionnaire.

¹⁰For more details of survey design and questionnaires, you can refer to the NFHS report.

Check NFHS-4 report: <http://rchiips.org/nfhs/NFHS-4Reports/India.pdf>

Check NFHS-5 report: http://rchiips.org/nfhs/NFHS-5_FCTS/India.pdf

¹¹The summary statistics do not include the state of Jammu and Kashmir where the reform came into force at a later date in 2020 and is excluded from my analysis for reasons cited earlier.

in the sample are 29 years old and they have 7 years of total education.¹² Women began their first sexual activity before the age of 16, followed by marriage, and they gave birth to their first child shortly after the age of 20. Large fractions of women are married when they are between the ages of 18 and 20 and gave birth to their first child by age 20. The most significant increase in the fraction of women who become sexually active is between the ages of 16 and 18. Additionally, by the age of 25 women have an average of about two and a half births. Finally, women desire to have at least 3 children in the given sample.

5 Econometric Framework

5.1 Baseline Estimates via Ordinary Least Squares

The previous literature has established a negative relationship between fertility and education. I begin my analysis by estimating an ordinary least squares (OLS) model to demonstrate that this negative relationship exists within India for individuals born between 1965 and 2006. In the model specification, I use total years of education ($Educ_{isc}$) as women's measure of education. The model estimated is defined by the equation:

$$Y_{iscy} = \beta_0 + \beta_1 Educ_{iscy} + \beta_2 \mathbf{X}_i + \alpha_s + \zeta_c + \Phi_y + \epsilon_{iscy} \quad (\text{OLS}) \quad (1)$$

where i is the individual, s is the state, and Y is the outcome variable (fertility measures). \mathbf{X}_i is the vector of some potential control variables that are either constant over a woman's life or occur before schooling decisions being made namely religion, district, urban/rural areas, and ethnicity. α_s is the state fixed effects, ζ_c is the birth cohort fixed effects where cohort c is defined by the interaction of the birth year and birth month of an individual i , Φ_y is the survey waves fixed effects and ϵ_{iscy} is the error term with the unobserved characteristics. Estimates are weighted using sampling weights provided by the NFHS, and the standard errors are robust and clustered at the state level.

I estimate the relationship between total years of education and four outcomes namely age at first intercourse, marriage, birth, and woman's total fertility based on the model described using

¹²In the survey, some respondents have incomplete information about their date of birth or it is missing. To address this, the NFHS attempts to estimate the missing data by utilizing other information gathered during the survey. However, including observations with estimated month or year data only results in minor inconsistencies across outcome variables for younger ages.

equation (1). I present the regression estimates in [Table 2](#) for women of each age between 15 and 25. The reform’s timing enables me to investigate the effect on Indian women till age 25.¹³ Panel A of [Table 2](#) reports the relationship between years of education and the women’s age at first intercourse. Each column of the table represents a separate regression, and the outcome variable for each regression is binary, with a value of one indicating the respondent reported having sexual intercourse before or at the specified age. The number of observations changes in each column because the sample is restricted to include only observations older than the given age.¹⁴ In Panel A, I find a significant negative relationship between education and women’s sexual intercourse at each age and the estimated coefficient is the largest at ages 18 and 20. Panel B shows that women delay marriages at each age with increased education.¹⁵ Similar to the previous two panels, the results in panel C show a statistically significant relationship between years of education and a woman’s first birth. The estimated coefficient is largest at ages 19, 20, and 21. Finally, Panel D shows the estimates for the total number of births at each age and it is seen that with increased education total fertility remains negative for all ages and becomes progressively more negative as the age of the women increases.

The OLS results in [Table 2](#) suggest that as education increases, women postpone their sexual activity, marriage, and childbearing. However, the results obtained fail to account for endogeneity problems like selection bias and reverse causality. As a result, the true effect of education on fertility outcomes may be overstated in absolute value. The estimates may be biased if education is correlated with unobservable factors such as social and cultural norms, religious beliefs, and family background that also influence a woman’s likelihood of delaying childbirth. Typically, such factors are established during childhood and remain constant over time. However, there may be other unobserved variables that affect both education and fertility and change over time. For instance, a preference for risky behavior during adolescence can lead to a higher chance of both educational failures and pregnancy. It is possible that those who are more likely to pursue further education may also have fewer children and may delay marriage due to an innate understanding of personal

¹³The density of observations gets smaller for the older cohorts compared to the initial ages in the NFHS sample because data collection is limited to women under 50.

¹⁴Panel A has fewer observations because some women chose not to report at what age they became sexually active. Additionally, in cases where a woman reported having a child at a particular age, but not having had sexual intercourse before or at that age, the observations were dropped.

¹⁵Minimum legal age of marriage for women in India is 18 years. Recently in February 2022, the government declared the minimum legal age as 21 years.

health and possible career ambition. This suggests that the negative association between education and the outcome variables could be attributed to these unobserved characteristics. Furthermore, human capital accumulation and reproductive decisions are interdependent, leading to potential problems of reverse causality. To address these concerns, I implement an instrumental variables (IV) strategy that induces exogenous variation in schooling due to the 2010 education reform in India but is uncorrelated with other characteristics, which affects women’s fertility outcomes.

5.2 Identification Strategy: The Estimated Likelihood of Being Treated by the 2010 Right to Education Act

The objective of this paper is to uncover the impact of the RTE Act on the fertility outcomes of women. As mentioned before, establishing causality between education and fertility is challenging due to the endogeneity of both variables. Education is a noisy measure and may serve as a substitute for unobservable factors such as parental background, personal motivation, skills and abilities, peer influence, and local women’s empowerment, which can significantly impact fertility decisions. To address this endogeneity concern, I have opted to employ an instrumental variable (IV) approach which is commonly used in randomized experimental setups. The IV approach is based on the assumption that the probability of compulsory education in school is correlated with the 8 years (age 6-14) of minimal education curriculum (*Reform_{isc}*), while the latter only has an impact on fertility through education (exclusion restriction). If there is another pathway through which the reform can affect fertility outcomes, the exclusion restriction would be violated, and the IV estimates would be biased and potentially misleading. The instrument is defined as below:

$$Reform_{isc} = \begin{cases} 1 & \text{if individual } i \text{ in the birth cohort } c \text{ is affected by the reform} \\ & \text{in the state } s \\ 0 & \text{otherwise} \end{cases}$$

The probability of starting school at age A depends on the individual’s birth cohort c affected by the reform in the state s . *Reform_{isc}* should be positively correlated with the total number of years of education (*Educ_{isc}*). The reform dummy is exogenous implying that the instrument is as good as randomly assigned thereby highlighting the independence assumption of IV. This implies that individuals with varying values of the instrument do not differ consistently in their potential outcomes, i.e., any unobserved variables that influence the result. However, the independence

assumption could be challenged and called into question if there was a correlation between the pre-reform fertility rates in the states and the implementation (timing or intensity) of the reform. In most states, the reform took place when total fertility rates were either decreasing or remaining to stagnate, suggesting the timing of the reform was not driven by fertility trends in particular. In addition, the monotonicity assumption eliminates the possibility of individuals who decrease their investments in education due to the reform, known as defiers. However, if there are women who are compelled to drop out of school due to the reform requirements, this assumption is violated. While this notion may appear counter-intuitive, it is reasonable to assume that there are no defiers.

The greatest threat to identification is that the generations most exposed to the law are also most exposed to other social changes, such as social media and changing cultural perceptions. For example, say a less secular state, has social media campaigns or discussions that influenced the behavior of individuals in a way that affected their compliance with the reform, then the IV estimate may be biased. Identification relies on having women from the same generation in both treated and control groups. This comes from two sources: (1) staggered implementation of the law across states and (2) individuals who were just above or below the age cut-off of the policy when it was passed. Since some individuals born before may be also affected by the reform, the estimate is likely to be biased downwards and will thus be a conservative estimate of the impact of years of education on early fertility.

Therefore, based on case (1), I check whether the exclusion restriction holds true or not by examining potential alternative pathways through which the instrument may affect fertility. [Figure 2](#) shows some demographic variables like the average GDP growth rate (2000-2010) and the literacy rates (2001) prior to the reform implementation across states that implemented the reform earlier or later.¹⁶ This offers a visual to assess the plausibility of the exclusion restriction assumption, but it is to be noted that it is not a definitive test of the instrument's validity. I find that both the average GDP growth rate and the literacy rate are similar across the states that implemented the policy earlier or later, suggesting that such socio-economic characteristics are not picking up the effect of the instrument, which supports the exclusion restriction assumption. It can be said that there are potentially confounding factors (pre-policy characteristics between early adopters and

¹⁶Note: I do not have data for other demographic variables like social media changes etc. Given that data on literacy rates in India is collected every 10 years, I chose to utilize the information from the year 2001, which precedes the implementation of the reform.

late adopters state) that are affecting the outcome variable besides the change in the reform. This strengthens the argument that the reform change is the only variable that is affecting the endogenous variable, which in turn is affecting the outcome variable. In other words, the treatment (IV) was assigned randomly. I discuss (1) in detail as a potential threat to the identification strategy in the later section and perform some robustness checks.

Furthermore, the identifying variation indicated in (2) provides insight into the retroactive attributes of the reform by delving deeper into understanding whether the reform extends its applicability to women who discontinued their education prior to its implementation but still fall within the specified age bracket. For example, consider a scenario where a 13-year-old girl discontinued her schooling. However, following the implementation of the policy reform, she is now required to resume primary education to comply with the rule, given that she falls within the policy age range of 6 to 14 years old. However, this threat is eliminated because of the special provision of the reform that does not affect the cohorts around the threshold of age 14. The reform requirement is such that if a child above six years of age has never been admitted to school or though admitted, could not complete elementary education, then the child will be admitted to an age-appropriate class and complete elementary education.¹⁷ The reform allows for children who are enrolled in age-appropriate classes to receive specialized training that will help them catch up with their peers. Because of the diverse life experiences of these children, the education sector acknowledges that their mental abilities exceed those of typical six-year-old children and they are capable of accelerated learning. This allows me to use all the potential cohorts to be affected by the reform in my regressions and not to isolate cohorts in and around the threshold as a part of identification.¹⁸

5.3 The Reduced-Form and 2SLS Model

I verify that the instrument predicts the change in education, the endogenous variable in the OLS model. This first stage relationship can be described by the following equation:

$$Educ_{iscy} = \gamma_0 + \gamma_1 Reform_{isc} + \gamma_2 \mathbf{X}_i + \delta_s + \phi_c + \nu_y + u_{iscy} \quad \textbf{(First Stage)} \quad (2)$$

¹⁷The overall objective of age-appropriate admission for these children is to save them from the humiliation and embarrassment of sitting with younger children. When older children are forced to sit in a class younger than their age, they tend to be teased, and taunted, suffer lower self-esteem, and consequently drop out.

¹⁸I do check for the total years of education in and around the threshold. But my data has no women whose years of education are affected around that cut-off.

$Reform_{isc}$ is the potential treatment for the education of the individuals when the policy came into force in different states. In Table 3, I present the estimates of γ_1 using total years of education as the dependent variable in panel A. The estimates in Table 3 show that the instrument predicts statistically significant increases in education due to the reform with F-statistics larger than 10. In column (2), the reform is estimated to increase years of education by 0.645 years when all the control variables are used in the regression.

While the 2x2 difference-in-difference (DD) model is widely understood and commonly used, I utilize the fixed effects DD estimator in the above equation, with treatments occurring at different times. Specifically, units of observation that are treated at a certain time based on the policy enactment in a state are regarded as the treatment group, while untreated units are interpreted as the control group.

Using the first stage estimates, the main empirical specification is defined by the equation:

$$Y_{iscy} = \pi_0 + \pi_1 \widehat{Educ}_{iscy} + \pi_2 \mathbf{X}_i + \theta_s + \lambda_c + \kappa_y + \tau_{iscy} \quad (\text{Second Stage, 2SLS}) \quad (3)$$

π_1 here can be expressed as the ratio of reduced form and first-stage coefficients (IV/ Wald estimator). In essence, it calculates the average impact of treatment on the compliers (LATE). This method determines that the estimate is derived by dividing the difference in outcomes between groups intended and not intended for treatment by the difference in actual treatment for these groups.

To summarize, the instrument is comparable to a random assignment which impacts the outcome variable through a single known channel in its initial stage. Furthermore, it only impacts the causal channel of interest in one direction and can be employed to estimate the average causal effect for women who are compelled to receive free and compulsory education due to the reform requirements (compliers).

Since the measure of education does not perfectly capture the full impact of the 2010 reform, I also focus on the estimates from the reduced-form model (intention to treat estimates or ITT) given by the following equation:

$$Y_{iscy} = \rho_0 + \rho_1 Reform_{isc} + \rho_2 \mathbf{X}_i + \sigma_s + \omega_c + \iota_y + \mu_{iscy} \quad (\text{Reduced Form}) \quad (4)$$

where i is the individual, and Y is the outcome variable (fertility measures). All covariates and the fixed effects are the same as described in the OLS model, equation (1). The variable $Reform_{isc}$ is

the instrument described in the previous subsection.

6 Results

6.1 2SLS and Reduced Form Results

[Table 4](#) reports the 2SLS results for each age from 15 to 25 using the same four outcome variables examined previously namely age at first intercourse, marriage, and birth, along with total fertility.¹⁹

The estimates in each column are generated from a separate regression. The results in Panel A, for first intercourse, are statistically significant for women in their teenage years till age 20. The largest negative relationship occurs at age 18 estimating the effect of education because the reform led to a 7.2 percentage point decline in the likelihood of a woman becoming sexually active. Premarital sex for teenage women is reduced through the impact of the reform on education. For later ages, the results are not statistically significant, but the negative relationship still holds. I find a negative coefficient in Panel B, for marriage, the results are negative and statistically significant beginning at age 15. The estimates indicate that the years of education affected by the reform led to women being 3.9 percentage points less likely to be married by the age of 21. These results suggest that women in India are postponing marriages from their early teenage years to their late twenties. The estimated effect on marriage remains negative, although insignificant and smaller in magnitude compared to age 20, for ages 24 and 25. The results for age at first birth in Panel C establish a similar pattern. Following the decline in the age at first marriages, the estimated effect of education because of the reform on the likelihood that a woman has given birth by age 18 is statistically significant at the 95 percent confidence level. The result then increases in magnitude and slightly in significance, estimating that the reform led to a 2.6 percentage point reduction in the likelihood of a woman giving birth by age 21. The estimated effect becomes slightly more negative as the women move at ages 24 and 25. The effect of postponing a woman's first childbirth lags the effect on marriage by between one or two years. This suggests that the effect on first birth may be linked to women delaying marriage. Although the reduction in marriage may contribute to delaying

¹⁹It is to be noted that the 2SLS estimates derived in [Table 4](#) are greater than the OLS estimates derived in [Table 2](#). The reason is that the OLS estimates capture the average treatment effect (ATE) over the entire population, while the 2SLS estimates measure the local average treatment effect (LATE) for the population whose choice of treatment is affected by the reform (IV). Furthermore, the measurement error in education due to omitted variables biases the OLS estimates of the treatment effect toward zero. The 2SLS estimates are unperturbed by the measurement error and hence they tend to be larger than the OLS estimates.

childbearing, it cannot be the main determinant in explaining the entire result. Additionally, it is seen that the reform leads to postponed sexual activity in the younger ages, which could explain some of the more persistent effects that are seen in panel C. Although insignificant, it is observed that the reform led to a decrease in the likelihood of women in their late twenties becoming sexually active or married or waiting to have their first child. This suggests that the RTE Act may also have led to other changes in behavior.

In addition to the delay in women’s initial fertility, the results in Panel D show how the effect on total fertility due to the reform has evolved at different ages. There is evidence that the years of education affected by the reform, at age 23, led to a statistically significant reduction of 0.042 births. Interestingly, the reduction in total fertility rates becomes increasingly negative for women in their twenties in their magnitude and significance, providing evidence the effect is not driven solely by an *incarceration effect* as proposed by [Black et al. \(2008\)](#). Career opportunities or educational pursuits incarcerate women in non-childbearing activities in their early teenage years but the effect is not significant. By age 25, the reform led to a reduction of 0.189 births, which is significant at the 95 percent confidence interval. This is evidence that women in their mid-twenties reduce their fertility rates due to the human capital they acquire through total years of education thereby highlighting the *human capital effect*. Although a woman’s fertility doesn’t cease or become complete at the age of 25, given the NFHS-4 and 5 data, I am unable to track and comment further on the change in the fertility behavior of women in their twenties due to the change in their education via the reform.

[Table 5](#) reports the reduced-form results i.e. the effect of the reform directly on the fertility outcomes as reported previously. The results are similar to the 2SLS results reported in [Table 4](#) in terms of the direction of change in the estimated effect of the reform. The level of significance for different ages also holds true compared to the results in [Table 4](#). This validates that the reduced-form estimates are not subject to issues accruing to instrument problems thereby showing that the effect of the reform on education had the same and consistent effect as the reform has had on fertility outcomes. Additionally, it implies that the causal effect of education on women’s fertility is well identified, affirming the validity of the instrument and the fulfillment of the exclusion restriction. The results obtained from both methods can thus be considered reliable.

6.2 Threats to Identification Strategy and Robustness Checks

In this paper, the instrument is assigned by utilizing the variability in the timing of reform implementation among states and birth cohorts of women, aiming to underscore the reform’s impact on women’s family planning decisions. As the first stage involves treatment status assignment using a DD method, there exists a policy endogeneity concern expressed in section 5.1 earlier. The policy adoption endogeneity is not completely resolved using the IV approach or controlling for fixed effects. The instrument is valid if the reform only affects the outcomes of interest through its effect on the total years of education. The 2SLS estimates for marriage and fertility behaviors will be biased if the instrument is capturing a secular trend in women’s propensity to attend and advance through their levels of education. The instrument is likely measuring some unobserved endogenous change in the demand for education before 2010, an arbitrary point in time.

I address this issue in the paper in two ways. I use some state-level characteristics that might be correlated with the adoption of the RTE law to see if they have any predictive power. First, in one set of auxiliary regressions, I include a control for the average state-level GDP growth rate²⁰ from 2000-2010 and interact with the linear trend in the birth cohort. I use the average state-level GDP growth rate as a proxy for educational investments in a particular state due to the absence of state-level educational expenditures or literacy rate data for each year. Integrating these controls, particularly when interacting with the linear trend of the woman’s birth cohort, enables me to discern and analyze whether the growth rates in each state before the implementation of the RTE Act are picking up the effect on education more than the instrument. The results are shown in Table 6.²¹ The estimates demonstrate a nearly identical pattern to the baseline results reported in Table 4.²² The pattern in Panel A also mirrors closely the results from the baseline estimates. The reform’s effect on marriage is largest for the ages 19 and 20, as it was without the GDP growth in linear birth cohort control. The estimates for first birth also lag that of marriage. The estimates for total fertility also remain similar to the baseline results and increase in magnitude for later ages. The results in Table 6 suggest that the pre-treatment GDP growth rate accounting for the strength and wealth of the state is not driving the results with the implementation of the

²⁰Data collected from MOSPI (Ministry of Statistics and Programme Implementation), Government of India. The growth rates are measured at a constant price 1999-2000.

²¹The number of observations is reduced because of the missing values for the GDP growth rate in some states.

²²The first stage results are robust and are reported in Appendix Table A2.

policy. Furthermore, the correlation between the pre-treatment GDP growth rate and the policy implementation, which occurred at varying times across different states (results not displayed), is observed to be significantly negative. This again verifies that the wealthy states didn't implement the policy earlier supporting the randomness of the treatment across states. The differences in states' growth do not bias my conclusions.

Second, in another set of auxiliary regression, I rerun equation (3) controlling for the state-level GDP per capita for the pre-treatment year i.e. 2009 interacted with the linear trend in the birth cohort.²³ This alternative control allows me to indirectly measure the per capita income level of a state prior to the reform implementation. Differing state per capita income might mean that some states are more likely to adopt the law sooner, so the instrument might be picking up such characteristics. The results are reported in [Table 7](#) and are found to be robust.²⁴ The estimates in all the panels are very similar to those seen previously in the baseline model.

As a part of the robustness check, I re-run the 2SLS results controlling for state-specific linear time trends based on the birth cohort to isolate the causal effect of education on women's outcome variables. This allows me to control for any time-varying factors that can affect women's fertility outcomes differently across states, such as changes in the state's economy, policy changes, or demographic shifts. The results are shown in [Table 8](#). Although I lost the significance level for some ages, the direction of changes in the magnitude of the coefficients remains similar to the baseline results as shown in [Table 4](#).

6.3 Exploration of Additional Pathways

In addition to the reform's effect on the beginning of sexual activity, marriage, and childbearing discussed in the prior sections, additional mechanisms and pathways could provide further insight into understanding the relationship between total years of education and fertility outcomes of women.

6.3.1 Predicting Fertility Practices

An increase in education allows women to understand their health and the healthcare options available in making better decisions about fertility outcomes ([Thomas, Strauss, and Henriques](#),

²³Data collected from MOSPI (Ministry of Statistics and Programme Implementation), Government of India and are measured at a constant price 1999-2000.

²⁴The first stage results are robust and are reported in Appendix [Table A2](#).

1991). The first column of Table 9 demonstrates that the increased education generated by India's policy change resulted in a favorable fertility preference by the women and their partners after their first birth. A potential outcome of this situation could be an increase in abortions, which could have played a role in the decrease in fertility rates. The NFHS classifies any pregnancy not ending in a live birth termination, but an increase in the use of abortion to avoid having a child would still lead to an increase in recorded terminations.²⁵ The result in the first column of Table 9 demonstrates that the increased education generated by India's policy change did not lead to more respondents reporting having ever had a terminated pregnancy. Furthermore, unintended pregnancies may lead women to seek unsafe abortions (Singh, Hussain, Shekhar, Acharya, Moore, Stillman, Frost, Sahoo, Alagarajan, Sundaram, et al., 2018), and unsafe abortion is one of the major causes of maternal mortality in India (Yokoe, Rowe, Choudhury, Rani, Zahir, and Nair, 2019). I also test a measure of whether respondents' last pregnancy was unwanted. The second column in Table 9 reports that the reform's effect on increasing total years of education reduced the probability that a woman's last pregnancy was reported as unwanted by 2 percentage points. Column 3 in Table 9 shows the effect of the reform on increasing education did not lead to reducing the fertility preferences of having more children after the first birth.

With continual efforts, India has expanded in delivering several healthcare services to families and households by expanding the reach of contraceptive options. The estimates in Columns 4 and 5 show the effectiveness of the reform in increasing education leading to an increased likelihood of women having more knowledge and awareness of using any contraception and modern contraception before having their first child. As further evidence of the reform's effect on the empowerment of these women, the last column shows that the reform led to an increase in the likelihood of being tested for HIV/AIDS by 6.9 percentage points. These pieces of evidence underscore both the *knowledge* and *autonomy effects*, highlighting how education can shape fertility attitudes and enhance awareness among women in Indian society.

²⁵As per the abortion laws in India, the legal age of abortion for unmarried girls is 18 years. If a woman is unmarried and is over 18 years in her age then she can provide her own written consent for having an abortion. But girls who are less than 18 years of age need to have written consent from their parent or guardian citing a specific reason for the abortion of pregnancy.

6.3.2 Predicting Marriage Characteristics and Economic Resources

I found evidence that changes in the husband’s characteristics played a role in reducing fertility. Due to assortative matching, it could be expected that women affected by the reform, may have married and paired themselves with men with higher levels of education, leading households to make different decisions regarding fertility. Estimates in the first column in panel A of [Table 10](#) demonstrate that women are marrying men whose total years of education have significantly increased due to the reform. Additionally, in the second column in panel A of [Table 10](#) it is observed that the reform did affect the age difference between husbands and wives. Even though the age difference estimate is not significant, the reform reduced the marital age difference by 1.9 percentage points. This means that the reform affected both genders as expected allowing both the husband and wife to have to increase their years of education. This leads to the expected result that women in this sample marry men with similar characteristics and they reduce the marital education gap between husband and wife by 0.556 total years of education. These findings indicate that the fertility decline was driven by women’s increased capacity to make autonomous decisions with a significant reduction in the education gap between spouses as shown in the second last column. The estimate in the last column is insignificant but positive in magnitude which shows respondents’ autonomy in having a final say in making decisions in the household. Women with more education can influence maternal health by shaping the extent to which they can afford and access healthcare and bolster women’s autonomy in the home. This increased empowerment is likely essential to women’s ability to affect fertility decisions if so desired.

The estimates in panel B of [Table 10](#) measure the economic resources and elucidate further increasing women’s empowerment and their ability to independently make decisions in family planning. While I do not quantify empowerment in this study, I believe that such a reform creates a transformative role in terms of further educational attainment which echoes the sentiment of women empowerment in India, particularly emphasizing the *autonomy effect*. NFHS data does not include questions about income. I assess economic resources with a measure of respondents’ employment in the last twelve months (0/1). I did not find a significant increase in women’s employment due to the reform. However, the increase in education is not likely to increase women’s relative earning potential, which could have positively affected bargaining power in the household

decision process.²⁶ But evidence of increased empowerment can be seen in columns 3 and 4 with a significantly increased likelihood of occupational status and contributing to the household wealth.²⁷ The last column is a measure of economic resources which is a dichotomous indicator of whether a respondent reported having health insurance or not. I find their probability of being insured due to the effect of the reform is 0.3 percentage points. But the estimate is insignificant.

6.3.3 Predicting Utilization of Reproductive Healthcare Service in Last Pregnancy

Women’s education is theorized to safeguard maternal health by influencing their fertility practices that exacerbate the likelihood of maternal illness and morbidity. It also enhances their access to and utilization of preventive healthcare services. Along with the previous measures, this section allows me to understand women’s empowerment through an increase in education that may lead women to better understand the healthcare options available to them and take better care of their health. The first column in [Table 11](#) shows a significantly positive effect of the reform to increase years of education for women and increase their probabilities of attending at least one antenatal checkup during their last pregnancy. Antenatal healthcare visits should increase the detection of hypertensive disorders and anemia ([McCarthy and Maine, 1992](#)), which can contribute to preterm birth ([Scholl and Reilly, 2000](#)) and convulsions, brain hemorrhaging, comas, or cardiac arrest during pregnancy ([Duley, 1992](#)). I also find a positive effect of education on visiting healthcare providers in the past 12 months. Women’s education allowed them to take preventative measures to protect their health and I find a significant increase in their consumption of iron supplements during their last pregnancy. All these observed trends underscore the *knowledge effect*, highlighting the crucial role of women’s informed decision-making in influencing the decline in fertility.

Moreover, delivering children in hospitals and other formal healthcare centers instead of at home improves postnatal health by lowering the probability of postpartum infection and providing skilled birth attendants who are equipped to address complications during delivery ([Graham, Bell, and Bullough, 2001](#)). Thus, the hypothesized positive effects of women’s education on healthcare utilization may help to alleviate the direct causes of maternal mortality through the prevention

²⁶The negative coefficient for relative earning potential implies that educated women tend to partner with husbands who have higher levels of education and earnings, resulting in a decrease in their relative earnings.

²⁷Occupational status is based on NFHS standardized broad categories. The measure of household wealth created by the NFHS is based on household assets and durable goods. This measure is divided into quintiles and captures households’ wealth relative to other households in the survey.

of semi-avoidable complications as well as early detection and management of unpreventable complications or preexisting conditions. [Table 11](#), the last column shows that increasing women’s education by the reform heightened their probability of delivering their last birth in a healthcare center by 3 percentage points.

6.3.4 Predicting Cognitive Skills and Mass Media Exposure

The final analytical component explores the other pathways by which women’s education may affect fertility practices and healthcare utilization, and implicitly maternal health. The first is cognitive skills, proxied only by literacy in the NFHS data. Literacy was assessed by asking all respondents to read the same sentence and is defined as 1 if a respondent was able to read the entire sentence and 0 if she was not. The results presented in [Table 12](#) show that an increase in women’s education through the reform increased the probability of literacy by 10 percentage points. The second is exposure to the mass media (newspaper, magazine, TV, Radio) and is defined as 1 if a respondent reads a newspaper/magazine and/or watches TV and/or listens to the radio almost every day or at least once a week, 0 otherwise. Exposure to the reform shows an increased likelihood of a woman being exposed to media, contributing to the *knowledge effect* by fostering increased awareness and learning about family planning, fertility practices, and healthcare utilization.

7 Discussion and Conclusion

This paper discusses the causal impact of education on fertility and associated behaviors in Indian women. The results obtained suggest that the Right to Education (RTE) Act in India used to measure education exogenously is a significant policy tool for the government’s endeavor to promote quality education in Indian society. This paper contributes to the growing literature that demonstrates the extensive economic and social benefits of education. The reform led to a substantial increase in total years of education and had an impact on a woman’s fertility decisions. It led to postponed marriages, and sexual activity, and delayed women’s age at first birth.

The results for fertility demonstrate that the effect is not confined to the period that women attend school, and becomes increasingly negative for women in their early twenties. This suggests, along with other evidence, that the *incarceration effect* is not driving the reduction in fertility but due to the *human capital effect*: women acquire more knowledge, education, and experience

which plays a crucial role in shaping their fertility decisions. The results are likely not driven by changes in the likelihood that a woman ever had a pregnancy terminated but changes in spousal characteristics do have an effect on family planning decisions. Women tend to select their partner with higher total years of education thereby reducing their education difference. Furthermore, there is an increased probability of the *knowledge effect* as demonstrated by widespread knowledge of contraceptives that seem to significantly affect fertility. The reform led to increased women's empowerment with women taking preventive measures for their health and increased utilization of healthcare services. This evidence is consistent with the idea of the *autonomy effect* highlighting that education can empower women to have more influence over household fertility decisions, ultimately resulting in decreased levels of fertility.

Although this study has its merits, some limitations are to be noted. Firstly, the latest NFHS data only allows for the tracking of a woman's fertility behavior until the age of 25, and not beyond. This prohibits me from commenting on women's fertility levels after age 25. Secondly, literacy is the only measure of cognitive skill in the NFHS, which is a basic measure and does not exhibit much variation among women. Thus, further analysis is necessary to establish whether cognitive skills are a likely factor driving changes in women's fertility practices and healthcare utilization. Thirdly, the NFHS data does not provide a comprehensive employment history, which makes it difficult to determine women's labor force participation and to investigate whether education reform impacted their fertility decisions through changes in labor force participation.

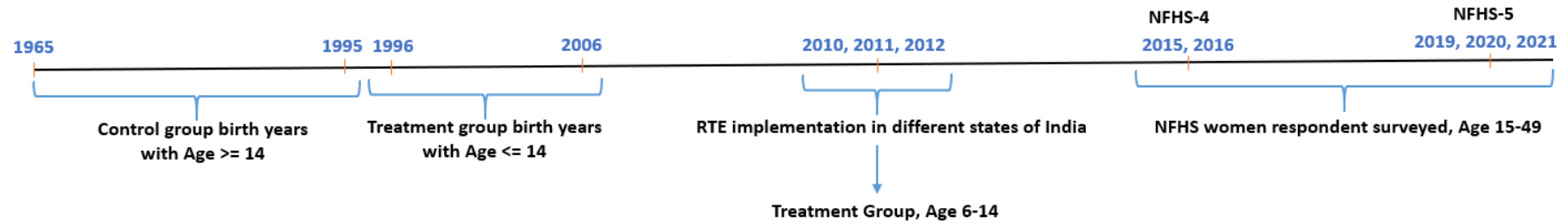
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Figure 1: NFHS Timeline of Events



Interview Year Age	Reform Year Age	Birth Years Affected by the Reform
(NFHS-4) 2015: 15-19	2010: 10-14	1996-2000
(NFHS-4) 2016: 15-20	2010: 9-14	1996-2001
(NFHS-5) 2019: 15-23	2010: 6-14	1996-2004
(NFHS-5) 2020: 15-24	2010: 5-14	1996-2005
(NFHS-5) 2021: 15-25	2010: 4-14	1996-2006

Figure 2: Exclusion Criteria of IV: A Visual Assessment

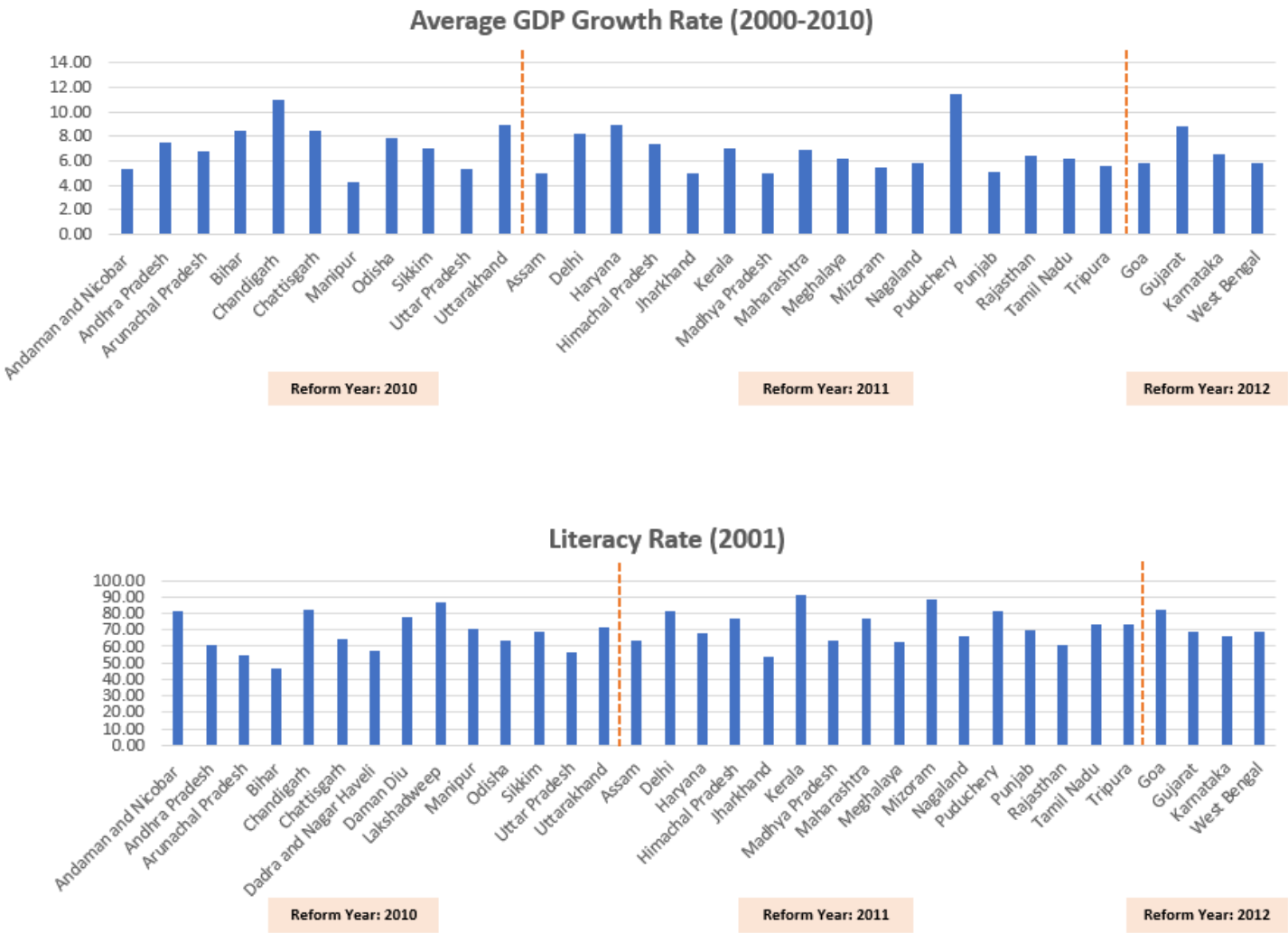


Table 1: Summary Statistics

Variable	Mean	Std. Dev.
Age	29.830	9.827
Total years of education	7.1970	5.155
Age at first intercourse	15.078	8.644
Age at first marriage	18.714	3.928
Age at first birth	20.758	3.764
<i>Fraction with first intercourse by age</i>		
15	0.387	0.283
18	0.241	0.427
20	0.271	0.444
22	0.266	0.442
25	0.293	0.455
<i>Fraction first married by age</i>		
15	0.060	0.239
18	0.129	0.336
20	0.124	0.330
22	0.094	0.292
25	0.051	0.330
<i>Fraction with first birth by age</i>		
15	0.018	0.133
18	0.079	0.271
20	0.116	0.320
22	0.106	0.307
25	0.064	0.245
<i>Total fertility by age</i>		
15	0.000	0.006
18	0.002	0.051
20	0.012	0.112
22	1.023	1.130
25	2.046	0.209
Ideal number of children	3.760	5.379
Fraction Working	0.242	0.428

Data Source: National Family Health Survey (NFHS-4 & 5). The sample includes women born between 1965 & 2006 and excludes the state of Jammu and Kashmir.

Table 2: OLS: Total Years of Education and First Intercourse/Marriage/Birth and Total Fertility, by Age

A. First Intercourse by Age:											
	15	16	17	18	19	20	21	22	23	24	25
Education	-0.009***	-0.011***	-0.013***	-0.016***	-0.014***	-0.016***	-0.011***	-0.010***	-0.007***	-0.003***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
N	880157	802875	703971	585050	443766	338923	246811	185350	135872	99359	72091
B. First Marriage by Age:											
	15	16	17	18	19	20	21	22	23	24	25
Education	-0.008***	-0.009***	-0.011***	-0.012***	-0.012***	-0.010***	-0.007***	-0.005***	-0.002***	-0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	1181598	1109673	1017293	904461	786947	684523	599353	534690	484190	445664	416512
C. First Birth by Age:											
	15	16	17	18	19	20	21	22	23	24	25
Education	-0.003***	-0.004***	-0.006***	-0.008***	-0.009***	-0.010***	-0.009***	-0.007***	-0.005***	-0.003***	-0.001***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
N	1265943	1242910	1201527	1135029	1044239	936111	827411	733656	655817	595190	548494
D. Total Fertility by Age:											
	15	16	17	18	19	20	21	22	23	24	25
Education	-0.000***	-0.000***	-0.000***	-0.000***	-0.001***	-0.001***	-0.001***	-0.002***	-0.002***	-0.001***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	1284814	1236461	1188714	1143810	1092633	1050685	1000317	959609	911700	868911	827032

*** p<0.01, ** p<0.05, * p<0.1. Each estimate is from a separate regression. In panels A, B, and C the dependent variable is equal to one if the event occurred by the given age, in panel D the dependent variable is total fertility by the given age. The sample is restricted to only include observations older than the age specified in each column. The sample also excludes the state of Jammu and Kashmir. All regressions include the fixed effects for birth cohorts, state, and survey waves and the covariates are religion, district, urban/rural area, and ethnicity. Each regression is weighted by sampling weights from the NFHS data, and standard errors are robust and clustered at the state level.

Table 3: First Stage

A. Dependent Variable: Total Years of Education		
	Without Covariates	With Covariates
<i>Reform_{isc}</i>	0.670*** (0.139)	0.645*** (0.144)
N	1286768	1284814
F-stat	23.2338	20.0629

*** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the measure of education. Each column is a separate regression without and with the covariates. The sample excludes the state of Jammu and Kashmir. *Reform_{isc}* is the probability of being treated by the reform in each state, and the variable ranges from 0 to 1. All regressions include the fixed effects for birth cohorts, state, and survey waves and the covariates are religion, district, urban/rural area, and ethnicity. Each regression is weighted by sampling weights from the NFHS data, and standard errors are robust and clustered at the state level.

Table 4: Second Stage: Age at First Intercourse/Marriage/Birth and Total Fertility, by Age

A. First Intercourse by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	-0.042***	-0.036***	-0.049*	-0.072**	-0.052**	-0.058**	-0.058	-0.032	-0.028	-0.016	-0.069
	(0.012)	(0.011)	(0.027)	(0.033)	(0.021)	(0.025)	(0.041)	(0.017)	(0.016)	(0.023)	(0.091)
N	880157	802875	703971	585050	443766	338923	246811	185350	135872	99359	72091
B. First Marriage by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	-0.032***	-0.036***	-0.046**	-0.042**	-0.054***	-0.054***	-0.039*	-0.036	-0.009	-0.028	-0.019
	(0.005)	(0.009)	(0.023)	(0.019)	(0.015)	(0.020)	(0.020)	(0.029)	(0.028)	(0.037)	(0.032)
N	1181598	1109673	1017293	904461	786947	684523	599353	534690	484190	445664	416512
C. First Birth by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	-0.003	-0.005	-0.007	-0.015**	-0.022**	-0.022***	-0.026***	-0.010	-0.015	-0.028**	-0.027**
	(0.003)	(0.004)	(0.004)	(0.006)	(0.010)	(0.007)	(0.007)	(0.012)	(0.018)	(0.012)	(0.012)
N	1265943	1242910	1201527	1135029	1044239	936111	827411	733656	655817	595190	548494
D. Total Fertility by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	0.000**	0.000	-0.005	-0.005	-0.003	-0.000	-0.045	-0.041	-0.042**	-0.155**	-0.189**
	(0.000)	(0.000)	(0.004)	(0.012)	(0.008)	(0.010)	(0.031)	(0.087)	(0.025)	(0.023)	(0.063)
N	1284814	1236461	1188714	1143810	1092633	1050685	1000317	959609	911700	868911	827032

*** p<0.01, ** p<0.05, * p<0.1. Each estimate is from a separate regression. In panels A, B, and C the dependent variable is equal to one if the event occurred by the given age, in panel D the dependent variable is total fertility by the given age. The sample is restricted to only include observations older than the age specified in each column. The sample also excludes the state of Jammu and Kashmir. All regressions include the fixed effects for birth cohorts, state, and survey waves and the covariates are religion, district, urban/rural area, and ethnicity. Each regression is weighted by sampling weights from the NFHS data, and standard errors are robust and clustered at the state level.

Table 5: Reduced Form: Age at First Intercourse/Marriage/Birth and Total Fertility, by Age

A. First Intercourse by Age:											
	15	16	17	18	19	20	21	22	23	24	25
<i>Reform_{isc}</i>	-0.031*** (0.005)	-0.027*** (0.007)	-0.039* (0.020)	-0.055** (0.020)	-0.041*** (0.012)	-0.046*** (0.016)	-0.043 (0.027)	-0.069 (0.055)	0.068 (0.071)	0.050 (0.120)	-0.020 (0.014)
N	880157	802875	703971	585050	443766	338923	246811	185350	135872	99359	72091
B. First Marriage by Age:											
	15	16	17	18	19	20	21	22	23	24	25
<i>Reform_{isc}</i>	-0.021*** (0.004)	-0.023*** (0.006)	-0.028** (0.014)	-0.024** (0.010)	-0.028*** (0.004)	-0.024*** (0.006)	-0.014*** (0.005)	-0.010* (0.006)	-0.002 (0.005)	-0.005 (0.004)	-0.003 (0.004)
N	1181598	1109673	1017293	904461	786947	684523	599353	534690	484190	445664	416512
C. First Birth by Age:											
	15	16	17	18	19	20	21	22	23	24	25
<i>Reform_{isc}</i>	-0.002 (0.002)	-0.003 (0.003)	-0.005 (0.003)	-0.010** (0.005)	-0.015** (0.007)	-0.015*** (0.004)	-0.017*** (0.003)	-0.006 (0.007)	-0.008 (0.008)	-0.013*** (0.003)	-0.010** (0.004)
N	1265943	1242910	1201527	1135029	1044239	936111	827411	733656	655817	595190	548494
D. Total Fertility by Age:											
	15	16	17	18	19	20	21	22	23	24	25
<i>Reform_{isc}</i>	0.000* (0.000)	0.000 (0.000)	-0.004 (0.002)	-0.003 (0.009)	-0.002 (0.005)	0.000 (0.007)	-0.035 (0.021)	-0.035 (0.080)	-0.046** (0.021)	-0.157** (0.073)	-0.202*** (0.019)
N	1284814	1236461	1188714	1143810	1092633	1050685	1000317	959609	911700	868911	827032

*** p<0.01, ** p<0.05, * p<0.1. Each estimate is from a separate regression. In panels A, B, and C the dependent variable is equal to one if the event occurred by the given age, in panel D the dependent variable is total fertility by the given age. The sample is restricted to only include observations older than the age specified in each column. The sample also excludes the state of Jammu and Kashmir. *Reform_{isc}* is the probability of being treated by the reform in each state, the variable ranges from 0 to 1. All regressions include the fixed effects for birth cohorts, state, and survey waves and the covariates are religion, district, urban/rural area, and ethnicity. Each regression is weighted by sampling weights from the NFHS data, and standard errors are robust and clustered at the state level.

Table 6: Second Stage Controlling for State Level Average Pre-Treatment GDP Growth Rate Interacted with Linear Birth Cohort: Age at First Inter-
course/Marriage/Birth and Total Fertility, by Age

A. First Intercourse by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	-0.041*** (0.010)	-0.035*** (0.011)	-0.048* (0.028)	-0.072** (0.036)	-0.052** (0.022)	-0.059** (0.025)	-0.059 (0.043)	-0.092 (0.081)	-0.039 (0.051)	-0.017 (0.029)	-0.054 (0.102)
N	875462	798412	699861	581443	440819	336496	244869	183809	134674	98459	71408
B. First Marriage by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	-0.032*** (0.005)	-0.036*** (0.009)	-0.046** (0.023)	-0.042** (0.019)	-0.054*** (0.015)	-0.054*** (0.020)	-0.039* (0.020)	-0.036 (0.029)	-0.009 (0.027)	-0.028 (0.037)	-0.018 (0.032)
N	1175024	1103324	1011296	898926	781936	680006	595301	531061	480917	442687	413769
C. First Birth by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	-0.003 (0.003)	-0.004 (0.004)	-0.007* (0.004)	-0.015** (0.006)	-0.022** (0.010)	-0.022*** (0.007)	-0.026*** (0.007)	-0.010 (0.011)	-0.015 (0.017)	-0.028** (0.012)	-0.027** (0.012)
N	1259105	1236132	1194878	1128642	1038198	930527	822312	729003	651593	591311	544887
D. Total Fertility by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	0.000* (0.000)	0.000 (0.000)	-0.005 (0.004)	-0.005 (0.012)	-0.003 (0.008)	0.000 (0.010)	-0.045 (0.029)	-0.040 (0.086)	-0.046** (0.027)	-0.152** (0.026)	-0.145** (0.060)
N	1277918	1229781	1182270	1137586	1086624	1044880	994732	954235	906565	863998	822337

*** p<0.01, ** p<0.05, * p<0.1. Each estimate is from a separate regression. In panels A, B, and C the dependent variable is equal to one if the event occurred by the given age, in panel D the dependent variable is total fertility by the given age. The sample is restricted to only include observations older than the age specified in each column. The sample also excludes the state of Jammu and Kashmir. All regressions include the fixed effects for birth cohorts, state, and survey waves and the covariates are religion, district, urban/rural area, and ethnicity. Each regression is weighted by sampling weights from the NFHS data, and standard errors are robust and clustered at the state level.

Table 7: Second Stage Controlling for State Level Pre-Treatment GDP Per-Capita Interacted with Linear Birth Cohort: Age at First Inter-
course/Marriage/Birth and Total Fertility, by Age

A. First Intercourse by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	-0.042*** (0.014)	-0.037** (0.017)	-0.058 (0.037)	-0.098* (0.052)	-0.080** (0.038)	-0.095** (0.044)	-0.126 (0.096)	-0.185 (0.181)	-0.024 (0.040)	-0.015 (0.025)	-0.023 (0.068)
N	875462	798412	699861	581443	440819	336496	244869	183809	134674	98459	71408
B. First Marriage by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	-0.036*** (0.007)	-0.042*** (0.013)	-0.058* (0.035)	-0.053* (0.031)	-0.079** (0.034)	-0.083** (0.042)	-0.067 (0.052)	-0.065 (0.076)	-0.017 (0.060)	-0.049 (0.081)	-0.028 (0.051)
N	1175024	1103324	1011296	898926	781936	680006	595301	531061	480917	442687	413769
C. First Birth by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	-0.005 (0.004)	-0.006 (0.006)	-0.008 (0.007)	-0.018* (0.009)	-0.029* (0.017)	-0.028** (0.011)	-0.037*** (0.013)	-0.008 (0.019)	-0.017 (0.032)	-0.041 (0.026)	-0.041* (0.023)
N	1259105	1236132	1194878	1128642	1038198	930527	822312	729003	651593	591311	544887
D. Total Fertility by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	0.000* (0.000)	0.001 (0.001)	-0.007 (0.005)	-0.007 (0.015)	-0.005 (0.010)	-0.005 (0.015)	-0.051 (0.032)	-0.048 (0.086)	-0.048** (0.111)	-0.158** (0.021)	-0.135** (0.061)
N	1277918	1229781	1182270	1137586	1086624	1044880	994732	954235	906565	863998	822337

*** p<0.01, ** p<0.05, * p<0.1. Each estimate is from a separate regression. In panels A, B, and C the dependent variable is equal to one if the event occurred by the given age, in panel D the dependent variable is total fertility by the given age. The sample is restricted to only include observations older than the age specified in each column. The sample also excludes the state of Jammu and Kashmir. All regressions include the fixed effects for birth cohorts, state, and survey waves and the covariates are religion, district, urban/rural area, and ethnicity. Each regression is weighted by sampling weights from the NFHS data, and standard errors are robust and clustered at the state level.

Table 8: Second Stage Controlling for State Specific Linear Time Trend in Birth Cohort: Age at First Intercourse/Marriage/Birth and Total Fertility, by Age

A. First Intercourse by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	-0.030*	-0.010	-0.038	-0.099	-0.077	-0.161	-0.265	-0.288	-0.274	-0.106	-0.054
	(0.017)	(0.011)	(0.042)	(0.096)	(0.055)	(0.143)	(0.409)	(0.301)	(0.264)	(0.243)	(0.060)
N	880157	802875	703971	585050	443766	338923	246811	185350	135872	99359	72091
B. First Marriage by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	-0.031***	-0.034**	-0.052	-0.043	-0.083**	-0.081**	-0.057	-0.030	-0.020	-0.015	-0.020
	(0.010)	(0.013)	(0.044)	(0.031)	(0.037)	(0.039)	(0.038)	(0.052)	(0.051)	(0.045)	(0.032)
N	1181598	1109673	1017293	904461	786947	684523	599353	534690	484190	445664	416512
C. First Birth by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	-0.005**	-0.008**	-0.006	-0.020**	-0.037**	-0.034***	-0.041***	-0.008	-0.002	-0.036	-0.038
	(0.002)	(0.004)	(0.010)	(0.010)	(0.017)	(0.013)	(0.016)	(0.025)	(0.045)	(0.032)	(0.025)
N	1265943	1242910	1201527	1135029	1044239	936111	827411	733656	655817	595190	548494
D. Total Fertility by Age:											
	15	16	17	18	19	20	21	22	23	24	25
2SLS	0.000*	0.002	-0.008	-0.004	-0.005	-0.009	-0.059	-0.051	-0.000	-0.006	-0.171
	(0.000)	(0.002)	(0.006)	(0.021)	(0.026)	(0.036)	(0.044)	(0.113)	(0.117)	(0.022)	(0.126)
N	1284814	1236461	1188714	1143810	1092633	1050685	1000317	959609	911700	868911	827032

*** p<0.01, ** p<0.05, * p<0.1. Each estimate is from a separate regression. In panels A, B, and C the dependent variable is equal to one if the event occurred by the given age, in panel D the dependent variable is total fertility by the given age. The sample is restricted to only include observations older than the age specified in each column. The sample also excludes the state of Jammu and Kashmir. All regressions include the fixed effects for birth cohorts, state, and survey waves and the covariates are religion, district, urban/rural area, and ethnicity. Each regression is weighted by sampling weights from the NFHS data, and standard errors are robust and clustered at the state level.

Table 9: Second Stage: Predicting Fertility Practices

	Ever Had Pregnancy Terminated	Last Pregnancy Unwanted	Desire For More Children	Ever Used Any Contraceptives	Using Modern Contraception	Ever Been Tested for HIV/AIDS
2SLS	-0.032* (0.019)	-0.020*** (0.005)	0.017 (0.013)	0.023** (0.010)	0.066 (0.054)	0.069** (0.030)
N	1284814	335948	1264402	1284814	1284805	206126

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Each estimate is from a separate regression. The dependent variable in the first column is equal to 1 if the woman and the husband desire any (more) children after their first birth, and 0 otherwise. The dependent variable in the second column is equal to 1 for women ever using any contraceptive method, and 0 otherwise. The third column has the dependent variable equal to 1 for women using modern contraception before having their first child, and 0 otherwise. The fourth column dependent variable reports ever having a pregnancy terminated, 0 otherwise. The fifth column reports the women's last pregnancy was unwanted, where 1 denotes that the respondent wanted no more pregnancies at the time she became pregnant and 0 denotes that she wanted the pregnancy at that time or at a later date. The last column dependent variable is equal to 1 for women who have ever been tested for HIV/AIDS, 0 otherwise. The sample excludes the state of Jammu and Kashmir. All regressions include the fixed effects for birth cohorts, state, and survey waves and the covariates are religion, district, urban/rural area, and ethnicity. Each regression is weighted by sampling weights from the NFHS data, and standard errors are robust and clustered at the state level.

Table 10: Second Stage: Predicting Marriage Characteristics and Economic Resources

A. Marriage Characteristics					
	Husband's Total Years of Education	Age Difference	Education Difference	Final Say on the Household Decisions	
2SLS	0.444*** (0.181)	-0.019 (0.247)	-0.556*** (0.181)	0.005 (0.027)	
N	153637	147271	153637	34602	
B. Economic Resources					
	Woman Currently Working	Earnings Relative to Husband	Woman's Occupational Status	Household Wealth	Has Health Insurance
2SLS	0.031 (0.029)	-0.012 (0.036)	1.046** (0.440)	0.064*** (0.020)	0.003 (0.012)
N	206126	36132	206126	1284814	1284814

*** p<0.01, ** p<0.05, * p<0.1. Each estimate is from a separate regression.

Panel A: The dependent variable in the first column is the total years of education for a woman's husband. The dependent variable in the second column is the age of the husband subtracted by the woman's age, and in the third column is the total years of education of the husband subtracted by the woman's total years of education. The dependent variable is positive if the husband is older or has completed more years of education. The dependent variable in the last column is equal to one if the woman has the final say on the household purchase/ spending on the husband's or woman's earnings/ woman's health care, 0 otherwise.

Panel B: The first column dependent variable is a measure of respondent's employment in the last twelve months equal to 1, 0 otherwise. The dependent variable in the second column is equal to 1 if the woman's earning is more than equal to the husband's earnings, and 0 otherwise. The dependent variable in the third column is the occupational status of the woman based on NFHS standardized categories. The third column dependent variable measures the total household wealth. The dependent variable in the fifth column is an indicator of whether a woman reported having health insurance at the survey, equal to 1, 0 otherwise.

The sample excludes the state of Jammu and Kashmir. All regressions include the fixed effects for birth cohorts, state, and survey waves and the covariates are religion, district, urban/rural area, and ethnicity. Each regression is weighted by sampling weights from the NFHS data, and standard errors are robust and clustered at the state level.

Table 11: Second Stage: Predicting Utilization of Reproductive Healthcare Service

	Any Antenatal Healthcare Visits	Visited Healthcare Provider	Iron Supplements	Delivery in Healthcare Center
2SLS	0.054*** (0.010)	0.025 (0.095)	0.051*** (0.010)	0.030*** (0.009)
N	332420	109901	334991	1284076

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Each estimate is from a separate regression. The dependent variable in the first column is equal to 1 if the women attended any antenatal visits at a healthcare facility, and 0 otherwise. The dependent variable in the second column is equal to 1 if the woman has visited a health care provider in the past 12 months, 0 otherwise. The third column has the dependent variable equal to 1 if the women consumed an iron supplement during pregnancy, and 0 otherwise. The fourth column dependent variable reports if the woman has delivered her baby in a hospital or clinic (public or private), 0 otherwise. The sample excludes the state of Jammu and Kashmir. All regressions include the fixed effects for birth cohorts, state, and survey waves and the covariates are religion, district, urban/rural area, and ethnicity. Each regression is weighted by sampling weights from the NFHS data, and standard errors are robust and clustered at the state level.

Table 12: Second Stage: Predicting Cognitive Skills and Mass Media Exposure

	Literacy	Exposure to Magazine Newspaper, TV, Radio
2SLS	0.100*** (0.015)	0.051*** (0.019)
N	1284814	1284814

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Each estimate is from a separate regression. The dependent variable in the first column is literate equal to 1 if a woman was able to read the entire sentence, and 0 otherwise. The dependent variable in the second column is equal to 1 if the woman reads a newspaper/magazine and/or watches TV and/or listens to the radio frequency, and 0 otherwise. The sample excludes the state of Jammu and Kashmir. All regressions include the fixed effects for birth cohorts, state, and survey waves and the covariates are religion, district, urban/rural area, and ethnicity. Each regression is weighted by sampling weights from the NFHS data, and standard errors are robust and clustered at the state level.

Appendix A

Institutional Background of RTE in India

There have been a lot of controversies and debates in framing a formal policy by the government officials and implementers surrounding the legal framework of the fundamental right to free and compulsory education in India since the time of independence in 1947. As per the Article 21 of the Indian Constitution, the Supreme Court of India upheld the view of a renewed commitment to providing the education that creates barriers to basic human rights and personal liberty.²⁸ However, the directive principles of the state policy with the goal of free and compulsory education by 1960 were not met. This was followed by the proposition of a common school system by the Kothari Commission (1964-1966) with the objective of increased public spending for education by 1985. But, this proposition did not materialize as well. The Acharya Ramamurti Committee Report in 1990 further supported the idea of achieving universal elementary and primary 8 years of education (from class 1 to class 8), by making recommendations about quality development and equitable rights. This resulted in the formation and announcement of the National Policy of Education in 1992 but that lacked commitment from officials and suffered from political setbacks and judicial willpower (???).

In that context, the Indian government (GoI) along with activists and social reformers presumed their role in strengthening the Indian education system. In 2002, the 86th amendment to the Indian constitution marked a significant milestone in the right-to-education debate. It added Article 21(a) which stated that “the State shall provide free and compulsory education to all children of the age of six to fourteen years in such manner as the State may, by law, determine.”²⁹ The Sarva Shiksha Abhiyan (SSA) was introduced in 2004 with the aim of achieving basic education to all children in India all children through the provision of community-owned quality education goals by 2010. The District Primary Education Project (DPEP) and SSA led the GoI to use resources in

²⁸Based on the cases of *Mohini Jain v. Union of India* (1992) 3 SCC 666 and *J P Unnikrishnan v. State of Andhra Pradesh*, 1993 SCC (1) 645, the Supreme Court stated that: “The citizens of this country have a fundamental right to education. The said right flows from Article 21. This right is, however, not an absolute right. Its content and parameters have to be determined in light of Articles 45 and 41. In other words, every child/citizen of this country has a right to free education until he completes the age of fourteen years. Thereafter his right to education is subject to the limits of economic capacity and development of the State.”

²⁹<https://www.india.gov.in/my-government/constitution-india/amendments/constitution-india-eighty-sixth-amendment-act-2002>

investing in demand and supply-side interventions and the lumbering process of making elementary education universal by providing funding. They allowed for setting targets in developing physical infrastructure for improving quality education, training human resources, teachers, and government officials, and establishing operational guidelines. The practical enforcement was there in spirit, however, achieving this goal and mission suffered from the state’s resource constraints, thereby making the vision of education rights to be challenging.

Thereafter a chain of successive bills was circulated in the Supreme Court of India upholding the broader context of educational goals as fundamental status thereby resulting in the passage of the RTE Act after a long and contentious hearing. The RTE Act gained approval from the Union Cabinet in 2008 and was passed by the Lower and Upper Houses of the Indian Parliament in July and August 2009. Following April 1st, 2010, the RTE Act became a fundamental right of every citizen in India, joining more than 100 developed and developing nations with rights to compulsory schooling, including the United Kingdom, Japan, Germany, Belgium, Norway, and others. However, the Act came into force in different states at different times, with some states taking longer to enforce it in their own legislatures than others due to institutional and resource barriers for state government and local levels.³⁰ For example, Andhra Pradesh, Bihar, Chandigarh, Dadra & Nagar Haveli, Daman & Diu, Uttar Pradesh, and Uttarakhand were the first seven states/UTs to pass the RTE Act in their state legislatures. Around 20 other states passed the RTE Act in their own state legislatures approximately after one year or more. Four states passed it only in 2012, almost two years after its enactment in the Indian Parliament. It is worth noting that the RTE Act implementation and enforcement within different state legislatures happened within three years after the Act was announced. The RTE Act was not enacted in the state of Jammu and Kashmir due to its special political category state status under Article 370. However, with the elimination of that status under Article 370 in April 2019, the state enforced the provisions of the RTE Act from May 2020.³¹ This paper exploits this staggered implementation of the RTE Act in different states as an exogenous variation to measure the causal relationship between education and fertility outcomes.

³⁰I consider April 2010 as the effective cut-off date of national enforcement because all states knew from there on that sooner or later they have to comply with the provisions of the act. However, for each state, the *Reform_{isc}* variable is created based on the date the law came into force (see [subsection 5.2](#)).

³¹Appendix [Table A1](#) provides details on the time period of enforcement in each state.

As per Article 21A of the Indian constitution, I summarize the main components and eligibility provisions of child entitlements as abrogated by the RTE Act.³² The entitlements include having the right to free and compulsory eight years of education for a child aged 6-14 years in a neighborhood school located within a certain distance from the child's habitation. The distance from the neighborhood school is classified as 1 kilometer from the child's habitation at the primary level (grade 1 to 5) and 3 kilometers at the upper primary level (grade 6 to 8). However, there is no mandate as per the Act on getting admission within the neighborhood schools only. The child has every right to choose a school guided by his/her preference. Additionally, every child is entitled to the provision of free midday meals, textbooks, uniforms, and notebooks. The Act guarantees that every child should gain joyful learning and education in an environment free from discrimination, physical punishment, harassment, trauma, or anxiety. Further, upon the Act's enactment, it required 25 percent of the seats allocated to private unaided schools for economically weaker sections and disadvantaged groups. In that perspective, these groups are characterized by the mindset of not being interested in schooling or unaware of the essential benefits of education, and not willing to send their children to schools. Proponents of these provisions claim that this can strengthen the elementary education system in the states of India. The Act also mandates child-centered pedagogy with no detention policy, prohibition of expulsion, and advocates the right to comprehensive continuous evaluation. Institutional arrangements required schools to have good infrastructure and desirable standards such as weather-proof buildings, availability of electricity, toilets, drinking water, ramps for special children, and libraries. It also specifies appointments of trained teachers with clear qualifications, working hours, and duties in the schools with quality indicators such as teacher-pupil ratios being 1:30 for primary and 1:35 for upper primary sections. The RTE Act required all schools to adhere to its norms and to ensure compliance which can otherwise lead to penalties such as the withdrawal of recognition or financial assistance to schools. The Act further mandated the creation of a School Management Committee and State Advisory Council, while also empowering local authorities by setting guidelines to monitor compliance and take action in case of violations.

According to Jha, Ghatak, Mahendiran, Bakshi, et al. (2013) and Choudhary (2018), the implementation of the RTE Act varied across India due to the state-level heterogeneity across

³²For details, check <https://dse1.education.gov.in/rte>.

states. Their research suggests that there exist differences in the economic and developmental stages of states and district-level variation in complying with the Act's indicators. This variation in implementation and compliance with the RTE Act was a crucial factor in the identification strategy discussed in [section 5](#). Despite challenges, the RTE Act, enacted in August 2009, aimed to provide greater access to good quality primary and upper primary education to all children up to the age of 14 years. The enactment of the Act sets the stage for a new phase in the educational evolution in India.

Table A1: Details of state-wise enactment of RTE rules

Serial No.	State/ Union Territory	Act coming to force (from MHRD) dd-mm-yyyy
1	Andaman & Nicobar Islands	1/4/2010
2	Andhra Pradesh	1/4/2010
3	Arunachal Pradesh	3/6/2010
4	Assam	3/11/2011
5	Bihar	1/4/2010
6	Chandigarh	1/4/2010
7	Chattisgarh	15/11/2010
8	Dadra & Nagar Haveli	1/4/2010
9	Daman & Diu	1/4/2010
10	Delhi	23/11/2011
11	Goa	2/8/2012
12	Gujarat	18/2/2012
13	Haryana	3/6/2011
14	Himachal Pradesh	5/3/2011
15	Jharkhand	14/5/2011
16	Karnataka	28/4/2012
17	Kerala	6/5/2011
18	Lakshadweep	1/4/2010
19	Madhya Pradesh	26/3/2011
20	Maharashtra	11/10/2011
21	Manipur	21/10/2010
22	Meghalaya	1/8/2011
23	Mizoram	28/3/2011
24	Nagaland	21/3/2011
25	Odisha	18/10/2010
26	Puducherry	27/10/2011
27	Punjab	12/10/2011
28	Rajasthan	30/3/2011
29	Sikkim	11/8/2010
30	Tamil Nadu	12/11/2011
31	Tripura	11/7/2011
32	Uttar Pradesh	1/4/2010
33	Uttarakhand	1/4/2010
34	West Bengal	16/3/2012

Table A2: First Stage

Dependent Var: Total Years of Education		
A. First Stage: Controlling for State-Level Average Pre-Treatment GDP Growth Rate Interacted with Linear Birth Cohort		
	W/O Covariates	W Covariates
<i>Reform_{isc}</i>	0.679*** (0.118)	0.654*** (0.121)
N	1279847	1277918
F-stat	33.1112	29.2136
B. First Stage: Controlling for State-Level Pre-Treatment GDP Per-Capita Interacted with Linear Birth Cohort		
	W/O Covariates	W Covariates
<i>Reform_{isc}</i>	0.470*** (0.119)	0.450*** (0.119)
N	1279847	1277918
F-stat	15.5991	14.2998

*** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the measure of education. Each column is a separate regression without and with the covariates. The sample excludes the state of Jammu and Kashmir. *Reform_{isc}* is the probability of being treated by the reform in each state, and the variable ranges from 0 to 1. All regressions include the fixed effects for birth cohorts, state, and survey waves and the covariates are religion, district, urban/rural area, and ethnicity. Each regression is weighted by sampling weights from the NFHS data, and standard errors are robust and clustered at the state level.