Workfare programs and family planning: The case of MGNREGA

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Abstract

To show how providing work opportunities to women affects their use of family planning methods, I exploit the staggered timing of the employment guarantee scheme in rural India. Using survey data from rural India, I employ a difference-in-differences strategy and inverse probability of treatment weighting techniques to estimate the causal effects. The results suggest an increase of 2 percentage points (a 3% increase) in the use of modern methods of family planning among currently married women with the introduction of an employment guarantee scheme. The use of modern contraceptive methods increased with significant heterogeneity across poor and non-poor households. The findings help inform our understanding of economic development, labor markets, contraceptive use, and fertility.

Keywords: Workfare programs, contraceptive use, family planning, financial autonomy, intra-household bargaining

JEL Classification: I38 , J13

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1 Introduction

According to the second round of the District Level Household and Facility Survey carried out in 2002-2004, 23 percent of rural Indian married women have an unmet need for family planning.[1] This suggests that women wanted contraception but did not have access to it. One reason of not using modern methods of contraceptives could be lack of financial autonomy for women. Public workfare programs such as the Mahatama Gandhi National Rural Employment Guarantee Act (MGNREGA) could give women financial autonomy to access modern method of contraceptives.

Family planning programs and the practice of modern contraception in low- and middle-income countries are crucial interventions to address maternal morbidities (or unsafe abortions) and infant and child mortalities (Gage, 1995; Miller, 2010; Palamuleni, 2013)[2]. In addition to reducing maternal morbidity and infant mortality rates, family planning can also foster human capital accumulation for mother and child. For example, Miller (2010) finds that family planning programme interventions promote human capital accumulation including additional years of schooling, a greater probability of working in the formal sector and a lower probability of being married at young ages among women in Colombia. According to the United Nations, contraceptive prevalence is one of the key indicators for measuring improvement in reproductive health and is also one of the indicators of sustainable development goals. According to the 2022 world contraceptive use data sheet, the Contraceptive Prevalence Rate (CPR) for women of reproductive age (15-49 years) in India is estimated at 66.7 percent which is marginally higher than Sri Lanka (64.6 percent) and Bangladesh (62.7 percent) in South Asia.[3]

Public workfare programs provide a way for governments to support livelihoods by providing employment opportunities for jobless workers. Public works programs, when implemented well, act as a source of employment and income for the poor and hence raise resilience for citizens (Muralidharan, Niehaus, & Sukhtankar, 2017; Sukhtankar et al., 2016). As of 2015, there were at least 4 prominent public workfare programs around the world concentrated in low- and middle-income countries. These programs provide jobs to people who seek

[1] In particular, 10% of women say they would like to delay their next birth by at least two years and 13% of rural women do not want any children, but do not use any form of contraception. Appendix figure A1 shows the trend of unmet need of currently married women for family planning.

[2] In the context of India, see also the National Family Planning Programme. Available at: https://nhm.gov.in

[3] Data is available at https://www.un.org/development/desa/pd/data/world-contraceptive-use

employment, particularly in both post-disaster and post-conflict situations (Subbarao, Del Ninno, Andrews, & Rodríguez-Alas, 2012).[4] The MGNREGA is the largest public workfare program in size and ambition. For example, in 2011-2012 the budget was US$ 7.8 billion (Deininger, Nagarajan, Singh, & Nagarajan, 2016).[5] With the MGNREGA wages being deposited directly to the bank accounts of women, it may lead to increased financial autonomy for women, which in turn may provide opportunity for them to use modern methods of contraception directly and privately.[6] However, the impact of workfare programs on family planning decisions remains largely unexplored in the literature. In this paper, using a nationally representative data set on women's reproductive health in India, I empirically examine if workfare programs affect the use of family planning methods among currently married women in rural India.

Given the policy relevance of the public works program, a sizeable literature exists studying a wide array of outcomes.[7] Despite this, the literature has been limited in considering the aspects of workfare programs related to women empowerment. There are a few studies in low- and middle-income countries that have examined the direct relationship between work status of women and their contraceptive use. Gage (1995), found that, in Togo, women who work outside the home for cash are significantly more likely to use modern methods of contraception. While the correlation between women economic power and contraceptive use has been established in the literature, the evidence that women who work outside the home for cash have a higher contraceptive prevalence rate has yet to be causally studied. This paper builds on two large strands of literature: the impact of workfare programs on labor market outcomes and the family planning decisions within households in low- and middle-income countries.

[4]Examples includes the Mahatama Gandhi National Rural Employment Guarantee Act (MGNREGA) in India, the Productive Safety Net Program (PSNP) in Ethiopia, the Programa de Jefes y Jefas de Hogar in Argentina, and the Rwandas's Vision 2020 Umereng Program.

[5]In past, developing countries have used public workfare programs to uplift poor people out of poverty. For example, the Maharashtra Employment Guarantee Scheme in India, 1975-89, and Food for Work Program in Bangladesh, 1987-88, have provided major relief in response to drought and famine (Ravallion, 1991).

[6]In 2012, the Government of India, mandated that MGNREGA wages be deposited directly to the bank accounts of workers to avoid corruption and leakages. Available at https://nrega.nic.in/Circular_Archive/archive/ Operational_guidelines_4thEdition_eng_2013.pdf

[7]Human capital accumulation (Ajefu & Abiona, 2019); on health (Chari, Glick, Okeke, & Srinivasan, 2019; Chatterjee & Merfeld, 2021; Dasgupta, 2017); on conflict (Fetzer, 2020); on agricultural productivity(Gazeaud & Stephane, 2020; Varshney, Goel, & Meenakshi, 2018); and on labor market (Azam, 2011; Berg, Bhattacharyya, Rajasekhar, & Manjula, 2018; Deininger et al., 2016; Imbert & Papp, 2015; Merfeld, 2020; Muralidharan et al., 2017; Zimmermann, 2012).

Labor market opportunities and fertility decisions are endogenous for a number of reasons. For example, women who want to have lots of children may not be motivated to get advanced degrees which will open doors for them in labor force, while women who are career-oriented often have to delay childbearing as they get their careers going. This study uses the employment guarantee program in rural India as an exogenous source of variation in labor market opportunities to investigate how that can impact fertility decisions and contraceptive use.

To estimate a causal impact of the employment guarantee scheme on women's family planning decisions, I use data from the largest demographic and health surveys carried out in India, the District Level Household and Facility Survey (DLHS). I exploit the phased roll out of MGNREGA at the district level within a difference-in-difference (DiD) model. I show evidence of parallel trends. Because the MGNREGA roll out was targeted rather than randomly, it is difficult to find a credible counterfactual.[8] I overcome this challenge by using the inverse probability of treatment weighted technique (Hirano, Imbens, & Ridder, 2003).

Results suggest that married women in rural districts increased their use of modern methods of family planning after the introduction of an employment guarantee scheme. The mean increase is about 2 percentage points. The use of modern contraceptive methods increased with significant heterogeneity across poor and non-poor households. I find that married women aged 35 years and above from poor households are driving the results. I also find that MGNREGA allowed young women to postpone their first birth by 0.11 years on average. This is an important result in the context of birth timing and child quality. Intra-household bargaining, financial autonomy for women as well as additional household income are likely mechanisms of impact. My study provides new evidence on the impact of public works on the use of family planning methods.

2 Institutional background

2.1 National Rural Employment Guarantee Act

The National Rural Employment Guarantee Act (NREGA) established in 2005 had a primary objective to enhance the livelihood security of the households in rural areas of India by providing at least 100 days of guaranteed minimum wage

[8] MGNREGA was first rolled out in the less developed districts based on the algorithm developed by the Indian Planning Commission, 2003.

employment in every financial year to each household whose adult members volunteer to do unskilled manual work.[9] The program was renamed to the Mahatma Gandhi National Rural Employment Guarantee Act in 2009.

The conditions of rural employment guaranteed by the MGNREGA include: (a) the adult members of each household who live in rural areas and are willing to do unskilled manual labour may submit their names, age and household address to the village governing body (*Gram Panchayat*) at the village level for the issue of a job card; (b) each adult member who has a job card is guaranteed employment for up to 100 days in a given fiscal year within 15 days of the request for work; (c) a minimum of 14 days of continuous employment with no more than 6 days per week; (d) at least a third of the beneficiaries must be women with wages equal to those of men.

The central government shares the major cost of the program: the payment of wages, and up to three-fourth of the material costs of the public works. The state government is liable for the unemployment allowances and one-fourth of the material costs of the public works.

The scheme was rolled out in three phases across three years (2006, 2007 and 2008). In the first phase, 200 districts were included in the scheme, and 130 and 270 districts were included in the second and third phase respectively. The roll out was not random. The scheme targeted poor districts first. Critical to the empirical strategy of this article is the way MGNREGA was rolled out. I exploit this variation in implementation timing to estimate the impact of MGNREGA on the use of family planning methods among currently married women. Figure 1 shows a map of the three phases of the scheme roll out.

According to the Ministry of Rural Development, Government of India, women constituted 54.59 percent in 2018-19, 54.78 percent in 2019-20, 53.19 percent in 2020-21 and 54.54 percent in 2021-22, an increase in women's participation in MGNREGA from 40 percent in 2006-07.[10] Existing evidence suggests that the MGNREGA had far reaching impacts. For example, Shah, Mann, Pande, et al. (2015) show that women's share of work under MGNREGA is greater than their share of work in the labor market across all states.[11] These findings suggest that MGNREGA had higher effects on employment for

[9] According to the National Rural Employment Guarantee Act, 2005, Ministry of Rural Development, Government of India, public works includes (a) water conservation and water harvesting; (b) drought proofing (including afforestation and tree plantation); (c) irrigation canals including micro and minor irrigation works; (d) renovation of traditional water bodies including desilting of tanks; (e) land development; (f) flood control and protection works including drainage in water logged areas; and (f) rural connectivity to provide all-weather access.

[10] Available at https://rural.nic.in/en/press-release/participation-rural-women-mgnregs

[11] Available at https://nrega.nic.in/Circular_Archive/archive/MGNREGA_SAMEEKSHA.pdf

rural women than it was for rural men. Table A12 in the appendix presents a summary of some studies in the field of public works.

3 Why MGNREGA may increase the contraceptive use?

This section gives an insight into why MGNREGA may influence contraceptive use. I use MGNREGA's mandate to give women work to study the relationship between women working for money and their use of contraceptives.

Women's economic power leads to attitudes towards negotiating safer sexual relations with the husband and the intention to use family planning services (Gage, 1995; Hogan, Berhanu, & Hailemariam, 1999). For example, Anderson and Eswaran (2009), in Bangladesh, demonstrate that women working outside the home have a greater negotiating power to make reproductive decisions. Therefore, women's economic empowerment may reduce their reproductive health vulnerabilities (Westeneng & d'Exelle, 2015) and is one pathway through which MGNREGA influences women's contraceptive use.

Fewer Indian women work away from home for pay because of a number of factors including high transaction costs and social stigma (Jensen, 2012). Jensen (2012) in his seminal paper shows that rural Indian women who work away from home for pay delay marriage and childbearing. MGNREGA may lowers such costs associated with working outside home by making work available in their villages. Reddy, Reddy, and Bantilan (2014) show that female workforce participated in MGNREGA in large numbers compared to other programs; and Zimmermann (2012) finds that MGNREGA increased female wages in private sector. This increase in income could ease budgetary constraints on the purchase of modern contraceptives. This is another way through which MGNREGA influences women's use of contraception.

Another study (Chari et al., 2019), in India, finds that MGNREGA increased infant mortality because their projects are associated with strenuous labor. This implies that women were increasing contraceptive use because they were afraid of what would happen to their child if they got pregnant while working via MGNREGA. MGNREGA wages would provide financial autonomy for women to purchase contraceptives in that situations.

In summary, MGNREGA may increase the contraceptive use among rural women because of the following reasons: first, MGNREGA wages may improve

the bargaining power of women and hence may lower the cost of negotiating sexual activity and fertility choices with men; Second, MGNREGA wages add to income within the household that may relax the budget constraint and the purchase of modern methods of contraceptives may be possible; and third, MGNREGA contributes to the financial autonomy among rural women as the MGNREGA wages are deposited directly to their bank accounts and thus the use of modern method of contraceptives directly and privately.

Figure 2 summarizes the various mechanisms through which the MGNREGA affects women's use of family planning methods.

4 Data and Empirical Strategy

This section details the data used in my analysis as well as my strategy for estimating the causal effects of MGNREGA on women's family planning decisions.

4.1 Data

I use the District Level Household and Facility Survey (DLHS) collected by the Ministry of Health and Family Welfare, Government of India to study the women use of family planning methods. The DLHS is one of the largest demographic and health surveys carried out at regular intervals in India. The DLHS data sets are available from the International Institute for population Sciences. In rural areas, DLHS employs a two-stage (many villages in a district) stratified probability proportional to size sampling design.[12] Households are primary sampling units in the DLHS. I use rounds 2 and 3, collected in 2002-2004 and 2007-2008.[13] The surveys are repeated cross-sections which cover detailed questionnaires on topics of maternal and child health, family planning and other reproductive health services. The DLHS round 2 (2002-2004) is pre-treatment year and the DLHS round 3 (2007-2008) comes after the implementation of the first phase of treatment and before the implementation of third phase. I apply Inverse Probability of Treatment Weighting (IPTW) to match district characteristics. I then exploit the variation in timing of the treatment to employ a difference-in-differences (DiD) estimator. This DiD strategy compares the

[12] More information about the DLHS sample selection is obtained at rchiips.org

[13] DLHS-2 reference period is from January, 1999-2001 to survey date and DLHS-3 reference period is from January, 2004 to survey date

outcomes in households in districts included in first and second phase (Early) to the households in districts in third phase (Late).

4.1.1 Family Planning Methods

This section reviews the contraceptive methods available to women in the sample and their characteristics.

The dependent variable used in the analysis, any family planning methods use, was obtained from a question in the section-IV on contraception and fertility preferences in the individual woman's questionnaire. Women were asked the question: Are you/your husband currently doing something or using any method to delay or avoid getting pregnant? If the woman reported that she was using any method, she was coded 1; If she reported she was not she was coded 0.

To make analysis and interpretation simpler, I regroup some variables into modern and traditional family planning methods. Modern methods include permanent contraceptives, such as female and male sterilization; Long-acting reversible contraceptives (LARCs), such as injectables and intrauterine devices: IUD/Copper-t/Loop; and Oral pills, female condom and a male condom (*Nirodh*). Traditional methods include the use of rhythm, periodic abstinence, and withdrawal.

Modern methods of contraceptives including oral pills, and female and male condoms do not require medical prescriptions and can be available over-the-counter but may require husband and or family members (especially the mother-in-law) approval, for example in the case of sterilization. Not all modern methods are easily accessible in rural areas depending on the socio-culture norms and the community access to health care services specifically in the case of LARCs. None of LARCs methods require the knowledge or consent of husband. There may be a concern of supply constraint in rural areas of the country. However, according to the third round of the DLHS (2007-2008), only less than 4% of contraceptive users in rural India ever faced difficulty in getting any methods of family planning.

Among the members of rural Indian households that have ever used contraceptives, a little less than three-fourths have paid money in 2007-2008 for pills, female and male condoms, and injectables. Therefore, MGNREGA wages would allow the purchase of contraceptives.

4.1.2 Inverse probability of treatment weighting

Following Gazeaud and Stephane (2020), I use the logit estimator to compute the inverse probability of treatment weighting:

$$Treated_d = \beta_0 + X_d{}'\beta + \varepsilon_d \tag{1}$$

where X_d is a vector of district-level variables. As mentioned earlier, roll out was targeted at poor districts which were defined on the basis of variables at the district level. Following Zimmermann (2012) and Merfeld (2020), I include total population, percent rural, area (in square km), percent scheduled castes, percent scheduled tribes, percent literate, average monthly per capita consumption expenditure (2004-2005 prices), average casual wage (2004-2005 prices), labor force participation rate, female labor force participation rate, rainfall, and growing degree days.[14]

I use logistic regression to calculate the propensity scores and then derive the inverse probability (IP) of treatment weighting. The IP-weight is then used as a weight in the equation 2. Appendix Table A1 shows the logistic regression predicting treatment.

Figure 3 shows the distribution of propensity score by treatment groups. The area within the dashed line represents the common support. The highest propensity score for untreated is 0.9636089 and the lowest propensity score for treated is 0.044275.

Table 1 shows the IP-weighted summary statistics for district characteristics used in the analysis. The labor force participation rate is higher in the comparison districts. In particular, the labour force participation rate for women is higher in the comparison districts. The p-value in column 3 of Table 1 indicates that district-level variables do not systematically differ across treated and untreated districts.

4.1.3 Descriptive Statistics

In the second round of the DLHS (2002-2004), data were collected on 507,622 eligible women aged 15 to 44 who are currently married and whose marriage has been consummated. In the thrid round of the DLHS (2007-2008), data were collected on 643,944 ever-married women aged 15 to 49 and 166,620 unmarried women aged 15 to 24. From this data, I focus on the sample of currently

[14] Appendix Table A13 shows the data sources used in the analysis.

married women aged 15 to 44 whose marriage was consummated to compare the outcomes of interest with other surveys. For the purposes of my analysis, I exclude currently pregnant women from the sample. The analytical samples include 292,810 currently married and fertile women aged 15-44 years living in rural India in 2002-2004, and 350,210 such women in 2007-2008. Under the MGNREGA Act, 2005, individuals 18 years of age or older are eligible to work under the program. Therefore, I restricted the sample to people 18 years of age and older.

Table 2 presents the individual summary statistics, IP-weighted, by treatment groups. More than a third of women currently married in treatment and untreated districts used family planning methods. About 48% of women currently married in the treated districts used modern contraception and about 41% in untreated districts. Fewer than 10% of currently married women used traditional contraceptive methods in both treated and untreated districts. In my sample, women's sterilization is the most common modern method and men's sterilization is the least common method of contraception. Oral pills, and male and female condoms remain very low at less than 8% in rural areas. Intrauterine device (IUD) for currently married females is less than 5% in both treated and untreated districts. The traditional method of contraception in my sample is about 12% in treatment districts and about the same in untreated districts. In summary, modern methods of contraception are few in number in rural areas and are intended for women. Appendix Table A2 presents individual summary statistics before the match.

While there are many variables that may influence contraceptive use, for the purpose of my analysis I focus on women's age, reading or writing ability, number of surviving children, social groups and religion. On an average, the age of women is about 30 years and half of them can read or write. A little less than three-fourth of husbands in the sample can read or write. Percent of households belonging to the scheduled castes or tribes - marginalized section of the society - are 35% in treated districts and 39% in untreated districts. Married women in rural areas bore, 3 children, on an average, in both treated and untreated districts. About 42% (respectively, 39%) of modern methods of contraception are used by married woman under the age of 35 years in treated (respectively, untreated) districts. About 62% (respectively, 55%) of modern methods of contraception are used by married women aged 35 years and older in treated (respectively, untreated) districts.

4.2 Econometric Specification

I present reduced-form estimates of family planning decisions by exploiting the roll out of MGNREGA at the district level within a difference-in-difference model.

$$y_{ihdt} = \beta_0 + \beta_1 MGNREGA_d{*}Post_t + \xi_{ihdt} + \alpha_d + \phi_{st} + \lambda_{mt} + \varepsilon_{ihdt} \quad (2)$$

where y_{ihdt} is the use of family planning methods for individual i in household h in district d at time t; $MGNREGA_d$ is the dummy variable, 1 if public workfare program is available in district d; $Post_t$ is a dummy variable indicating that the observation is from the 2007-2008 round; ξ_{ihdt} includes a set of individual and household-level controls. Individual characteristics include age of women, age at first birth, education. Household characteristics include religious and social groups. α_d are district fixed effects, which control for time-invariant characteristics of each district which impact the use of contraceptives; ϕ_{st} are state-year fixed effects which controls for common shocks at the state level across time; λ_{mt} is month and year of the interview fixed effects; and ε_{ihdt} is the error term. I estimate this specification using weighted-least-squares, where the weights are determined by the inverse probability of treatment weighting techniques. Weighted Least Square (WLS) estimator is used for all regressions. I cluster the standard errors at the level of treatment (district).

The coefficient of interest is β_1, which measures the average effect of MGNREGA on the outcome of interest and is interpreted as the intention to treat (ITT). Because in the DLHS dataset, I do not observe who participated in the MGNREGA.

4.2.1 Threats to identification

The major threat to identification is that confounding variables that determine treatment may also affect the outcome variable. By including these observables in main Equation 1, I take into account the confounding variables. I go into detail on the main threats to identification and others.

As the MGNREGA program was targeted toward poor districts rather than randomly allocated, finding a credible counterfactual is difficult. So, the first threat to identification arise from non-random assignment of treatment districts. In the absence of a credible counterfactual, the treatment and control

groups may not be equivalent in their characteristics and, therefore, a simple difference in the outcome variable may bias the estimates. In literature (e.g., Merfeld (2020)), the above concern was addressed by including the variables used to rank districts - the proportion of scheduled castes/tribes, the agricultural productivity, and the agricultural wages - in the right hand side of the econometric equation. I use IP-weighted technique to match district characteristics in the main econometric specification. The IP-weighted technique is a propensity score-based method which aims to achieve a balanced distribution of confounding factors across treatment groups. The result is more robust and less biased estimates of the impact of treatment.(Allan et al., 2020). However, it will not circumvent the sample selection problem.

Second, there is a concern that districts with greater female labour force participation already expect to use family planning methods. I address this concern by including the term triple interaction MGNREGA*Post*High female LFPR into the main specification. I construct a dummy variable of the high female labour force participation rate (LFPR), 1 for values higher than or equal to the average of the female LFPR and 0 for the others.[15] Appendix Table A3 presents the effect of MGNREGA on women use of family planning methods by female labor force participation rate. The coefficients are insignificant at the 5 percent significance level, suggesting that there is no impact on my findings.

As mentioned before, the MGNREGA rollout was in multiple time periods and thus differential timing design might introduce bias. Unfortunately, the rounds of DLHS does not match with the timeline of program rollout and hence I cannot test the heterogeneous treatment effect with multiple time periods.

However, I am able to test for heterogeneity across implementation phases with the dataset used in this analysis. Figure 5a and 5b shows the pre-program trends for any family planning methods and any modern methods across MGNREGA implementation phases. We see that the parallel trends in the pre-treated period hold.

Furthermore, Figure 6a and 6b shows the differential effects of MGNREGA for any family planning methods and any modern methods, respectively. Phase 1 districts had one additional year of implementation than districts in phase

[15]The sample used to identify the districts with a higher women workforce participation rate includes both the urban and the rural residents whereas, the MGNREGA is implemented only in rural areas.

2. As a result, we see that any family planning methods is positive and statistically significant for districts in phase 1.

4.2.2 Pre-Program Trends

The identification strategy requires that the trends in outcomes of the treatment group moves in parallel with the comparison group prior to the implementation of MGNREGA. Figure A2 in the appendix shows the pre-program trends for two family planning methods using Rounds 1 (1998-1999) and 2 (2002-2004). There is evidence to support a parallel trend in contraceptive outcomes of interest.

To support the parallel trend assumption, I re-evaluate Equation 2 but use Round 2 (2002-2004) as post and Round 1 (1998-1999) as pre-program. Table 3 presents the placebo analysis. The coefficients are nonsignificant at the 5 percent significance level suggesting that pre-treatment trends are not driving the results. Moreover, the coefficients for falsification test on any current use of contraception and the use of modern methods of contraception is opposite sign relative to the main treatment effect. This may raise a concern for mean reversion, but the size of the coefficients is small and hence not a serious problem for the purposes of my analysis. The placebo test excludes the possibility that MGNREGA was adopted in districts where birthrates were already increasing.

I provide further evidence of parallel trends. I include rounds 1-3 in a single specification and do an event-study in addition to the traditional DiD. Figure 4a and 4b shows an event-study regression for any family planning methods and any modern methods, respectively. We see no evidence for non-parallel trends in pre-treated period.

5 Results

Table 4 presents the main results from equation 2 using IP-weighted and restricted to the common support region (See Table A5 in the Appendix for unweighted results.).[16] The results suggest an increase of 1.8 percentage points (approximately 3% increase) in the use of family planning methods in treated districts. Specifically, the use of modern methods shows an increase of 1.4 percentage points (approximately 3% increase). The point estimate for any traditional methods of family planning is not different from zero. Refer to

[16] About 10% of data is excluded when restricted to common support.

Appendix Table A6 for the impact of MGNREGA on the use of family planning methods for women under the age of 18.

As mentioned in the data section, the distribution of propensity scores for treated and untreated are skewed. This may arise from the presence of very high propensity scores for untreated and very small propensity score for treated and may influence the estimates. The trimming process addresses the above concern by removing very high and low propensity scores from the sample. Appendix Table A4 presents the effect of trimming at the fifth centile on the IP-weighted estimate. The results remain the same.

Table 5 presents the disaggregated types of modern contraceptives. The permanent contraceptives includes female and male sterilization and reversible contraceptives includes IUDs/Copper-t/Loop, oral pills, male and female condoms, and others. Panel A shows the use of modern contraceptives for married women aged under 35 years. In Panel A, all coefficients are positive with small size and nonsignificant at the 5 percent significance level. Panel B shows the use of contraceptive use for married women age 35 and above. The results suggest that MGNREGA has a positive association with the use of reversible contraceptives for married women aged 35 years and older. The mean increase is 1 percentage point. The point estimate is significant at 5 percent significance level. This shows that the married women aged 35 years and older are the most impacted by MGNREGA in regard to the use of modern methods of contraceptives. I also compare this using an interacted model. Table A7 in the Appendix presents results after including the triple interaction term MGNREGA*Post*Age 35 and above in the main specification. I construct a dummy variable for married women aged 35 years and older. The findings are unchanged. See Appendix Table A6 for the effect of MGNREGA on the use of family planning methods below the age of 18.

Next, I show how MGNREGA's availability is associated with the timing of a woman's first birth. Table 6 reports the impact of MGNREGA on women's age at first birth. The results suggest an increase in women's age at first birth in treated districts by 0.11 years or 1.32 months. This finding implies that MGNREGA may have raised the costs of the first birth. These costs may include forgoing desired sexual activity and negotiating sexual behaviour and fertility with husbands (Miller, 2010). This demonstrates that putting money in women's hands empowers them to negotiate family planning decisions within a household.

The results are robust to a number of robustness checks. First, I perform a matched DID with coarsened exact matching algorithm. Second, as the dependent variables are binary, I use the probit specification to estimate the impact of MGNREGA on the use of family planning methods. Third, I include the estimated propensity score of being in the treated district on the right hand side of the main regression equation 2 as an additional variable. Tables A8, A9 and A10 in the appendix provide the respective results. The findings are unchanged.

As mentioned previously in the empirical strategy section, I combined Phase 1 and Phase 2 districts to build treated districts. In order to explore if this is of concern, I investigate the differential effects of MGNREGA across phase 1 and phase 2 on the use of family planning methods. Table 7 reports how the results differ across treated districts in phase 1 and in phase 2. The results show an impact of MGNREGA on the use of modern methods of contraception for married women in the districts treated in phase 1. I find no effect for the districts treated in phase 2. This suggests that the impacts take time. In addition, I fail to reject the equality test of DID estimate across phase 1 and phase 2. Therefore, the results provide no evidence of differential effects of MGNREGA in the Phase 1 and in Phase 2 districts.

5.1 Extended results

5.1.1 Heterogeneity by star states

There exists enough evidence in literature highlighting a large heterogeneity in the implementation of MGNREGA. The heterogeneity exists in key features of implementation such as access to works, the efficiency of payments, corruption, work site facilities and projects (Sukhtankar et al., 2016). Dutta, Murgai, Ravallion, and Van de Walle (2012) shows rationing in public works, not all rural households that demand paid work gets work. For example, in 2011-12, the share of households that demanded work (total households demanded work in a district divide by total rural households in that district) was 33 percent, on average, at the national level. Only about 4 percent of share of households reached 100 days limit of work. For about 29 percent of share of households that demanded work there was not enough work was available[17].

[17]Own calculation based on MGNREGA Public Data Portal for FY: 2011-12 (available at MGNREGA Public Data Portal; website: nregarep2.nic.in)

Imbert and Papp (2015) have identified states that have shown comparatively better performance and classified them as star states[18]. I expect MGNREGA in star states to have a larger effect on women use of family planning methods. I follow the same classification in my analysis. Table 8 presents the results on star states. The sign on coefficients for the modern family planning methods is positive but nonsignificant at the 5 percent significance level.

5.1.2 Heterogeneity by wealth index

The MGNREGA is a poverty-alleviation program whose main objective is to increase the well-being of low-income households. But middle- and high-income households can participate in the MGNREGA program. For example, Dutta et al. (2012) found that non-poor households participated in the MGNREGA in response to the agricultural productivity shock, such as the rainfall shock.

To estimate heterogeneity by wealth index, a composite measure of a household's cumulative standard of living, I split the data into low, medium, and high wealth indices. I observe the Wealth Index variable in the DLHS Dataset. About 58, 30, and 12 percent of the sample in DLHS-2 (2002-2004) falls into the category of low, middle, and high life indexes, respectively. About 41, 37, and 22 percent of the sample in DLHS-3 (2007-2008) falls into the category of low, middle, and high life indexes, respectively.

Table 9 reports the results. Panel A presents the results of women from low-income households. The results suggest a 3 percentage point increase (a 6% increase) in family planning methods with the introduction of MGNREGA. Due to MGNREGA wages, low-income women can afford the high upfront costs of contraceptives, especially LARCs, such as intrauterine devices. I also see effects for high-income women, as shown in Panel C. This may be because of an income effect that prioritizes the quality of investment in a child. The effect is relatively lower, 2 percentage points, for high-income households.

Panel B presents the findings of women associated with middle-income households. Point estimates are positive and suggest an increase in family planning methods. But the coefficients are not significant at the 5% significance level.

[18]Star states include Andhra Pradesh, Himachal Pradesh, Madhya Pradesh, Chattisgarh, Rajasthan, Uttarakhand, and Tamil Nadu Imbert and Papp (2015)

I also compare this using an interacted model. Table A11 in the appendix presents results after including the triple interaction term MGNREGA*Post*Poor in the main specification. I construct a dummy variable for a low-income household. Poor is coded as 1 for low wealth and 0 if not. The results indicate that the use of contraceptives by women in both poor and non-poor households is statistically different.

6 Discussion and Conclusions

This paper examines the impact that workfare programs have on family planning decisions within households. Exploiting the rollout of MGNREGA at the district level within a difference-in-difference model I document that MGNREGA increased the use of any family planning methods by 1 percentage point (15% increase) among married women aged 35 and older. The effect of treatment is significant for poor as well as rich households. The impact is greater among poor households (about 6%). The MGNREGA program may have helped women who have reached their peak of fertility (aged 35 and over) achieve the desired level of fertility by increasing their use of contraceptives. In addition, the woman's age at first birth increased by 1.3 months from the 19.36-year-old sample mean with the introduction of the MGNREGA program. The results of the paper provide new evidence and inform policy makers and implementers about the impact of MGNREGA on women's empowerment.

One contribution of my article is to offer a causal relation between work programs and family planning decisions. This study contributes to the literature that demonstrates that providing women with opportunities to generate income affects their reproductive decision-making within the household. Increased family planning methods could address maternal morbidity and negative impacts on child health in rural areas in low- and middle-income countries.

6.1 Limitations

The limitations of this study are related to various sources of measurement errors and are as follows: First, reporting on contraceptive use might be inaccurate. That may arise because in traditional societies such as in rural India, the discussion on sex and sex-related subjects is regarded as taboo. Second, my study includes only currently married women in the sample that may bias downward the contraceptive prevalence. Third, cultural setting also influences

the reproductive decision-making along with the position of individual women. Therefore, any detailed examination of contraceptive practice requires variables on cultural practices and social norms which are missing in the national datasets including DLHS. For my results, this means that the treatment effect is a lower bound of the true impact.

6.2 Future works

Women's peer groups may influence contraceptive use. A future research idea based on this paper is to explore the spill-over effect of MGNREGA on contraceptive uses. More specifically, research will focus on whether contraceptive choices are influenced by peer groups.

Another idea for future research using the similar framework is to investigate the employment opportunities and breastfeeding practices. Breastfeeding is associated with maternal and child health. Putting money in women's hands could increase household nutrition and encourage maternal breastfeeding practices. Also, working away from home may reduce the contact time between the mother and the child and thus interfere with breastfeeding practices. The empirical literature on this topic is still incipient and requires additional research.

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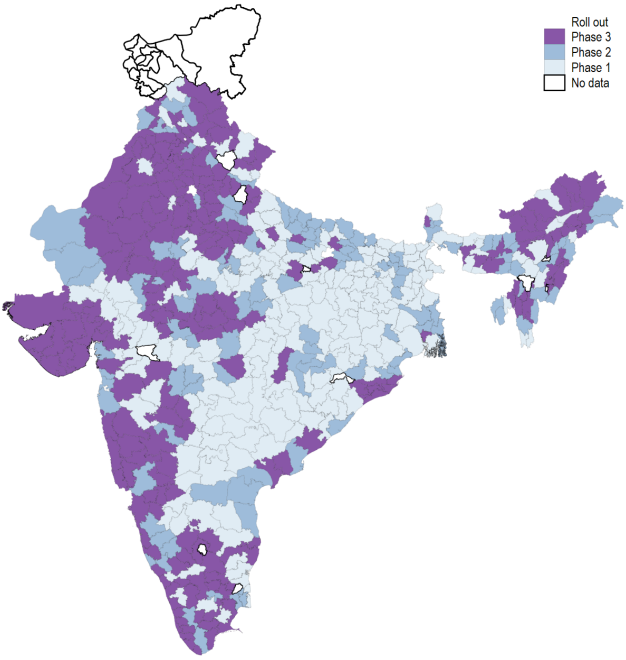
Appendix A Additional Figures and Tables

Fig. 1: The three phases of NREG scheme roll out.



Notes: Rural Indian districts color-coded to distinguish different phases. Source: Own calculation based on 2001 census boundaries.

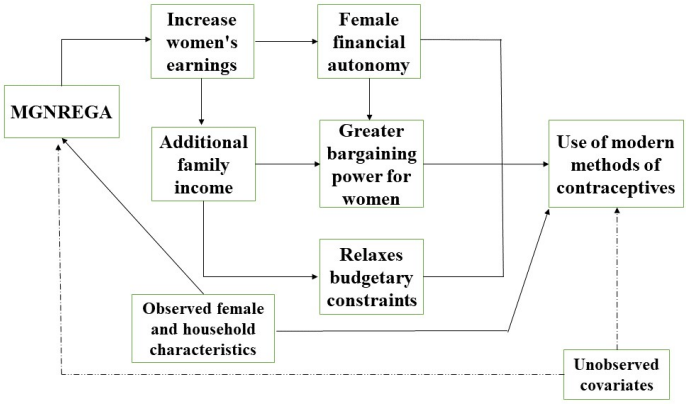
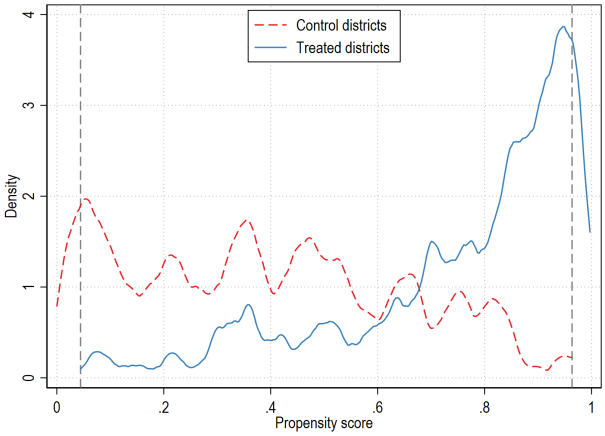
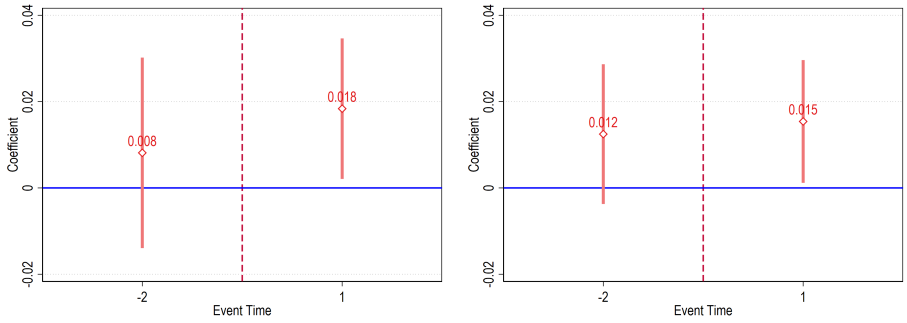


Fig. 2: The figure highlights the different mechanisms through which the MGNREGA, the Job Guarantee Act, empowers women to use family planning methods. Source: Own elaboration.



Note: The area within the dashed line represents the common support. The highest propensity score for untreated is 0.9636089 and the lowest propensity score for treated is 0.044275. Source: Own calculation

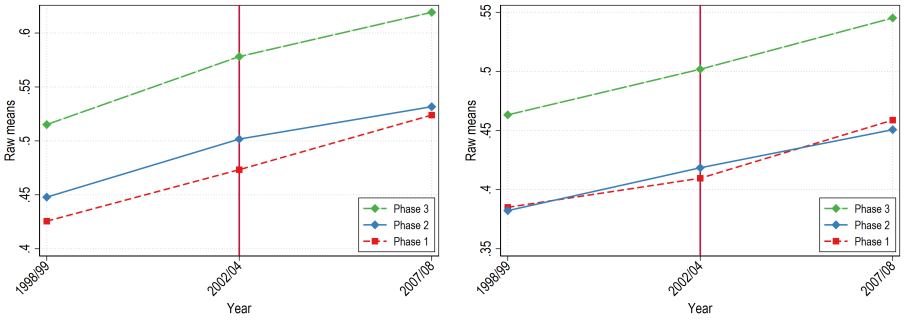
Fig. 3: Propensity score distribution by treatment groups.



(a) Any methods (b) Any modern methods

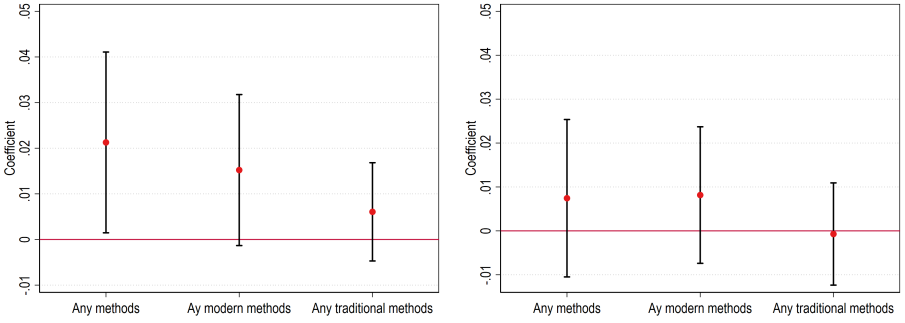
Note: The omitted category is DLHS-2 (Event Time = -1)

Fig. 4: Event-study regression



(a) Any methods (b) Any modern methods

Fig. 5: Pre-program trends across MGNREGA implementation phases.



(a) Phase 1 (2006) x $Post_{2008}$ (b) Phase 2 (2007) x $Post_{2008}$

Note: Figure in the left panel compare districts in phase 1 and phase 3, excluding phase 2. Right panel compares districts in phase 2 and phase 3, excluding phase 1.

Fig. 6: Differential effects of MGNREGA.

Table 1: District Summary Statistics

	Pre-Program (2002-2004)		
	Treated	Control	Diff. (p-value)
Propensity score	0.540	0.580	0.412
	(0.309)	(0.264)	
Total Population (in thousands)	1685.455	1423.395	0.125
	(1374.647)	(1140.525)	
Percent rural	0.791	0.799	0.674
	(0.145)	(0.114)	
Area (in square km)	116.355	109.100	0.650
	(143.130)	(135.001)	
Percent Scheduled Castes	0.157	0.141	0.282
	(0.088)	(0.094)	
Percent Scheduled Tribes	0.143	0.218	0.209
	(0.223)	(0.344)	
Percent Literate	0.547	0.535	0.457
	(0.118)	(0.100)	
Average MPCE	3524.572	3466.498	0.704
	(1057.067)	(1076.334)	
Average casual wage	329.410	334.066	0.671
	(134.240)	(133.176)	
Labor force participation rate	0.657	0.669	0.493
	(0.089)	(0.105)	
Female labor force participation rate	0.201	0.220	0.225
	(0.095)	(0.106)	
Rainfall (mm)	1217.950	1404.769	0.268
	(712.139)	(1113.264)	
Growing degree days	2366.131	2251.824	0.207
	(462.101)	(603.619)	
Number of observations	152,370	104,455	571,080
Number of districts	282	198	480

Note: Standard deviations are in parentheses. Sample restricted to common support region. Treated includes phase one and two districts, and control includes phase three districts. The third column, difference, is calculated with WLS regressions and clustered standard errors at the district level. MPCE refers to the monthly per capita consumption expenditure. Average MPCE and casual wage are in 2004-2005 prices.

Table 2: Individual Summary Statistics

	Pre-Program (2002-2004)		
	Treated	Control	Diff. (p-value)
Outcomes			
Any family planning methods	0.551	0.517	0.282
	(0.497)	(0.499)	
	[152,370]	[104,455]	
Any modern methods	0.478	0.438	0.179
	(0.500)	(0.496)	
	[152,370]	[104,455]	
Any traditional methods	0.074	0.079	0.638
	(0.261)	(0.269)	
	[152,370]	[104,455]	
Among women who are currently taking contraceptives.			
Female sterilization	0.663	0.630	0.260
	(0.473)	(0.483)	
	[76,945]	[61,207]	
Male sterilization	0.022	0.018	0.365
	(0.147)	(0.133)	
	[76,945]	[61,207]	
Intrauterine Device (IUD)	0.033	0.044	0.128
	(0.180)	(0.204)	
	[76,945]	[61,207]	
Oral pills	0.071	0.081	0.446
	(0.256)	(0.273)	
	[76,945]	[61,207]	
Condom	0.072	0.073	0.928
	(0.258)	(0.260)	
	[76,945]	[61,207]	
Rhythm/Periodic abstinence/Withdrawal	0.122	0.144	0.234
	(0.327)	(0.351)	
	[76,945]	[61,207]	
Individual-level characteristics			
Women age in years	30.466	30.701	0.097
	(7.262)	(7.230)	
	[152,369]	[104,455]	
Woman's age at first birth	18.752	18.982	0.162
	(3.278)	(3.345)	
	[140,073]	[96,111]	
Women can read or write	0.466	0.449	0.524
	(0.499)	(0.497)	
	[152,338]	[104,439]	
Spouse can read or write	0.713	0.698	0.407
	(0.452)	(0.459)	
	[152,318]	[104,423]	
Number of children	2.671	2.762	0.275
	(1.664)	(1.755)	
	[152,370]	[104,455]	
Household-level characteristics			
Religion: Hindu	0.800	0.710	0.085
	(0.399)	(0.456)	
	[152,370]	[104,455]	
Scheduled Castes/Tribes	0.351	0.393	0.347
	(0.477)	(0.489)	
	[152,370]	[104,454]	

Note: Standard deviations are in parentheses. Observations are in square bracket. Sample is restricted to common support region. Treated includes phase one and two districts, and control includes phase three districts. The third column, difference, is calculated with WLS regressions and clustered standard errors at the district level. Source: DLHS round 2 (2002-2004).

Table 3: Effect of MGNREGA on the use of family planning methods - Placebo

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post	-0.011	-0.012	0.001
	(0.011)	(0.008)	(0.007)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.484	0.422	0.062
SD dependent variable	0.500	0.494	0.241
Observations	549,059	549,059	549,059
Number of districts	422	422	422
R-squared	0.150	0.146	0.097

Note: Robust standard errors are in parentheses and clustered at the district level. The sample is restricted to common support. WLS estimator is used across all regressions. *Post* is a dummy variable indicating that the observation is from the 2002/04 round. All dependent variables are binary (1/0). Any methods refer to individuals who are currently using any family planning methods. Modern methods include sterilization of women and men, IUDs/copper-t/loop, oral pills, male and female condoms, and others. Traditional methods include using rhythm, periodically abstinence, withdrawal, and others.

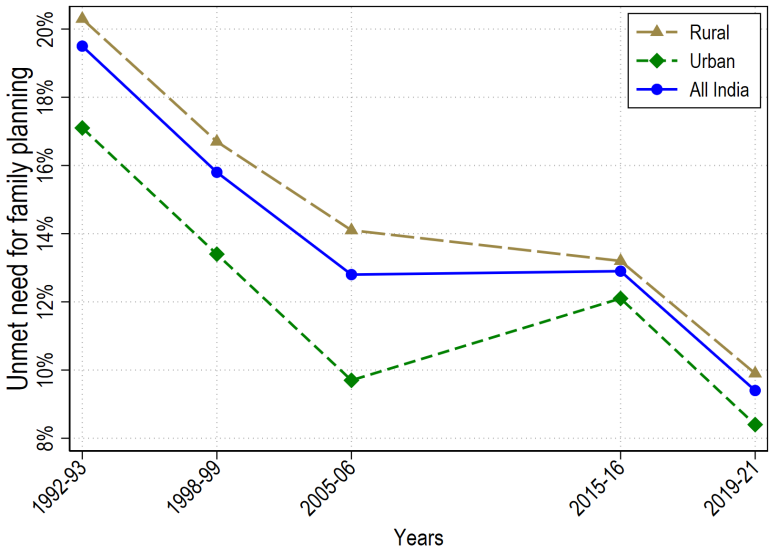


Fig. A1: Unmet need of currently married women for family planning. Source: Various rounds of National Family Health Survey.

Table 4: Effect of MGNREGA on the use of family planning methods

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post	0.018**	0.014**	0.004
	(0.008)	(0.006)	(0.005)
Individual-level and household controls			
Women age in years	0.014***	0.014***	-0.0002*
	(0.0004)	(0.0004)	(0.0001)
Women can read or write	0.057***	0.043***	0.014***
	(0.005)	(0.004)	(0.001)
Spouse can read or write	0.056***	0.048***	0.008***
	(0.003)	(0.003)	(0.001)
Number of children	0.043***	0.038***	0.005***
	(0.003)	(0.003)	(0.001)
Religion: Hindu	0.094***	0.090***	0.004
	(0.012)	(0.012)	(0.003)
Scheduled castes/tribes	-0.042***	-0.039***	-0.003**
	(0.005)	(0.006)	(0.001)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.558	0.486	0.072
SD dependent variable	0.497	0.500	0.259
Observations	570,193	570,193	570,193
Number of districts	480	480	480
R-square	0.220	0.227	0.091

Note: Levels of significance: p< 0.01***, p< 0.05**. Robust standard errors in parentheses are clustered at the level of treatment (district). Sample is restricted to common support and excludes currently pregnant women. WLS estimator is used for all regression. All dependent variables are binary (1/0). Any methods refer to individuals who are currently using any family planning methods. Modern methods include sterilization of women and men, IUDs/copper-t/loop, oral pills, male and female condoms, and others. Traditional methods include using rhythm, periodically abstinence, withdrawal, and others.

Table 5: Effect of MGNREGA on selected use of modern contraceptives

	Permanent contraceptives	Reversible contraceptives
Panel A: Age 18 to 34 years		
MGNREGA x Post	0.003	0.005
	(0.004)	(0.005)
Mean dependent variable	0.301	0.122
SD dependent variable	0.459	0.327
Observations	380,575	380,575
Number of districts	480	480
R-square	0.293	0.112
Panel B: Age 35 years and older		
MGNREGA x Post	0.010	0.010**
	(0.007)	(0.004)
Mean dependent variable	0.533	0.066
SD dependent variable	0.499	0.248
Observations	189,616	189,616
Number of districts	480	480
R-squared	0.243	0.084
District FEs	Yes	Yes
State-year FEs	Yes	Yes
Interview month-year FEs	Yes	Yes

Note: Levels of significance: p< 0.01***, p< 0.05**. Robust standard errors in parentheses are clustered at the level of treatment (district). The sample is restricted to common support and excludes current pregnant women. WLS estimator is used for all regressions. All dependent variables are binary (1/0). Controls at the individual and household level are included in every regression. The minimum age for working in the MGNREGA is 18. Permanent contraceptives include female and male sterilization. Reversible contraceptives include IUDs/Copper-t/Loop, oral pills, male and female condoms, and others.

Table 6: Effect of MGNREGA on woman's age at first birth

	Woman's age at first birth
MGNREGA x Post	0.110**
	(0.051)
District FEs	Yes
State-year FEs	Yes
Interview month-year FEs	Yes
Mean dependent variable	19.361
SD dependent variable	3.239
Observations	525,573
Number of districts	480
R-squared	0.180

Note: Levels of significance: p< 0.01***, p< 0.05**. Robust standard errors in parentheses are clustered at the level of treatment (district). The sample is restricted to common support and excludes current pregnant women. WLS estimator is used for all regressions. All dependent variables are binary (1/0). Controls at the individual and household level are included in every regression.

Table 7: Differential impacts of MGNREGA on the use of family planning in the Phase 1 and in the Phase 2 districts

	Any methods	Any modern methods	Any traditional methods
Phase 1 x Post	0.037***	0.029***	0.008
	(0.009)	(0.007)	(0.005)
Phase 2 x Post	0.008	0.010	-0.002
	(0.010)	(0.008)	(0.007)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.554	0.481	0.073
SD dependent variable	0.497	0.500	0.260
Observations	630,173	630,173	630,173
Number of districts	536	536	536
R-square	0.218	0.227	0.090
p-val[Phase 1 x Post = Phase 2 x Post]	0.285	0.277	0.718

Note: Levels of significance: p< 0.01***, p< 0.05**. Robust standard errors in parentheses are clustered at the level of treatment (district). Individual- and household-level controls are included in all regressions. The row 'p-val[Phase 1 x Post = Phase 2 x Post]' reports the p-value of the test of difference in the coefficient across the interaction terms between Phase 1 and Post and Phase 2 and Post.

Table 8: Effect of MGNREGA on the use of family planning methods by star states: Triple difference

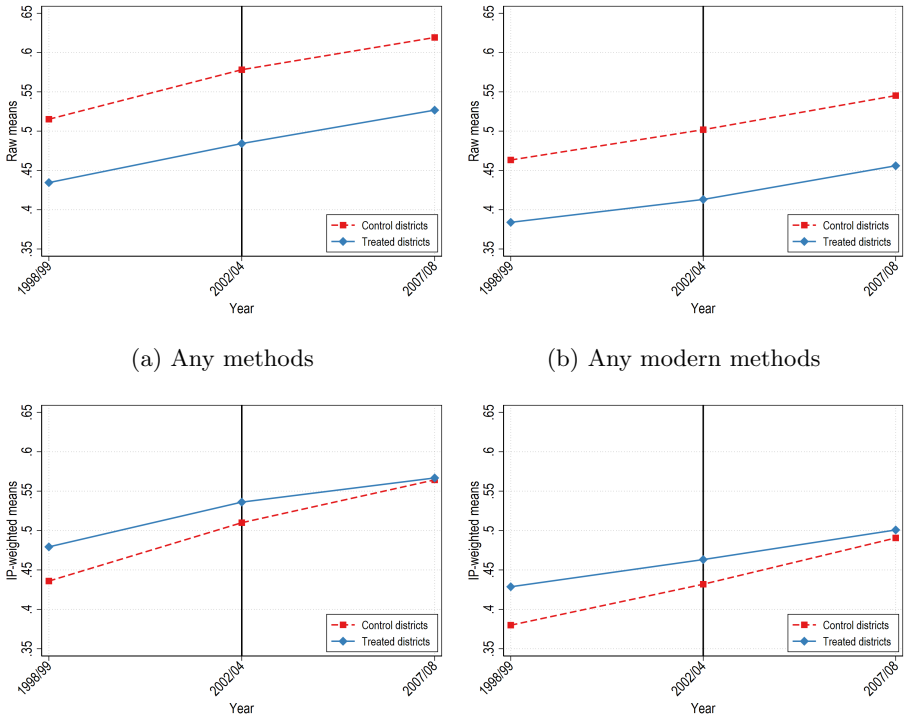
	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post x Star states	0.0004	0.007	-0.006
	(0.016)	(0.015)	(0.009)
MGNREGA x Post	0.018*	0.012*	0.006
	(0.009)	(0.007)	(0.008)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.558	0.486	0.072
SD dependent variable	0.497	0.500	0.259
Observations	570,193	570,193	570,193
Number of districts	480	480	480
R-squared	0.220	0.227	0.091

Note: Levels of significance: p< 0.01***, p< 0.05**. Robust standard errors in parentheses are clustered at the level of treatment (district). The sample is restricted to common support and excludes current pregnant women. WLS estimator is used across all regressions. All regressions include controls at the individual and household level. Star states include Andhra Pradesh, Himachal Pradesh, Madhya Pradesh, Chattisgarh, Rajasthan, Uttarakhand and Tamil Nadu. Imbert and Papp (2015). See note to Table 4 for other details.

Table 9: Effect of MGNREGA on the use of family planning methods

	Any methods	Any modern methods	Any traditional methods
Panel A: Low wealth index			
MGNREGA x Post	0.027**	0.017*	0.011
	(0.012)	(0.009)	(0.008)
Mean dependent variable	0.468	0.397	0.071
SD dependent variable	0.499	0.489	0.257
Observations	272,016	272,016	272,016
Number of districts	480	480	480
R-square	0.225	0.237	0.109
Panel B: Medium wealth index			
MGNREGA x Post	0.008	0.006	0.002
	(0.008)	(0.007)	(0.005)
Mean dependent variable	0.610	0.541	0.069
SD dependent variable	0.488	0.498	0.253
Observations	198,917	198,917	198,917
Number of districts	480	480	480
R-squared	0.210	0.220	0.092
Panel C: High wealth index			
MGNREGA x Post	0.021**	0.028***	-0.008
	(0.008)	(0.009)	(0.007)
Mean dependent variable	0.668	0.587	0.082
SD dependent variable	0.471	0.492	0.274
Observations	99,183	99,183	99,183
Number of districts	479	479	479
R-squared	0.176	0.180	0.076

Note: Levels of significance: p< 0.01***, p< 0.05**. Robust standard errors in parentheses are clustered at the level of treatment (district). The sample is restricted to common support and excludes current pregnant women. WLS estimator is used across all regressions. All regressions include controls at the individual and household level. District, state-year, and interview month-year fixed effects are included in all regressions.



(a) Any methods

(b) Any modern methods

(c) Any methods

(d) Any modern methods

Note: The y-axis measures the average means from the pre-program: DLHS round 1 (1998/99) and round 2 (2002/04) and post-program: DLHS round 3 (2007/08). The IP-weighted mean is restricted to common support region.

Fig. A2: Pre-program trends in the use of family planning methods

Table A1: Logistic regression predicting treatment

	Treatment
Total Population	1.000***
	(0.000)
Percent rural	186.748***
	(7.485)
Area (in square km)	1.000***
	(0.000)
Percent Scheduled Castes	1905.793***
	(111.530)
Percent Scheduled Tribes	123.363***
	(2.849)
Percent Literate	0.074***
	(0.003)
Average MPCE	0.999***
	(0.000)
Average casual wage	0.995***
	(0.000)
Labor force participation rate	0.030***
	(0.002)
Female labor force participation rate	8.851***
	(0.657)
Rainfall (mm)	1.000***
	(0.000)
Growing degree days	1.000***
	(0.000)
Observations	631,152

Note: Standard errors are in parentheses. Odds ratios are reported.

Table A2: Individual Summary Statistics before matching

	Pre-Program (2002-2004)		
	Treated	Control	Diff. (p-value)
Outcomes			
Any family planning methods	0.500	0.589	0.000
	(0.500)	(0.492)	
	[168,230]	[115,579]	
Any modern methods	0.428	0.512	0.000
	(0.495)	(0.499)	
	[168,230]	[115,579]	
Any traditional methods	0.072	0.077	0.506
	(0.259)	(0.267)	
	[168,230]	[115,579]	
Among women who are currently taking contraceptives.			
Female sterilization	0.681	0.660	0.321
	(0.466)	(0.474)	
	[84,126]	[68,082]	
Male sterilization	0.022	0.018	0.378
	(0.148)	(0.135)	
	[84,126]	[68,082]	
Intrauterine Device (IUD)	0.022	0.045	0.000
	(0.147)	(0.208)	
	[84,126]	[68,082]	
Oral pills	0.075	0.063	0.134
	(0.263)	(0.242)	
	[84,126]	[68,082]	
Condom	0.051	0.079	0.000
	(0.220)	(0.270)	
	[84,126]	[68,082]	
Rhythm/Periodic abstinence/Withdrawal	0.126	0.125	0.901
	(0.332)	(0.330)	
	[84,126]	[68,082]	
Individual-level characteristics			
Women age in years	30.169	30.708	0.000
	(7.296)	(7.201)	
	[168,229]	[115,579]	
Women can read or write	0.388	0.489	0.000
	(0.487)	(0.499)	
	[168,191]	[115,559]	
Spouse can read or write	0.650	0.738	0.000
	(0.477)	(0.440)	
	[168,166]	[115,542]	
Number of children	2.743	2.653	0.013
	(1.723)	(1.630)	
	[168,230]	[115,579]	
Household-level characteristics			
Religion: Hindu	0.824	0.764	0.021
	(0.381)	(0.424)	
	[168,230]	[115,579]	
Scheduled castes/tribes	0.396	0.317	0.000
	(0.489)	(0.465)	
	[168,230]	[115,578]	

Note: Standard deviations are in parentheses. Observations are in square bracket. Treated includes phase one and two districts, and control includes phase three districts. The third column, the difference, is computed using OLS regressions and standard errors clustered at the district level. Source: DLHS round 2 (2002-2004).

Table A3: Effect of MGNREGA on the use of family planning methods by female labor force participation rate: Triple difference

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post x High Female LFPR	-0.004	-0.003	-0.00003
	(0.015)	(0.014)	(0.011)
MGNREGA x Post	0.020	0.015*	0.004
	(0.012)	(0.009)	(0.010)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.558	0.486	0.072
SD dependent variable	0.497	0.500	0.259
Observations	570,193	570,193	570,193
Number of districts	480	480	480
R-square	0.220	0.227	0.091

Note: Levels of significance: p< 0.01***, p< 0.05**. Robust standard errors in parentheses are clustered at the level of treatment (district). The sample is restricted to common support and excludes current pregnant women. WLS estimator is used across all regressions. All regressions include controls at the individual and household level. See note to Table 4 for other details.

Table A4: Effect of trimming at the fifth centile on the IP-weighted estimate

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post	0.020*	0.019*	0.002
	(0.011)	(0.010)	(0.006)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.582	0.512	0.070
SD dependent variable	0.493	0.500	0.256
Observations	297,492	297,492	297,492
Number of districts	252	252	252
R-square	0.204	0.227	0.121

Note: Levels of significance: p< 0.01***, p< 0.05**. Robust standard errors in parentheses are clustered at the level of treatment (district). The sample is cut at the 5th percentile. WLS estimator is used for all regression. All dependent variables are binary (1/0). Controls at the individual and household level are included in every regression. Any methods refer to individuals who are currently using any family planning methods. Modern methods include sterilization of women and men, IUDs/copper-t/loop, oral pills, male and female condoms, and others. Traditional methods include using rhythm, periodically abstinence, withdrawal, and others.

Table A5: Effect of MGNREGA on the use of family planning methods: Unweighted results

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post	0.025***	0.021***	0.004
	(0.008)	(0.006)	(0.005)
Individual-level and household controls			
Women age in years	0.015***	0.015***	-0.0002**
	(0.0004)	(0.0004)	(0.0001)
Women can read or write	0.060***	0.046***	0.014***
	(0.003)	(0.003)	(0.001)
Spouse can read or write	0.056***	0.049***	0.008***
	(0.002)	(0.002)	(0.001)
Number of children	0.044***	0.038***	0.006***
	(0.002)	(0.002)	(0.0004)
Religion: Hindu	0.104***	0.102***	0.002
	(0.006)	(0.007)	(0.002)
Scheduled castes/tribes	-0.048***	-0.045***	-0.003**
	(0.003)	(0.003)	(0.001)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.554	0.481	0.073
SD dependent variable	0.497	0.500	0.260
Observations	630,173	630,173	630,173
Number of districts	480	480	480
R-square	0.218	0.227	0.090

Note: Levels of significance: p< 0.01***, p< 0.05**. Robust standard errors in parentheses are clustered at the level of treatment (district). OLS estimator is used for all regression. All dependent variables are binary (1/0). Any methods refer to individuals who are currently using any family planning methods. Modern methods include sterilization of women and men, IUDs/copper-t/loop, oral pills, male and female condoms, and others. Traditional methods include using rhythm, periodically abstinence, withdrawal, and others.

Table A6: Effect of MGNREGA on the use of family planning methods for women below the age of 18

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post	0.031	0.021	0.009
	(0.019)	(0.013)	(0.014)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.090	0.050	0.040
SD dependent variable	0.286	0.219	0.195
Observations	14,716	14,716	14,716
Number of districts	459	459	459
R-square	0.186	0.137	0.148

Note: Robust standard errors in parentheses are clustered at the level of treatment (district). Dependent variables comprise women under 18 years of age. Controls at the individual and household level are included in every regression.

Table A7: Effect of MGNREGA on selected use of modern contraceptives: Triple difference

	Permanent contraceptives	Reversible contraceptives
MGNREGA x Post x Age 35 years and older	−0.025	0.015**
	(0.017)	(0.007)
MGNREGA x Post	0.014*	0.002
	(0.007)	(0.005)
District FEs	Yes	Yes
State-year FEs	Yes	Yes
Interview month-year FEs	Yes	Yes
Mean dependent variable	0.380	0.103
SD dependent variable	0.485	0.304
Observations	570,193	570,193
Number of districts	480	480
R-square	0.286	0.102

Note: Levels of significance: p< 0.01***, p< 0.05**. Robust standard errors in parentheses are clustered at the level of treatment (district). The sample is restricted to common support and excludes current pregnant women. WLS estimator is used for all regressions. All dependent variables are binary (1/0). Controls at the individual and household level are included in every regression. The minimum age for working in the MGNREGA is 18. Permanent contraceptives include female and male sterilization. Reversible contraceptives include IUDs/Copper-t/Loop, oral pills, male and female condoms, and others. Married women 35 years and older represent a binary variable (1/0).

Table A8: Robustness check: Coarsened Exact Matching method

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post	0.020***	0.017***	0.003
	(0.008)	(0.006)	(0.005)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.583	0.508	0.075
SD dependent variable	0.493	0.500	0.263
Observations	450,442	450,442	450,442
Number of districts	536	536	536
R-squared	0.206	0.219	0.095

Note: Levels of significance: p< 0.01***, p< 0.05**. Robust standard errors in parentheses are clustered at the level of treatment (district). WLS estimator is used across all regressions. Controls at the individual and household level are included in every regression. The coarse variables used were age of women, literacy of women and spouses, religion, scheduled castes/tribes, number of children and wealth index. The match summary consists of: 225,420 matched on 242,257 observations for control and 225,420 matched on 388,895 for treatment.

Table A9: Robustness check: Probit

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post	0.058**	0.041**	0.050
	(0.024)	(0.020)	(0.042)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.558	0.486	0.073
SD dependent variable	0.497	0.500	0.260
Observations	570,183	570,166	563,289
Number of districts	480	480	473

Note: This table reports probit regression estimates. IP weight is applied across all regressions. Sample is restricted to common support. Robust standard errors in parentheses are clustered at the level of treatment (district). Controls at the individual and household level are included in every regression. Levels of significance: p< 0.01***, p< 0.05**.

Table A10: Robustness check: Propensity score

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post	0.025***	0.021***	0.004
	(0.008)	(0.006)	(0.005)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.554	0.481	0.073
SD dependent variable	0.497	0.500	0.260
Observations	630,173	630,173	630,173
Number of districts	536	536	536
R-square	0.218	0.227	0.090

Note: Robust standard errors in parentheses are clustered at the level of treatment (district). Controls at the individual and household level are included in every regression. Levels of significance: p< 0.01***, p< 0.05**.

Table A11: Effect of MGNREGA on the use of family planning methods by household wealth index: Triple difference

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post x Poor	-0.007	-0.016	0.009
	(0.011)	(0.010)	(0.006)
MGNREGA x Post	0.019**	0.019***	0.0003
	(0.008)	(0.007)	(0.005)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.558	0.486	0.072
SD dependent variable	0.497	0.500	0.259
Observations	570,193	570,193	570,193
Number of districts	480	480	480
R-squared	0.223	0.229	0.091

Note: Levels of significance: p< 0.01***, p< 0.05**. Robust standard errors in parentheses are clustered at the level of treatment (district). The sample is restricted to common support and excludes current pregnant women. WLS estimator is used across all regressions. All regressions include controls at the individual and household level. Poor is coded as 1 for low wealth and 0 if not. See note to Table 4 for other details.

Table A12: Summarized selected literature review

Studies	Outcome	Methodology	Sample and time frame	Relevant findings
Ajefu and Abiona (2019)	Non-agricultural labor market and children schooling	Diff-in-Diff	NSS EUS 61 (2004/05) and 64 (2007/08)	NREGS increases labor market engagements of females and reduces children's engagement in school in response to rainfall shocks.
Chatterjee and Merfeld (2021)	Child gender	Diff-in-Diff	NSS EUS 61 (2004/05) and 64 (2007/08) and IHDS-II (2011/12)	NREGS reduces sex-selection among children during lean agricultural years.
Chari et al. (2019)	Neonatal mortality	Diff-in-Diff	DLHS-2 (2002/04) and DLHS-3 (2007/08)	NGREGS increased neonatal mortality.
Fetzer (2020)	Conflict events	Diff-in-Diff	IHDS-I (2004/05) and IHDS-II (2011/12)	NREGS lead to a drop in conflict levels by a way of acting as an insurance to agricultural productivity shock.
Azam (2011)	Labor market	Diff-in-Diff	NSS EUS 61 (2004/05) and 64 (2007/08)	NREGS increased the female labor force participation rate.
Imbert and Papp (2015)	Labor market	Diff-in-Diff	NSS EUS 61 (2004/05) and 64 (2007/08)	NREGS crowd out private sector work and increased private sector wages.
Zimmermann (2012)	Labor market	Regression discontinuity	NSS EUS 61 (2004/05) and 64 (2007/08)	NREGS increased private sector wages for women.
Muralidharan et al. (2017)	Labor market	Diff-in-Diff	Own survey data, 2012	Improved NREG scheme implementation (via Smart cards) raises private sector employment.
Berg et al. (2018)	Labor market	Diff-in-Diff	Agricultural wages of India (2000/11)	NREGS increased agricultural wages.
Merfeld (2020)	Self-employment in non-farm	Diff-in-Diff	NSS EUS 61 (2004/05) and 64 (2007/08) rounds	NREGA significantly decreases the number of days spent in non-farm self-employment.
Dasgupta (2017)	Child health	Diff-in-Diff	Young Lives Survey, Andhra Pradesh, India	NREGS mitigates the negative effects of drought on child height-for-age z scores.
Deininger et al. (2016)	Labor market and ag productivity	Diff-in-Diff	1999/00 and 2007/08 rounds of ARIS-REDS	NREGS increased agricultural wages; and no impact on the value of per acre output.

Table A13: District-level variables

Variable	Source
Total Population	2001 Census
Percent rural	2001 Census
Area (in square km)	2001 Census
Percent Scheduled Castes	2001 Census
Percent Scheduled Tribes	2001 Census
Percent Literate	2001 Census
Average monthly per capita consumption expenditure	2004/05 NSSEUS
Average casual wage (2004/05 prices)	2004/05 NSSEUS
Labor force participation rate	2004/05 NSSEUS
Female labor force participation rate	2004/05 NSSEUS
Rainfall (2004)	NCMRWF
Growing degree days (2004)	NCMRWF

Note: I use the socioeconomic high-resolution rural-urban geographic platform for India (SHRUG) (Asher, Lunt, Matsuura, & Novosad, 2021) to construct 2001 census variables. NSSEUS refer to the National Sample Surveys on Employment and Unemployment Situation in India. NCMRWF refer to the National Centre for Medium Range Weather Forecasting (Rani et al., 2021). I use growing season (June through September) in a given year to construct rainfall and growing degree days.