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 method 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

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1 Introduction

According to the District Level Household and Facility Survey round 2 conducted in 2002/04, 23 percent of currently married women in rural India have an unmet need for family planning[1]. Moreover, currently married women in rural India say that they would like to delay their next birth by at least two years (10 percent) or they do not want any more children (13 percent) but are not using any form of contraception. 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 intervention 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[3], 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. From the economy and health points of view, rural India needs successful implementation of family planning programs (Chandrasekhar, 1959).

Public workfare programs provide a way for governments to support livelihoods by providing employment opportunities for jobless workers. Public works

[1] Unmet need for family planning is defined as currently married women who say that either they do not want any more children or they want to delay their next birth by at least two years, but are not using contraceptives. 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

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 employment, particularly in both post-disaster and post-conflict situations (Subbarao, Del Ninno, Andrews, & Rodríguez-Alas, 2012)[4]. The Mahatama Gandhi National Rural Employment Guarantee Act (MGNREGA) is the largest public workfare program in size and ambition. For example, in 2011/12 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[6], it may lead to financial autonomy for women, which in turn may provide opportunity for them to use modern methods of contraception directly and privately. 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 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 have examined the direct relationship between work status of women and their contraceptive use. Gage (1995), found that, in Togo, women who work outside 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

[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 Jefes 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). Appendix Table A6 provides a summary of selected studies in public works.

who work outside home for cash have a higher contraceptive prevalence rate has yet to be causally studied.

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. As the MGNREGA roll out was targeted rather than random, I test for the parallel trends[8]. I then use the inverse probability of treatment weighted technique to address the non-random assignment of the treatment.

The 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 the 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 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. 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.

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

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 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 for guaranteed rural employment under the MGNREGA: (a) the adult members of every household who reside in rural areas and are willing to do unskilled manual work may submit their names, age and the address of the household to the village governing body (*Gram Panchayat*) at the village level for the issuance of a job card; (b) every adult member with a job card is guaranteed employment for a maximum of 100 days in a given financial year within 15 days of work demand; (c) a period of employment at least 14 days continuously with not more than 6 days in a week; (d) at least one-third of the beneficiaries are required to be women with a wage paid as equal to the 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.

Figure A2 shows the total volume of person-days generated under MGNREGA from 2011 to 2016. This figure shows the range between 2 and 2.5 billion

[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.

person-days employment generated under MGNREGA except in 2014. Most of the work days were allocated during the agricultural lean season (January through May). 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, a steady rise in women's participation in MGNREGA from 40 percent in 2006-07.[10] 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] 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. These findings suggest that MGNREGA had higher effects on employment for rural women than it was for rural men.

3 Why MGNREGA may increase the contraceptive use?

This section seeks to identify aspects of women empowerment in the presence of workfare programs. I exploit the MGNREGA mandate to give work to women through 33 percent reservation to study the relationship between women who work for cash and their use of contraceptives.

Fewer women work away from home for pay because of number of factors including high transaction costs and social stigma (Jensen, 2012). MGNREGA lowers such costs associated with working outside home by making work available in their villages. Ashraf, Field, and Lee (2014), in Zambia, find that individual consultation of married women increases the use of modern contraception compared to couple consultation, where husband may have the final decision. MGNREGA provide opportunities for women to afford contraceptives via financial autonomy.

Studies have documented that women who work outside home for cash have greater control over household decisions including earnings and greater exposure to ideas about reproductive choice and contraceptive methods. For example, Jensen (2012) in his seminal paper shows that rural Indian women who work away from home for pay delay marriage and childbearing. Anderson and Eswaran (2009), in Bangladesh, show that women who work outside home

[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

have a greater ability to make reproductive decisions within the household; Another study Chari et al. (2019), in India, find 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.

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). 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. Figure 2 summarizes the various mechanisms through which MGNREGA impacts the use of women 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 2002/04 and 2007/08[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 (2002/04) is pre-treatment year and the DLHS round 3 (2007/08) 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[14]. I then exploit the variation in timing of the treatment to employ a difference-in-differences (DiD) estimator. This DiD strategy compares the 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.

[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

[14] IPTW is a propensity score based method that aim to achieve a balance distribution of confounders across treatment groups and hence leads to more robust and less biased estimations of the treatment effect (Allan et al., 2020).

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 DLHS-3 (2007/08), only less than 4 percent of contraceptive users in rural India ever faced difficulty in getting any methods of family planning.

Who pays for contraceptives? Among the members of rural Indian households that have ever used contraceptives, a little less than three-fourths have paid money in 2007/08 for pills, female and male condoms, and injectables. Therefore, MGNREGA wages would allow the purchase of contraceptives.

4.1.2 Descriptive Statistics

In the DLHS round 2 (2002/04), the data was collected on 5,07,622 eligible women aged 15-44 years, currently married and whose marriage was consummated. In the DLHS round 3 (2007/08), the data was collected on 6,43,944 ever-married women aged 15-49 years and 1,66,620 unmarried women aged 15-24 years. From this data, I focus on sample of currently married women aged 15-44 years whose marriage was consummated to compare outcome of interest with other surveys. For the purpose of my analysis, I exclude currently pregnant women in the sample. The analysis samples include 292,810 currently married, fecund women aged 15-44 living in rural India in 2002/04, and 350,210 such women in 2007/08.

Table 1 presents the individual summary statistics, IP-weighted, by treatment groups. More than one-third of the currently married women in treated and untreated districts used any methods of family planning. About 48 percent of currently married women in treated districts have used modern method of contraception and about 41 percent in untreated districts. Less than 10 percent of currently married women used traditional method of contraception in treated and in untreated districts. In my sample, the female sterilization is the most used modern method and the male sterilization is the least used modern method of contraception. Oral pills, and male and female condoms are still

very low at less than 5 percent in rural areas. Intrauterine device (IUD) for currently married women is less than 2 percent in treated and in untreated districts. Traditional method of contraception in my sample is about 7 percent in treated and about same in untreated districts. In summary, the modern methods of contraceptives are low in rural areas and geared towards women. Appendix Table A1 presents individual summary statistics before matching.

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 percent in treated districts and 42 percent in untreated districts. Married women in rural areas bore, 3 children, on an average, in treated and untreated districts. About 42 percent (respectively, 39 percent) of modern methods of contraceptives are used by married woman under the age of 35 years in treated (respectively, untreated) districts. About 62 percent (respectively, 55 percent) used by married woman aged 35 years and above 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.

$$y_{ihdt} = \beta_0 + \beta_1 MGNREGA_d * Post_t + \xi_{ihdt} + \alpha_d + \phi_{st} + \lambda_{mt} + \varepsilon_{ihdt} \quad (1)$$

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 2007/08 round; ξ_{ihdt} is a vector of individual-level and household-level controls; 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 regression.

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

4.2.1 Inverse probability of treatment weighting

To calculate the inverse probability of treatment weighting, I use the following econometric equation:

$$Treated_d = \beta_0 + X_d{}'\beta + \varepsilon_d \tag{2}$$

where X_d is a vector of district-level variables including total population, percent rural, area (in square km), percent scheduled castes, percent scheduled tribes, percent literate, average monthly per capita consumption expenditure (2004/05 prices), average casual wage (2004/05 prices), labor force participation rate, female labor force participation rate, rainfall, and growing degree days.

Appendix Table A7 shows the data sources used in the analysis. Appendix TableA8 shows the IP-weighted summary statistics for district characteristics used in the analysis. The labor force participation rate is higher in the comparison districts. Specifically, the female labor force participation rate is higher in the comparison districts. The p-value reported in column 3 in table 1 that the outcome of interest are systematically not different across treated and untreated districts.

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 1. Appendix Table A9 shows the logistic regression predicting treatment.

Figure 3 shows the distribution of propensity score by treatment groups. Propensity score distribution for treated and untreated are skewed.

5 Results and Discussion

Table 2 presents the main results from equation 1 using IP-weighted and restricted to the common support region. The results suggest an increase of 2 percentage points (a 3% increase) in the use of family planning methods in treated districts. Specifically, the use of modern methods shows an increase of 2 percentage points (a 3% increase). The point estimate for any traditional methods of family planning is not different from zero.

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 A2 presents the effect of trimming at the fifth centile on the IP-weighted estimate. The results remain the same.

Table 3 presents the disaagregated types of modern contraceptives. The permanent contraceptives includes female and male sterilization and long acting reversible contraceptives includes IUD/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 long acting reversible contraceptives for married women aged 35 years and above. 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 above are the most impacted by MGNREGA in regard to the use of modern methods of contraceptives.

Next, I show how MGNREGA's availability is associated with the timing of a woman's first birth. Table 4 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 result implies that MGNREGA may have lowered the costs of first birth. These costs may include forgoing desired sexual activity and negotiating sexual behaviour and fertility with husbands (Miller, 2010). This shows that putting money in the hand of women gives them negotiating power in family planning decisions within a household.

Next, I investigate differential effects of MGNREGA across phase 1 and phase 2 on the use of family planning methods. Table 5 reports 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 contraceptives for married women in treated districts in phase 1. I find null effect for treated districts in phase 2. I fail to reject the equality test of DID estimate across phase 1 and phase 2. Therefore, the results suggest no evidence of differential effects of MGNREGA across treated districts in phase 1 and in phase 2.

The results are robust to a number of robustness checks. First, I perform matched DID with coarsened exact matching algorithm. Appendix table A3 present the results. The results remain unchanged.

Second, because the dependent variables are binary, I use probit specification to estimate the impact of MGNREGA on the use of family planning methods. Appendix Table A4 presents the results.

Third, I include the estimated propensity score of being in the treated district in the right hand side of the main regression equation 1 as an additional variable. Appendix Table A5 presents the results.

5.1 Pre-Program Trends

As shown in the previous section, the main result suggests an increase in the family planning methods in treated districts (phase one and two districts). 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. Appendix figure A2 shows the pre-program trends for two methods of family planning using DLHS round 1 (1998/99) and round 2 (2002/04). The evidence supports the assumption of parallel trend in contraceptive outcomes of interest.

To empirically test the parallel trend assumption, I re-estimate the equation 1 but use round 2 (2002/04) as Post and round 1 (1998/99) as pre-program. Table 6 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 purpose of my analysis.

5.2 Threats to identification

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, treatment and control groups may not be equivalent in their characteristics and thus may lead to a downward bias in the estimates. In literature, 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.

Second, there may be concern that districts that are characterized by a higher women workforce participation would expect to already be using the family planning methods. I address this concern by including the triple interaction term MGNREGA*Post*High female LFPR in the main specification. I construct a high female labor force participation rate (LFPR) dummy variable, 1 for values greater than or equal to the mean of female LFPR and 0 otherwise[15]. Table 7 presents the effect of MGNREGA on women use of family planning methods by female labor force participation rate. The negative sign of coefficients on column 1 and 2 are suggesting that women in districts characterized by high labor force participation rate are not more likely to use the family planning methods. Therefore, this would not impact my results. Another explanation could be that employment guarantee scheme employing husbands allows spouses to withdraw from the labor force and thus, weaken the bargaining power of women.

Third, a recent growing literature shows that a TWFE linear regression can provide biased estimates in DiD with multiple time periods (Callaway & Sant'Anna, 2021; De Chaisemartin & d'Haultfoeuille, 2020; Goodman-Bacon, 2021; Sun & Abraham, 2021). As mentioned before, the MGNREGA rollout was in multiple time periods and thus my results may be biased. 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.

[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.

5.3 Extended results

5.3.1 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[16].

Imbert and Papp (2015) have identified states that have shown comparatively better performance and classified them as star states[17]. I expect MGNREGA in star states to have a larger effect on women ruse 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.

5.3.2 Heterogeneity by wealth index

To estimate the heterogeneity by wealth index, a composite measure of a households' cumulative living standard, I split the data into low, medium and high wealth index[18]. Table 9 report the results. Panel A present results of women of a lower wealth index households. The results suggest an increase of 3 percentage points (a 6% increase) in family planning methods with the introduction of MGNREGA. Because of the MGNREGA wages, low-income women may afford the high upfront costs of contraceptives, in particular LARCs, such as intrauterine devices. The effect is smaller, 2 percentage points, for rich households as shown in Panel C. This may be because of an income effect that

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

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

[18] I observe wealth index variable in the DLHS dataset.

prioritise the quality of investment in a child. Furthermore, non-poor households in rural areas of a low income country also participates in the public workfare programs as an outside option. Dutta et al. (2012) finds that non-poor households in rural areas participated in the MGNREGA in response to agricultural productivity shock such as rainfall shock. Panel B present results of women associated with households of medium wealth. Point estimates are positive suggesting increased use of family planning methods. The coefficients are nonsignificant at 5 percent significance level.

5.4 Alternative mechanisms

5.4.1 Effect of MGNREGA on labor reallocation

Previous research has shown that the agricultural households in rural areas of low- and middle-income countries relies on family labor for most of the agricultural operations and thus have a large household size by lowering the use of family planning methods. This section considers whether potential labor reallocation from agricultural to non-agricultural activities with the introduction of MGNREGA is driving the results.

I consider the possibility of a reallocation of labor from agricultural to non-agricultural by examining the impact of MGNREGA on self-employment in farming. Table 10 report the results of the effect of MGNREGA on employment situations. The days spent in self-employment in farming have increased with the introduction of MGNREGA. However, the point estimate on self-employment in farming is very small and not statistically different from zero. In contrast, the days spent in self-employment in non-farming, which includes manufacturing, construction and services have declined less than 1 percentage points. Overall, the results do not support the alternative mechanisms for explaining an increase use of family planning methods.

5.4.2 Effects of MGNREGA on forest cover

Another alternative mechanism through which MGNREGA may influence the use of contraception is changes in the forest cover. Effects of environmental change on fertility. Brauner-Otto and Axinn (2017) finds an inverse relationship between decline in forest resources and fertility.

To estimate the productive effects of the MGNREGA. I built an indicator of forest cover by combining the Normalized Difference Vegetation Index (NDVI)

with information on land use[19]. I find no evidence to suggest that public works increased forest cover[20].

5.5 Limitations

The limitations of this study 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.

6 Conclusion

This paper investigates the impact of workfare programs 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 among currently married women aged 35 and above by about 2 percentage points. The treatment effect is significant for both the poor and the rich households. The effect is larger for poor households. MGNREGA may have helped women achieve their desired level of fertility by reducing the costs of fertility control. The results of the paper provide new evidence and informs policy makers and implementer on the impact of MGNREGA on women empowerment.

One contribution of my paper is to offer a causal relationship between workfare programs and family planning decisions. This study builds on the literature which demonstrates that providing income generating opportunities in women hands influences their reproductive decision-making within the household. An increase in family planning methods may address maternal morbidity and adverse infant health outcomes in rural areas of low- and middle-income countries.

[19]For the purpose of my analysis, I compute mean NDVI for the growing season (June through September) for a given year. I use Land use data for the year 2005. I downloaded data from NASA's Land Process Distributed Active Archive Center (LP DAAC) located at the USGS Earth Resources Observation and Science (EROS) Center

[20]Table is not presented here.

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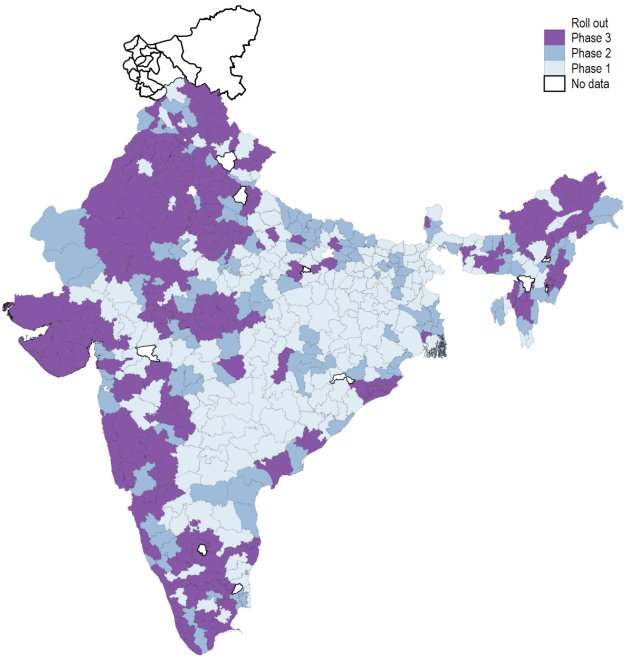
Appendix A Additional Figures and Tables

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.

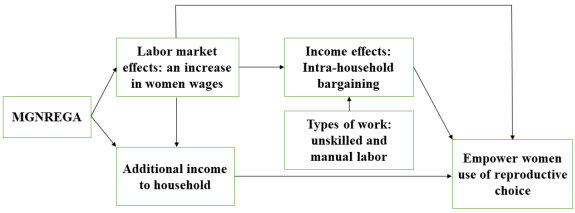
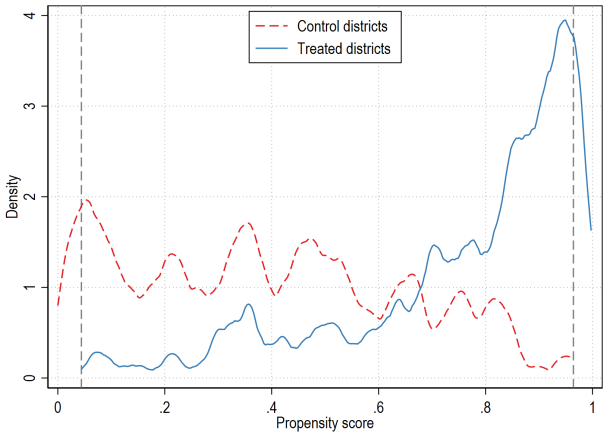


Fig. 2: Theory of change. The figure highlights the various mechanisms through which MGNREGA, the employment guarantee act empowers women use of family planning methods. Source: Own elaboration.



Note: The region within the dotted line represents the common support. The largest propensity score in the untreated is 0.9642001 and the smallest in the treated is 0.0440235. Source: Own calculation

Fig. 3: Propensity score distribution by treatment groups.

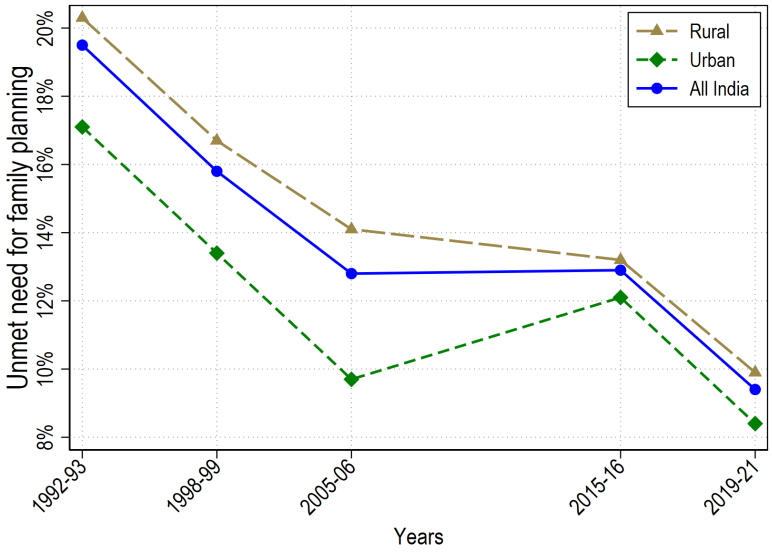


Fig. A1: Unmet need of currently married women for family planning. Source: Various rounds of National Family Health Survey.

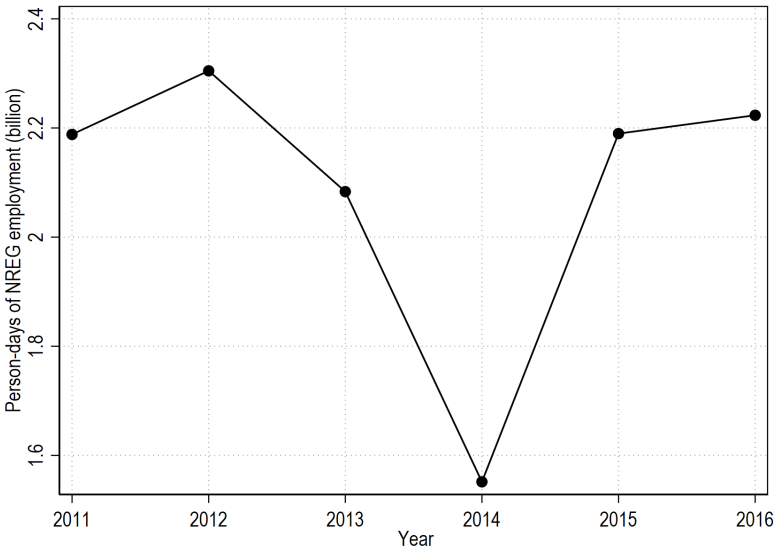


Fig. A2: Total person-days employment under MGNREGA between 2011 and 2016. Source: Own calculation based on Management Information System (MIS), Government of India.

Table 1: Individual Summary Statistics

	Treated	Control	Diff. (p-value)
Outcomes			
Any family planning methods	0.555	0.519	0.264
	(0.497)	(0.500)	
	[359,426]	[226,004]	
Any modern methods	0.485	0.444	0.185
	(0.500)	(0.497)	
	[359,426]	[226,004]	
Any traditional methods	0.070	0.075	0.551
	(0.255)	(0.263)	
	[359,426]	[226,004]	
Among women who are currently using any methods of contraceptives			
Female sterilization	0.668	0.633	0.239
	(0.471)	(0.482)	
	[183,877]	[134,408]	
Male sterilization	0.023	0.016	0.136
	(0.148)	(0.126)	
	[183,877]	[134,408]	
Intrauterine Device (IUD)	0.027	0.036	0.051
	(0.162)	(0.187)	
	[183,877]	[134,408]	
Oral pills	0.076	0.087	0.443
	(0.265)	(0.282)	
	[183,877]	[134,408]	
Condom	0.075	0.080	0.615
	(0.264)	(0.272)	
	[183,877]	[134,408]	
Rhythm/Periodic abstinence/Withdrawal	0.121	0.140	0.219
	(0.326)	(0.347)	
	[183,877]	[134,408]	
Individual-level characteristics			
Women age in years	30.291	30.549	0.075
	(7.422)	(7.319)	
	[359,425]	[226,004]	
Women can read or write	0.493	0.498	0.839
	(0.500)	(0.500)	
	[359,374]	[225,958]	
Spouse can read or write	0.727	0.728	0.941
	(0.445)	(0.445)	
	[358,776]	[225,759]	
Number of children	2.735	2.858	0.104
	(1.815)	(1.881)	
	[359,426]	[226,004]	
Religion: Hindu	0.808	0.683	0.043
	(0.394)	(0.465)	
	[359,426]	[226,004]	
Scheduled castes/tribes	0.360	0.419	0.237
	(0.480)	(0.493)	
	[359,426]	[226,003]	

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 (2002/04).

Table 2: Effect of MGNREGA on the use of family planning methods

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post	0.016**	0.013**	0.003
	(0.008)	(0.006)	(0.005)
Individual-level and household controls			
Women age in years	0.015***	0.015***	-0.0003
	(0.0004)	(0.0004)	(0.0001)
Women can read or write	0.056***	0.042***	0.014***
	(0.004)	(0.004)	(0.001)
Spouse can read or write	0.052***	0.045***	0.008***
	(0.003)	(0.003)	(0.001)
Number of children	0.042***	0.037***	0.005***
	(0.003)	(0.003)	(0.001)
Religion: Hindu	0.087***	0.083***	0.004
	(0.011)	(0.011)	(0.003)
Scheduled castes/tribes	-0.041***	-0.038***	-0.003**
	(0.005)	(0.005)	(0.001)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.541	0.469	0.072
SD dependent variable	0.498	0.499	0.258
Observations	584,463	584,463	584,463
Number of districts	480	480	480
R-squared	0.235	0.240	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). 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). The any methods refer to individuals currently using any family planning methods. Modern methods include female and male sterilization, IUD/Copper-t/Loop, oral pills, male and female condom, and others. Traditional methods include the use of rhythm, periodic abstinence, withdrawal, and others.

Table 3: Effect of MGNREGA on selected use of modern contraceptives

	Permanent contraceptives	Long acting reversible contraceptives
Panel A: Age 15 to 34 years		
MGNREGA x Post	0.001	0.005
	(0.004)	(0.005)
Mean dependent variable	0.286	0.119
SD dependent variable	0.452	0.324
Observations	394,676	394,676
Number of districts	480	480
R-squared	0.299	0.112
Panel B: Age 35 years and above		
MGNREGA x Post	0.011	0.010**
	(0.007)	(0.004)
Mean dependent variable	0.522	0.067
SD dependent variable	0.500	0.250
Observations	189,785	189,785
Number of districts	480	480
R-squared	0.258	0.083
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). 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). Permanent contraceptives includes female and male sterilization. Long acting reversible contraceptives includes IUD/Copper-t/Loop, oral pills, male and female condom, and others. Individual-level and household controls are included in all regressions.

Table 4: Effect of MGNREGA on women's age at first birth

	Women's age at first birth
MGNREGA x Post	0.111**
	(0.054)
District FEs	Yes
State-year FEs	Yes
Interview month-year FEs	Yes
Mean dependent variable	19.336
SD dependent variable	3.271
Observations	530,523
Number of districts	480
R-squared	0.178

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). Individual-level and household controls are included in all regressions.

Table 5: Differential impacts of MGNREGA on the use of family planning

	Any methods	Any modern methods	Any traditional methods
Phase 1 x Post	0.036***	0.028***	0.008
	(0.009)	(0.007)	(0.005)
Phase 2 x Post	0.007	0.009	-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	0.543	0.471	0.073
SD dependent variable	0.498	0.499	0.259
Observations	645,451	645,451	645,451
Number of districts	536	536	536
R-squared	0.230	0.236	0.090
p-val[Phase 1 x Post = Phase 2 x Post]	0.253	0.241	0.705

Note: Levels of significance: p< 0.01***, p< 0.05**. Robust standard errors in parentheses are clustered at the level of treatment (district). Individual-level and household 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 6: 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. Sample is restricted to common support. WLS estimator is used for all regression. *Post* is a dummy variable indicating that the observation is from the 2002/04 round. All dependent variables are binary (1/0). The any methods refer to individuals currently using any family planning methods. Modern methods include female and male sterilization, IUD/Copper-t/Loop, oral pills, condom/*Nirodh*, and others. Traditional methods include the use of rhythm, periodic abstinence, withdrawal, and others.

Table 7: 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	0.002	-0.003	0.005
	(0.016)	(0.014)	(0.012)
MGNREGA x Post	0.014	0.014	0.0001
	(0.013)	(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	0.541	0.469	0.072
SD dependent variable	0.498	0.499	0.258
Observations	584,463	584,463	584,463
Number of districts	480	480	480
R-squared	0.235	0.240	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). Sample is restricted to common support and excludes currently pregnant women. WLS estimator is used for all regression. Individual-level and household controls are included in all regressions. See note to Table 2 for other details.

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	0.004	0.008	-0.003
	(0.016)	(0.014)	(0.010)
MGNREGA x Post	0.015	0.010	0.004
	(0.010)	(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	0.541	0.469	0.072
SD dependent variable	0.498	0.499	0.258
Observations	584,463	584,463	584,463
Number of districts	480	480	480
R-squared	0.235	0.240	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). Sample is restricted to common support and excludes currently pregnant women. WLS estimator is used for all regression. Individual-level and household controls are included in all regressions. Star states includes Andhra Pradesh, Himachal Pradesh, Madhya Pradesh, Chattisgarh, Rajasthan, Uttarakhand, and Tamil Nadu Imbert and Papp (2015). See note to Table 2 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	0.025**	0.015*	0.010
	(0.012)	(0.009)	(0.008)
Mean dependent variable	0.447	0.378	0.069
SD dependent variable	0.497	0.485	0.253
Observations	281,614	281,614	281,614
Number of districts	480	480	480
R-squared	0.242	0.251	0.107
Panel B: Medium wealth index			
MGNREGA x Post	0.007	0.007	-0.0001
	(0.008)	(0.007)	(0.005)
Mean dependent variable	0.597	0.527	0.070
SD dependent variable	0.491	0.499	0.255
Observations	203,010	203,010	203,010
Number of districts	480	480	480
R-squared	0.220	0.231	0.091
Panel C: High wealth index			
MGNREGA x Post	0.019**	0.026***	-0.008
	(0.008)	(0.009)	(0.007)
Mean dependent variable	0.665	0.583	0.082
SD dependent variable	0.472	0.493	0.274
Observations	99,760	99,760	99,760
Number of districts	479	479	479
R-squared	0.177	0.183	0.078

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). District, state-year, and interview month-year fixed effects are included in all regressions. Also, individual-level and household controls are included in all regressions. See note to Table 2 for other details.

Table 10: Effect of MGNREGA on employment situations

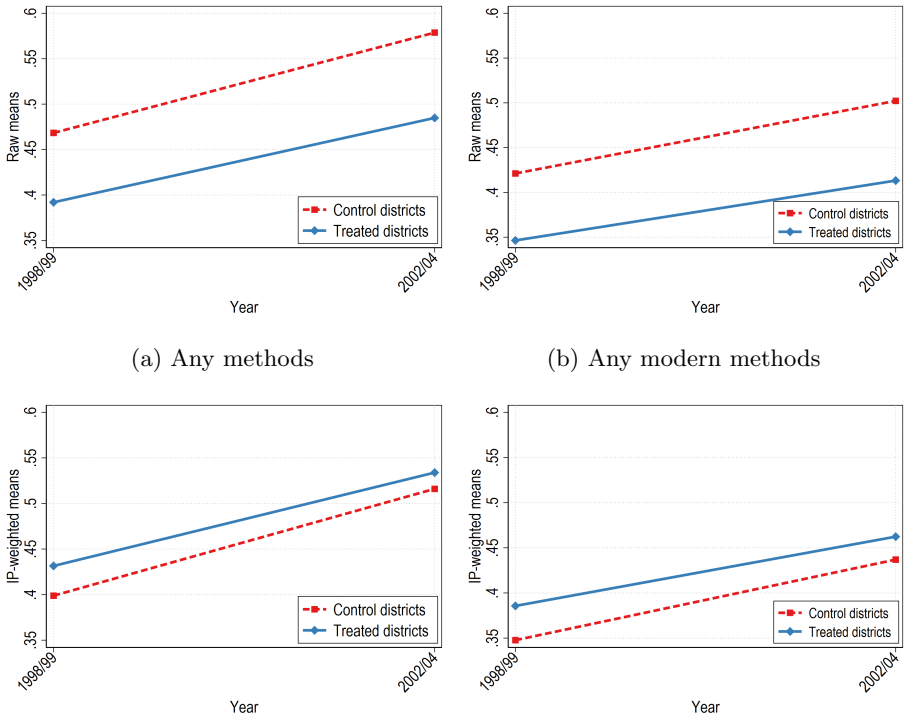
	Self-employed: Farm	Self-employed: Non-farm
MGNREGA x Post	0.002	-0.008***
	(0.006)	(0.003)
Mean dependent variable	0.113	0.053
Observations	429,147	429,147
Number of districts	483	483
R-squared	0.061	0.015

Note: Robust standard errors in parentheses are clustered at the level of treatment (district). The dependent variables are share of days spent on each occupation choice and are in log terms using IHS transformation. Non-farm includes manufacturing, construction and services. District, and state-year fixed effects are included in all regressions. The data sources for this analysis comes from the round 61 (July, 2004-June, 2005) and round 64 (July, 2007-June, 2008) of the National Sample Surveys on Employment and Unemployment Situation (NSSEUS) in India.

Table A1: Individual Summary Statistics before matching

	Treated	Control	Diff. (p-value)
Outcomes			
Any family planning methods	0.508	0.600	0.000
	(0.500)	(0.490)	
	[400,063]	[246,450]	
Any modern methods	0.437	0.524	0.000
	(0.496)	(0.499)	
	[400,063]	[246,450]	
Any traditional methods	0.071	0.075	0.543
	(0.257)	(0.264)	
	[400,063]	[246,450]	
Among women who are currently using any methods of contraceptives			
Female sterilization	0.678	0.666	0.551
	(0.467)	(0.472)	
	[203,291]	[147,758]	
Male sterilization	0.023	0.017	0.187
	(0.150)	(0.130)	
	[203,291]	[147,758]	
Intrauterine Device (IUD)	0.019	0.039	0.000
	(0.138)	(0.194)	
	[203,291]	[147,758]	
Oral pills	0.080	0.063	0.032
	(0.265)	(0.243)	
	[203,291]	[147,758]	
Condom	0.056	0.087	0.000
	(0.229)	(0.282)	
	[203,291]	[147,758]	
Rhythm/Periodic abstinence/Withdrawal	0.132	0.122	0.427
	(0.339)	(0.327)	
	[203,291]	[147,758]	
Individual-level characteristics			
Women age in years	29.934	30.627	0.000
	(7.483)	(7.308)	
	[400,062]	[246,450]	
Women can read or write	0.416	0.528	0.000
	(0.493)	(0.499)	
	[399,997]	[246,402]	
Spouse can read or write	0.673	0.763	0.000
	(0.469)	(0.425)	
	[399,340]	[246,196]	
Number of children	2.844	2.712	0.000
	(1.908)	(1.749)	
	[246,450]	[246,450]	
Religion: Hindu	0.832	0.780	0.026
	(0.374)	(0.414)	
	[246,450]	[246,450]	
Scheduled castes/tribes	0.402	0.313	0.000
	(0.490)	(0.464)	
	[400,063]	[246,449]	

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, difference, is calculated with OLS regressions and clustered standard errors at the district level. Source: DLHS round 2 (2002/04).



(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). The IP-weighted mean is restricted to common support region.

Fig. A3: Pre-program trends in the use of family planning methods

Table A2: Effect of trimming at the fifth centile on the IP-weighted estimate

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post	0.022**	0.018*	0.003
	(0.010)	(0.009)	(0.006)
District FEs	Yes	Yes	Yes
State-year FEs	Yes	Yes	Yes
Interview month-year FEs	Yes	Yes	Yes
Mean dependent variable	0.573	0.503	0.070
SD dependent variable	0.495	0.500	0.255
Observations	301,121	301,121	301,121
Number of districts	250	250	250
R-squared	0.216	0.237	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). Sample is trimmed at the fifth centile. WLS estimator is used for all regression. All dependent variables are binary (1/0). The any methods refer to individuals currently using any family planning methods, the use of any modern methods refer to the Female and male sterilization, IUD/Copper-t/Loop, Oral pills, Condom/*Nirodh*, and other, and any traditional methods refer to the use of rhythm, periodic abstinence, withdrawal, and others. Individual-level and household controls are included in all regressions.

Table A3: Robustness check: Coarsened Exact Matching method

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post	0.018**	0.012**	0.005
	(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	0.574	0.500	0.074
SD dependent variable	0.494	0.500	0.262
Observations	458,689	458,689	458,689
Number of districts	536	536	536
R-squared	0.216	0.227	0.094

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 for all regression. Individual-level and household controls are included in all regressions. The coarsened variables used were: women age, women and spouse literacy, religion, scheduled castes/tribes, the number of children, and wealth index. The matching summary includes: 229,554 matched out of 246,450 observations for control and 229,554 matched out of 400,063 for treated.

Table A4: Robustness check: Probit

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post	0.050**	0.039*	0.043
	(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	0.541	0.469	0.073
SD dependent variable	0.498	0.499	0.259
Observations	584,453	584,453	584,453
Number of districts	480	480	473

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

Table A5: Robustness check: Propensity score

	Any methods	Any modern methods	Any traditional methods
MGNREGA x Post	0.024***	0.020***	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	0.543	0.471	0.073
SD dependent variable	0.498	0.499	0.259
Observations	645,451	645,451	645,451
Number of districts	536	536	536
R-squared	0.230	0.236	0.090

Note: Robust standard errors in parentheses are clustered at the level of treatment (district). Individual-level and household controls are included in all regressions. Levels of significance: p< 0.01***, p< 0.05**.

Table A6: 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 A7: 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.

Table A8: District Summary Statistics

	Treated	Control	Diff. (p-value)
Propensity score	0.580	0.605	0.595
	(0.301)	(0.268)	
Total Population (in thousands)	1713.943	1417.4032	0.093
	(1396.652)	(1146.646)	
Percent rural	0.812	0.804	0.631
	(0.130)	(0.108)	
Area (in square km)	109.718	104.268	0.721
	(140.662)	(127.762)	
Percent Scheduled Castes	0.160	0.137	0.150
	(0.086)	(0.095)	
Percent Scheduled Tribes	0.134	0.237	0.116
	(0.203)	(0.363)	
Percent Literate	0.536	0.530	0.721
	(0.122)	(0.096)	
Average MPCE	3419.196	3468.775	0.722
	(1004.143)	(999.746)	
Average casual wage	318.261	324.980	0.692
	(128.988)	(123.083)	
Labor force participation rate	0.658	0.673	0.337
	(0.089)	(0.103)	
Female labor force participation rate	0.200	0.222	0.161
	(0.096)	(0.107)	
Rainfall (mm)	1242.854	1452.253	0.221
	(732.361)	(1137.082)	
Growing degree days	2373.358	2287.947	0.279
	(448.324)	(560.720)	
Number of observations	359,426	226,004	585,430
Number of districts	281	199	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 2004/05 prices.

Table A9: Logistic regression predicting treatment

	Treatment
Total Population	1.000***
	(0.000)
Percent rural	189.114***
	(7.889)
Area (in square km)	1.000***
	(0.000)
Percent Scheduled Castes	1910.798***
	(110.867)
Percent Scheduled Tribes	124.959***
	(2.872)
Percent Literate	0.067***
	(0.002)
Average MPCE	0.999***
	(0.000)
Average casual wage	0.995***
	(0.000)
Labor force participation rate	0.028***
	(0.002)
Female labor force participation rate	8.852***
	(0.677)
Rainfall (mm)	1.000***
	(0.000)
Growing degree days	1.000***
	(0.000)
Observations	646,513

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