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# The Impact of Conditional Cash Transfers on Early Marriage: Evidence from Mukhyamantri Kanya Utthan Yojana in Bihar

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**Abstract**

This paper evaluates the impact of Bihar's Mukhyamantri Kanya Utthan Yojana (MKUY), a conditional cash transfer scheme, on early marriage rates using repeated cross-sectional data from NFHS-4 and NFHS-5. Exploiting the staggered exposure across age cohorts and wealth groups, we employ difference-in-differences and triple-difference estimation strategies. The results indicate that among poorer households, eligibility for MKUY led to a statistically significant reduction in early marriage. A subsample analysis focusing on post-graduation cash transfers reveals a further reduction in early marriage among women aged 20–22, suggesting that the later-in-life transfers have a significant impact. Placebo tests show no false effects, which strengthens the reliability of our findings. However, potential violations of the parallel trends assumption and omitted variable bias limit definitive causal interpretation. Still, the evidence points to MKUY's potential as an effective tool to delay early marriage by aligning financial incentives with educational attainment and delayed unions.

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# 1 Introduction

Gender inequality has been a persistent issue in India, manifesting across various dimensions of women's personal, social, and economic lives. This inequality is evident in several key areas, including gender-based violence, low female labor force participation, educational disparities, child marriage and early motherhood, and inadequate access to healthcare. A significant factor contributing to this inequality is the traditional and deep-rooted belief that male children are potential income earners, especially in economically disadvantaged households. This perception often leads to disinvestment in the girl child. Among the many consequences, child marriage is particularly detrimental, as it is closely associated with reduced educational attainment, limited labor market opportunities, and increased vulnerability to gender-based violence. Moreover, child marriage reinforces other barriers to women's growth, creating a cycle of disadvantage.

Various schemes have been introduced by both central and state governments in India to address gender-based inequalities. This report focuses on evaluating one such initiative implemented by the Government of Bihar—the Mukhyamantri Kanya Utthan Yojana (MKUY), launched in April 2018. The scheme offers financial assistance to girls at multiple stages of their educational journey, from birth to graduation to families of low income group, conditional on the girl remaining unmarried. The primary objectives of MKUY are to promote female education and deter early marriages. To assess the impact of this conditional cash transfer program on child marriage, this study utilizes data from two rounds of the National Family Health Survey—NFHS-4 (2015–16) and NFHS-5 (2019–21). The provision of financial incentives tied to specific eligibility conditions, such as educational progression and marital status, may have significant implications for reducing the prevalence of early marriage among girls.

This study aims to analyze the effectiveness of the Mukhyamantri Kanya Utthan Yojana (MKUY) in reducing child marriage by utilizing large cross-sectional datasets. To address the issue of child marriage, the Government of India enacted the Child Marriage Prohibition Act in 2006, which defines child marriage as a marriage where the bride is below 18 years of age or the groom is below 21 years of age. The Act prohibits the arrangement or conduct of child marriages within the country. Despite this legal framework, child marriage remains a significant challenge, particularly among disadvantaged groups. Numerous studies have established a strong association between child marriage and limited educational opportunities, as well as high dropout rates.[1] Furthermore, evidence indicates that child marriage is more prevalent among economically poorer sections of society.[2] In light of these facts, this study seeks to

answer the following research question:
**"Does the implementation of a conditional cash transfer scheme that requires girls to remain unmarried until a specified age lead to a greater reduction in child marriage rates compared to states without such a condition?"**

# 2 Data Sources and Variables

## 2.1 Data Sources

This study utilizes NFHS-4 (2015–16) as the pre-treatment period and NFHS-5 (2019–21) as the post-treatment period. The timing of these survey rounds is critical, as NFHS-5 was conducted after the implementation of the MKUY scheme, while NFHS-4 preceded it. Due to the absence of a unique identifier to link individuals across rounds, the data do not form a panel but instead represent repeated cross-sections.

The National Family Health Survey (NFHS) includes information on age at first cohabitation, which is employed in this study as a proxy for child marriage. This measure is preferred over reported age at formal marriage, as the latter may be subject to misreporting due to the legal prohibition of early marriage in India. In many cases, formal marriage may occur at a younger age, while cohabitation is delayed.[4] Given these inconsistencies, age at first cohabitation provides a more reliable indicator of the actual onset of marital life. Specifically, the response to the survey question, "How old were you when you started living with your (first) husband/partner?", is used to identify instances of child marriage in this analysis.

The NFHS dataset provides information on the household wealth index, which classifies individuals into five income groups—poorest, poorer, middle, richer, and richest—based on a composite measure of living standards[1]. The MKUY specifically targets beneficiaries from the bottom two wealth quintiles: the poorest and poorer groups. For the purposes of this study, we define the poor as individuals belonging to these two categories, and the non-poor as those in the middle and richer groups. The richest category is excluded due to the low incidence of early marriage and a small sample size of girls under 18. In addition, the analysis incorporates a range of household- and individual-level control variables from the NFHS dataset. These controls help account for other observable factors that may influence early marriage.

[1]The wealth index is constructed using data on a household's ownership of selected assets, materials used for housing construction, and access to water and sanitation facilities.

## 2.2 MKUY Scheme

Numerous conditional cash transfer (CCT) schemes have been implemented across Indian states to incentivize the welfare and education of the girl child. These programs provide financial assistance at various stages—from birth to the completion of secondary or higher secondary education—contingent upon meeting specific eligibility criteria. However, there exists significant variation in the structure of these schemes, including differences in benefit amounts, disbursement stages, and conditions attached to the transfers. Notably, most programs do not mandate that the girl remain unmarried or enrolled in school until the age of 18 to receive benefits.

Examples of such initiatives include Ladli (Delhi, 2008), Vidhya Laxmi (Gujarat, 2003), Apni Beti Apna Dhan (Haryana, 1994), Mukhyamantri Kanya Sumangala Yojana (Uttar Pradesh, 2019), and Kanyashree Prakalpa (West Bengal, 2013). These schemes vary not only in their year of implementation but also in eligibility requirements and the scale of benefits provided. A key observation is that most programs lack stringent provisions to ensure continued education or delay marriage until adulthood (18 years), potentially limiting their long-term impact on gender equity and social outcomes.

The Government of Bihar launched the Mukhyamantri Kanya Utthaan Yojana (MKUY) in April 2018 with the twin objectives of promoting higher education among girls and preventing child marriage. A key condition of the scheme is that the girl must remain unmarried and must have passed the intermediate (Class 12) examination to receive  25,000, and the undergraduate degree to receive an additional  50,000. The scheme also offers financial incentives at earlier stages:  2,000 at birth,  600 upon admission to Class 1,  600 annually from Classes 3 to 5, and  700 per year for Classes 7 to 10. Compared to these interim benefits, the lump-sum amounts disbursed upon completion of higher education are significantly larger, signaling a strong incentive to delay marriage and continue education. Benefits are provided up to the age of 21, and the scheme specifically targets girls from economically weaker sections, regardless of caste or religion.

Madhya Pradesh is used as the control state in this analysis, as it does not provide comparable benefits under a similar scheme to the relevant cohort. Although, Madhya Pradesh introduced a similar scheme Ladli Laxmi Yojana in 2007, eligibility is restricted to girls born after 2006. Since the oldest respondents in NFHS-5 were born in 2004, the cohort under study does not qualify for the scheme's benefits, making Madhya Pradesh a suitable control group. Moreover, both Bihar and Madhya Pradesh exhibit high rates of child marriage and are undergoing comparable shifts in societal attitudes toward early marriage. These shared characteristics enhance the credibility of the comparison between the two states.

## 2.3 Variables

### 2.3.1 Outcome Variable

The outcome variable is the rate of early marriage for individual women i. This is defined using age at first cohabitation. The outcome variable is defined as follows:

$$\text{EarlyMarriage}_i = \begin{cases} 1 & \text{if Age at first cohabitation}_i < 18 \\ 0 & \text{otherwise} \end{cases}$$

Age at first cohabitation is used to define early marriage rate.[2] and respondent's current age is used to define treatment and control group. All age groups that do not form a part of control or treatment group are eliminated from the data. This is done for NFHS-4 as well as NFHS-5.

### 2.3.2 Treatment and Control Group

To evaluate the impact of the MKUY scheme we define both a treatment and a control group based on respondent's current age. Individuals aged 17–22 are classified as the treatment group, as they were eligible for and likely exposed to the scheme at the time of the NFHS-5 survey. In contrast, individuals aged 23–26 serve as the control group, as they were beyond the eligible age range when the scheme was implemented and thus remained unexposed.[3]
We compare the treatment group across two different classifications:

- Using NFHS-5 to examine differences in early marriage outcomes between poor and non-poor individuals
- Using NFHS-4 to capture pre-trend effects and NFHS-5 for post-trend effects, focusing on individuals in the bottom two wealth index groups
- A pre- and post-trend analysis using NFHS-4 and NFHS-5 data for the treatment state, Bihar, and a control state, Madhya Pradesh.

[2]For age group 17 actual percentage of child marriage is taken into account due a high number of missing variables

[3]During MKUY's rollout in 2018, the treatment group (17–22) was aged 16–21, and the control group (23–26) was 22–25. Benefits were disbursed in October 2018, and the NFHS-5 women's survey (IR) was conducted in 2019, so beneficiaries had received the scheme benefits by the time of the survey

It is important to account for the fact that older age cohorts in the control group are naturally more likely to be married than younger cohorts in the treatment group. To address this issue, the analysis focuses specifically on the probability of child marriage—defined as being married before the age of 18—rather than the overall probability of being married. By doing so, the study compares the percentage of girls married before age 18 in cohorts before the MKUY scheme (control group) with those after the scheme's implementation (treatment group).
This approach ensures a more valid comparison across age cohorts and isolates the potential impact of the policy on early marriage.

### 2.3.3 Independent Variables and Controls

The independent variables include dummy variables for time and group fixed effects. The differential effect of the scheme is captured by the interaction term, which represents the treatment effect under the difference-in-differences framework. In addition, the model includes control variables to account for observable characteristics that may influence the likelihood of child marriage.
The other variables included in the analysis serve as covariates (as shown in table 1) to isolate the effect of observable characteristics on the outcome variable. For instance, a longer duration of residence in a particular place may indicate greater stability, reducing the likelihood of early marriage. Girls living in rural areas are more likely to be married early than their urban counterparts. Evidence also suggests that girls exposed to domestic violence are at higher risk of early marriage.[3] Additionally, numerous studies have documented a strong negative relationship between educational attainment and child marriage, making it essential to control for the highest level of education achieved.[4] Religious affiliation is included as it often correlates with cultural and social norms that influence marriage practices. Larger households may face greater financial pressure, potentially incentivizing families to marry off daughters early. Finally, non-biological children may be at greater risk of early marriage.

# 3 Descriptive Statistics and Observations

Table 1 presents descriptive statistics for key variables. To address potential biases stemming from observed heterogeneity, a suite of individual and household-level control variables are included. The analysis employs three distinct panels: Panel A utilizes NFHS 5 data for Bihar, accounting for variations across wealth groups; Panel B incorporates data from NFHS 4 and 5 for Bihar, examining temporal differences;

Table 1: Descriptive Statistics by Estimation Strategy

| Variable | Obs | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| **Panel A. Age × Wealth** | | | | | |
| early_marriage | 14,875 | 0.3562 | 0.4789 | 0 | 1 |
| Age at first cohabitation | 9,851 | 17.3686 | 2.3049 | 12 | 26 |
| Respondent's current age | 14,875 | 21.1434 | 2.8991 | 17 | 26 |
| Years lived in place of residence dummy | 14,875 | 10.0452 | 7.6658 | 0 | 26 |
| Rural/Urban dummy | 14,875 | 1.9085 | 0.2883 | 1 | 2 |
| Selected for domestic violence module dummy | 14,875 | 1.6551 | 1.4307 | 0 | 3 |
| Highest educational level dummy | 14,875 | 1.5439 | 0.9471 | 0 | 3 |
| Religion dummy | 14,875 | 1.1600 | 0.3744 | 1 | 5 |
| No. of household members (listed) | 14,875 | 6.1644 | 2.7898 | 1 | 23 |
| Relationship to household head dummy | 14,875 | 3.3518 | 1.9586 | 1 | 16 |
| **Panel B. Age × Year** | | | | | |
| early_marriage | 19,786 | 0.3326 | 0.4712 | 0 | 1 |
| Age at first cohabitation | 13,424 | 17.4278 | 2.8819 | 0 | 26 |
| Respondent's current age | 19,786 | 21.3826 | 2.9051 | 17 | 26 |
| Years lived in place of residence dummy | 19,786 | 9.4783 | 7.6653 | 0 | 26 |
| Rural/Urban dummy | 19,786 | 1.8893 | 0.3138 | 1 | 2 |
| Selected for domestic violence module dummy | 19,786 | 0.3507 | 0.8595 | 0 | 3 |
| Highest educational level dummy | 19,786 | 1.4273 | 1.0280 | 0 | 3 |
| Religion dummy | 19,786 | 1.1551 | 0.3858 | 1 | 8 |
| No. of household members (listed) | 19,786 | 6.4087 | 3.0823 | 1 | 40 |
| Relationship to household head dummy | 19,786 | 3.5600 | 2.3043 | 1 | 17 |
| **Panel C. Triple Difference** | | | | | |
| early_marriage | 28,951 | 0.2933 | 0.4553 | 0 | 1 |
| Age at first cohabitation | 20,686 | 17.3205 | 2.7860 | 0 | 25 |
| Respondent's current age | 28,951 | 20.4551 | 2.9452 | 16 | 25 |
| Years lived in place of residence dummy | 28,951 | 10.0406 | 7.6430 | 0 | 26 |
| Rural/Urban dummy | 28,951 | 1.8337 | 0.3724 | 1 | 2 |
| Selected for domestic violence module dummy | 28,951 | 0.3829 | 0.9079 | 0 | 3 |
| Highest educational level dummy | 28,951 | 1.5643 | 0.9046 | 0 | 3 |
| Religion dummy | 28,951 | 1.1540 | 0.4071 | 1 | 8 |
| No. of household members (listed) | 28,951 | 6.2143 | 2.8471 | 1 | 40 |
| Relationship to household head dummy | 28,951 | 3.6017 | 2.2815 | 1 | 17 |

*Note:* The descriptive statistics in this table are generated using data from the fourth and fifth rounds of the National Family Health Survey (NFHS-4 and NFHS-5).

and Panel C appends data from both Bihar and Madhya Pradesh to facilitate a triple difference analysis.
The independent variable age at first cohabitation is used to define early marriage. The respondent's current age is used to classify individuals into the treatment group (ages 17–22) and the control group (ages 23–26). Individuals outside these age ranges are excluded from the analysis.
Across these estimation strategies, the mean incidence of early marriage ranges from 29.3% to 35.6%, underscoring the continued prevalence of this practice within the study population. The average age at first cohabitation is approximately 17 years, suggesting that marriage frequently occurs shortly thereafter. Respondents' mean age is around 21 years. Control variables encompass critical socio-economic dimensions: household wealth, educational attainment, religious affiliation, and exposure to domestic violence. These factors are essential for understanding the multifaceted determinants of child marriage in the specified context. Subsequent analyses will explore the relationships between these variables and early marriage employing appropriate regression techniques.

# 4 Empirical Model

The objective of this paper is to examine the differential impact of the MKUY scheme on child marriage rates. The first specification leverages the fact that within Bihar, only girls from households in the lower wealth index categories are eligible to receive benefits under the scheme, and this eligibility applies to specific age cohorts. To estimate the scheme's impact on child marriage among these lower-income households, a difference-in-differences (DiD) approach is employed. This method effectively functions as a fixed effects estimator in repeated cross sectional setting. The DiD specification is estimated using the following equation:

$$y_{ihw} = \beta_0 + \beta_1(t \times \text{wealth}) + \beta_2 t + \beta_3 \text{wealth} + X_{ihw} + \epsilon_{ihw} \tag{1}$$

where,
$y$ denote the rate of child marriage for individual i, residing in household $h$, with wealth level $w$.
The variable t takes the value 1 if the woman belongs to the treated age group (17–22), and 0 if she belongs to the control age group (23–26).
The variable wealth equals 1 if the woman falls within the "poorest" or "poorer" wealth index categories, and 0 otherwise.
The vector X includes individual- and household-level control variables.

The model aligns with DD framework discussed by Angrist and Pischke.[5] The coefficient of the interaction term $\beta_1$ is the main coefficient of interest capturing the effect of policy. $\beta_1$ captures the additional effect of being in the treated age group for individuals from poorer households, above and beyond the separate effects of being treated. It indicates whether the policy impact differs between poorer and non-poor individuals. Lastly, the coefficient shows the change in probability in percent.
The second empirical specification leverages NFHS-4 data to capture pre-trend effects and NFHS-5 data to capture post-trend effects. This allows for a comparison of outcomes among poorer groups before and after the implementation of the policy. The treatment and control groups remains the same across both specifications. The equation for the second empirical specification is given below:

$$y_{iht} = \beta_0 + \beta_1(t \times \text{year}) + \beta_2 t + \beta_3 \text{year} + X_{iht} + \epsilon_{iht} \tag{2}$$

where all the variables are the same as the first specification except year which takes value 0 for NFHS-4 data and 1 for NFHS-5 data. The coefficient of interest is $\beta_1$.
There is a good chance that DD analysis is not valid since parallel trends assumption might be violated. There is a chance that certain unobserved factors like broader trends affect the DD estimate.
Thus, we run a DDD regression to get rid of broader trends in data. We leverage the fact that for the people surveyed in NFHS-5, MP did not have a scheme like Bihar. We run a triple DDD regression to obtain the effect of MKUY scheme on treated groups using NFHS-4 and NFHS-5 data set. Both the states have high rates of child marriage and similar social characteristics. The triple DDD specification is:

$$\begin{aligned} y_{iht} = \beta_0 &+ \beta_1(t_{iht} \times \text{Year}_{iht} \times \text{Bihar}_{iht}) + \beta_2(t_{iht} \times \text{Year}_{iht}) + \beta_3(t_{iht} \times \text{Bihar}_{iht}) \\ &+ \beta_4(\text{Bihar}_{iht} \times \text{Year}_{iht}) + \beta_5 t_{iht} + \beta_6 \text{Year}_{iht} + \beta_7 \text{Bihar}_{iht} + X_{iht} + \epsilon_{iht} \end{aligned} \tag{3}$$

where, Bihar takes value 1 for the treatment state bihar and 0 for the control state MP. All the other variables are as same as defined previously.
The tables 2 and 3 below show the effect of DD and DDD equations, respectively. The two tables clearly show how the main coefficient of interest determined.

Table 2: Difference-in-Difference

| | Treatment Group | Control Group | Difference |
|---|---|---|---|
| Pre-Policy | $\beta_0 + \beta_2$ | $\beta_0$ | $\beta_2$ |
| Post-Policy | $\beta_0 + \beta_1 + \beta_2 + \beta_3$ | $\beta_0 + \beta_3$ | $\beta_1 + \beta_2$ |
| Difference | $\beta_1 + \beta_3$ | $\beta_3$ | $\boldsymbol{\beta_1}$ |

Table 3: Difference-in-Difference-in-Difference

| | Treatment state | Control state | Diff |
|---|---|---|---|
| *Year = 0* | | | |
| t = 0 | $\beta_0$ | $\beta_0 + \beta_7$ | $\beta_7$ |
| t = 1 | $\beta_0 + \beta_3 + \beta_5 + \beta_7$ | $\beta_0 + \beta_5$ | $\beta_3 + \beta_7$ |
| *Year = 1* | | | |
| t = 0 | $\beta_0 + \beta_6$ | $\beta_0 + \beta_4 + \beta_6 + \beta_7$ | $\beta_4 + \beta_7$ |
| t = 1 | $\beta_0 + \beta_2 + \beta_5 + \beta_6$ | $\beta_1 + ... + \beta_7$ | $\beta_1 + \beta_3$ |
| *DD* | | | |
| t=0 | $\beta_6$ | $\beta_4 + \beta_6$ | $\beta_4$ |
| t=1 | $\beta_2 + \beta_6$ | $\beta_1 + \beta_2 + \beta_4 + \beta_6$ | $\beta_1 + \beta_4$ |
| DDD | $\beta_2$ | $\beta_1 + \beta_2$ | $\beta_1$ |

# 5 Results

This section reports the results of the three specification mentioned earlier.
Table 4 reports the results of DD regression using equation (1). The coefficient of the interaction term captures the differential effect of the policy on girls from poorer households relative to wealthier ones. Column (1) reports the results without any controls but the regression is implemented with robust standard errors clustered at Primary Sampling Units (PSU) accounting for within cluster correlation. In column (1), the coefficient of interaction term is statistically insignificant. This suggests no clear differential effect of the treatment on early marriage for poorer households
Column (2) adds individual and household levels controls. After adding covariates, the coefficient of the interaction term becomes statistically significant. The coefficient on the interaction term in Column (2) indicates that girls from poorer households experienced an 8.1 percentage point greater reduction in early marriage compared to girls from wealthier households, following the implementation of the MKUY scheme. However, the results are subject to satisfying parallel trends.

Table 4: Difference-in-differences (DiD) Estimate of the Impact of the MKUY (Bihar) on Early Marriage

| | (1) | (2) |
|---|---|---|
| VARIABLES | Early Marriage | Early Marriage |
| $t$ (Treat) | -0.170*** | 0.278*** |
| | (0.015) | (0.015) |
| $w$ (Post) | 0.168*** | -0.004 |
| | (0.016) | (0.013) |
| $t \times w$ (DiD) | -0.003 | 0.081*** |
| | (0.018) | (0.015) |
| Constant | 0.349*** | 0.166*** |
| | (0.013) | (0.030) |
| Individual Controls | No | Yes |
| Household Controls | No | Yes |
| Clustered SE (PSU level) | Yes | Yes |
| Observations | 14,875 | 14,875 |
| R-squared | 0.055 | 0.393 |

**Notes:** Column (1) reports basic DiD estimates. Column (2) controls for individual-level variables (e.g., age, education, religion, caste) and household characteristics (e.g., household size, relationship to head). Robust standard errors are clustered at the PSU level (v001) and shown in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The treated group includes eligible girls under the Mukhyamantri Kanya Utthaan Yojana in Bihar.

Table 5 reports the results of DD regression using equation (2). The key coefficient of interest is the interaction term, which captures the differential change in early marriage among treated girls in the post-reform period. In Column (1), which includes no controls, the interaction coefficient is statistically insignificant. After adding individual and household level controls, column (2) shows that the coefficient is statistically significant. This implies that MKUY reduced the probability of early marriage among eligible girls by 5.8 percentage points relative to non-eligible girls after the reform. The negative and significant effect of year in both columns reflects a general decline in early marriage over time for the entire sample. Notably, the treatment dummy (for table 4 and 5) switches from negative to positive. Once individual and household characteristics are controlled for, younger girls (17–22) are shown to have had a higher likelihood of early marriage compared to their older counterparts, aligning with demographic expectations.

Table 5: Difference-in-Differences Estimates of the Impact of the MKUY on Early Marriage

| | (1) | (2) |
|---|---|---|
| VARIABLES | Early Marriage | Early Marriage |
| $t$ (Treatment) | -0.117*** | 0.287*** |
| | (0.008) | (0.010) |
| *year* (Post-reform) | -0.258*** | -0.055*** |
| | (0.014) | (0.013) |
| $t \times year$ (DiD term) | -0.016 | -0.058*** |
| | (0.015) | (0.014) |
| Constant | 0.452*** | 0.235*** |
| | (0.007) | (0.022) |
| Individual Controls | No | Yes |
| Household Controls | No | Yes |
| Clustered SE (PSU level) | Yes | Yes |
| Observations | 19,786 | 19,786 |
| R-squared | 0.0616 | 0.3546 |

**Notes:** Column (1) presents a basic DiD model estimating the effect of the Mukhyamantri Kanya Utthaan Yojana using treatment status, year, and their interaction. Column (2) includes additional individual and household-level controls such as education level, residence, interview privacy, religion, caste, and relationship to household head. Robust standard errors are clustered at the PSU level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6 presents the results of the difference-in-differences regression based on Equation (3). The triple interaction term (Treatment × Year × Bihar) captures the effect of the MKUY policy on early marriage rates among eligible girls aged 17–22 in Bihar. The negative and statistically significant coefficient suggests that the policy led to an 8.1% reduction in early marriage for this group. The coefficient on Treatment × Year indicates that, overall, younger girls experienced an increase in early marriage after the policy period. The positive and significant coefficient on Treatment × Bihar suggests that, even before the policy, younger girls in Bihar had higher rates of early marriage compared to those in MP. The negative Bihar × Year coefficient points to a general decline in early marriage rates in Bihar over time, regardless of the policy. These effects remain statistically significant, though slightly smaller in magnitude, after accounting for individual and household characteristics.

Table 6: Triple Difference Estimates of the Impact of MKUY on Early Marriage

| VARIABLES | (1) No Controls Early Marriage | (2) With Controls Early Marriage |
|---|---|---|
| Triple Interaction (t × year × Bihar) | -0.110*** | -0.081*** |
| | (0.031) | (0.025) |
| Treatment × Year (t × year) | 0.067*** | 0.067*** |
| | (0.018) | (0.015) |
| Treatment × Bihar (t × Bihar) | 0.079*** | 0.072*** |
| | (0.014) | (0.011) |
| Bihar × Year | -0.317*** | -0.149*** |
| | (0.027) | (0.022) |
| Treatment Group Indicator (t) | -0.193*** | 0.257*** |
| | (0.009) | (0.009) |
| Post-Policy Year Indicator (year) | 0.050*** | 0.063*** |
| | (0.015) | (0.014) |
| Bihar Indicator | 0.007 | -0.008 |
| | (0.011) | (0.009) |
| Constant | 0.489*** | 0.244*** |
| | (0.008) | (0.022) |
| Individual Controls | No | Yes |
| Household Controls | No | Yes |
| Clustered SE (PSU level) | Yes | Yes |
| Observations | 28,951 | 28,951 |
| R-squared | 0.0426 | 0.3589 |

**Notes:** This table reports estimates from a difference-in-difference-in-differences (DDD) model evaluating the effect of the Mukhyamantri Kanya Utthaan Yojana (MKUY) on early marriage. The dependent variable is an indicator equal to one if the woman was married early. Column (1) includes no additional controls. Column (2) includes controls for individual (v104, v025, v044, v106, v130) and household characteristics (v136, v150). Standard errors are clustered at the PSU level (v001). Robust standard errors are in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

While the regression results suggest an association between the MKUY scheme and reduced early marriage rates, these estimates should be interpreted with caution. First, the dataset lacks information on whether an individual girl actually received MKUY benefits. As a result, treatment is assigned based on eligibility criteria rather than actual exposure to the scheme, which introduces measurement error and may lead to attenuation bias. Additionally, other time-varying factors—such as 'shifting

social attitudes toward girls' education and empowerment'—may coincide with the policy period and independently reduce early marriage rates, thus confounding the estimated impact of the scheme. Second, the use of repeated cross-sectional data limits our ability to control for unobserved, time-invariant factors at household level—such as cultural norms—that may systematically influence early marriage practices. These unmeasured variables can bias the results if they are correlated with both the treatment assignment and the outcome.

# 6 Parallel Trend Assumptions

*The first thing to realize about parallel universes . . . is that they are not parallel.* DiD punt on comparisons in levels, while requiring the counterfactual trend behavior of treatment and control groups to be the same.[4] It has been widely used in studies assessing the impact of policy interventions on labour market outcomes (Wolfers, 2003) and educational outcomes (Muralidharan and Prakash, 2017).
While we do not formally test for the parallel trends assumption, we include graphical evidence that visually supports the plausibility of this assumption.

## 6.1 Poor v/s Non-Poor

A key identifying assumption in a DD framework is that the trends would have been parallel between treatment and control groups, pre-intervention. However, visual inspection reveals a noticeable decline in early marriage among the poor aged 17–22 compared to the older poor group (23–26), and because these pre-trends are not parallel (Figure 1 (a)). As such, it is difficult to attribute the decline with certainty to the MKUY policy alone, which as discussed in Angrist and Pischke (2008), one approach to assessing the credibility of the parallel trends assumption is to examine pre-treatment trends graphically. The graph does not clearly confirm whether the trends remained parallel during the treatment period (23-26). There appears to be a faster decline in early marriage rates among the non-poor which may indicate a potential violation of the parallel trends assumption.

[4]As noted by Angrist and Pischke (2008), the validity of DD estimates hinges critically on the assumption that treatment and control groups would have followed similar trends in the absence of the intervention.

## 6.2 Bihar v/s Madhya Pradesh

In a triple difference (DDD) estimation strategy, the central identifying assumption is that, in the absence of the intervention—here, the Mukhyamantri Kanya Utthan Yojana (MKUY)—the differential trends in outcomes across treated and control groups would have remained constant over time. We assess the plausibility of this assumption by examining pre-treatment trends using NFHS-4 data. Specifically, we compare the age-wise early marriage rates between Bihar (treated state) and Madhya Pradesh (control state), across cohorts aged 16 to 26. The trajectories of early marriage exhibit similar shapes and slopes over age in both states and it increases steadily, and visual inspection suggests an absence of major differential trends between the ages (Figure 2 (b)). However, slight differences in the slope during the treatment window (ages 17–22) suggest that caution is warranted, and robustness checks are used to address this concern.


(a) Marriage rates by poverty status

(b) Marriage rates by state and age

Figure 1: **Parallel Trend Tests for Difference-in-Differences**

# 7 Robustness

## 7.1 Heterogeneity

Does the graduation transfer (of Rs 50000) under MKUY increase the likelihood of early marriage (before age 18)?

To further explore the nuanced effects of the MKUY and investigate whether the graduation benefits explain delayed early marriage, we examined whether this incen-

tive might inadvertently increase the likelihood of early marriage. To do so, we used the our third specification and changed the control and treatment groups.

Table 7: Heterogeneity in Age group

| | (1) | (2) |
|---|---|---|
| VARIABLES | Early Marriage | Early Marriage |
| Triple Interaction ($Triple$) | -0.115*** | -0.082*** |
| | (0.036) | (0.030) |
| Treatment × Year ($txyear$) | 0.034 | 0.049*** |
| | (0.022) | (0.017) |
| Treatment × Bihar ($txbihar$) | 0.049*** | 0.044*** |
| | (0.016) | (0.013) |
| Bihar × Year ($biharxyear$) | -0.317*** | -0.113*** |
| | (0.027) | (0.022) |
| Treatment Dummy ($t$) | -0.096*** | 0.264*** |
| | (0.011) | (0.010) |
| Year Dummy ($year$) | 0.050*** | 0.036** |
| | (0.015) | (0.015) |
| Bihar Dummy ($bihar$) | 0.007 | -0.015 |
| | (0.011) | (0.009) |
| Constant | 0.489*** | 0.201*** |
| | (0.008) | (0.024) |
| Individual Controls | No | Yes |
| Household Controls | No | Yes |
| Clustered SE (PSU level) | Yes | Yes |
| Observations | 19,889 | 19,889 |
| R-squared | 0.024 | 0.367 |

**Notes:** The table reports coefficients from a Triple Difference (DDD) regression estimating the impact of the Mukhyamantri Kanya Utthaan Yojana on early marriage. Standard errors are clustered at the PSU level and reported in parentheses. Column (1) includes no controls, while Column (2) includes individual and household level controls such as education, caste, religion, and household relationship indicators. Statistical significance is denoted by *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

### 7.1.1 Data and Subsample and Empirical Strategy

We restricted our sample to women aged 20–26 years, categorizing them into a treatment group (20–22 years) and a control group (23–26 years). This age range ensures

that both groups are post-school-age, enabling us to isolate the effect of the 50,000 transfer from the school-based components of the MKUY. Critically, the younger cohort is more likely to be directly influenced by the incentive's timing. We employ the same triple difference (DDD) identification strategy as in our main specification, where the treatment dummy is redefined.

### 7.1.2 Mechanisms

The heterogeneity in this analysis stems from the age-specific targeting of the Rs. 50,000 transfer. This effect is theoretically distinct from the school-based incentives due to: (1) the more selective nature of graduation, suggesting differing constraints and motivations for beneficiaries; (2) the potentially altered interaction between conditionality on remaining unmarried and household dynamics at older ages; and (3) the close alignment of the benefit's timing with traditional marriageable age norms in Bihar. This positions the 20–22 age group to respond uniquely to the incentive.

### 7.1.3 Results

Table 7 reports the results of DDD regression on subgroup. The results do not show much difference than main specification results in table 6. Specifically, the coefficient on the triple interaction is negative and statistically significant in both specifications; with controls(-0.115, $p < 0.01$) and without controls (-0.082, $p < 0.01$).
This suggests that the introduction of the additional 50,000 transfer reduces the incidence of early marriage among women aged 20–22 relative to older women in the control group (23–26) and relative to the same group in Madhya Pradesh (the control state). The similarity between main specification and heterogeneity test may reflect similar influence of MKUY scheme across different segments of the population. It should be noted that we are not capturing varied heterogenous effects with out chosen specification.

## 7.2 Robustness test

We try to check whether selecting a different treatment group provide similar results or not. To assess the robustness of our findings, we conducted a placebo test by creating a false treatment group to test for the reliability of our results.

Table 8: Placebo Test: Effect of Triple DiD Variables on Early Marriage in Pre-Treatment Period

| | (1) | (2) |
|---|---|---|
| VARIABLES | Early Marriage | Early Marriage |
| Triple Interaction (Placebo) | -0.038 | -0.061 |
| | (0.059) | (0.046) |
| Treatment × Year (Placebo) | 0.097*** | 0.094*** |
| | (0.034) | (0.025) |
| Treatment × Bihar (Placebo) | -0.010 | 0.008 |
| | (0.026) | (0.019) |
| Bihar × Year (Placebo) | -0.332*** | -0.060** |
| | (0.034) | (0.025) |
| Treatment Dummy | -0.070*** | 0.133*** |
| | (0.018) | (0.014) |
| Year Dummy | 0.025 | -0.002 |
| | (0.019) | (0.020) |
| Bihar Dummy | 0.018 | -0.011 |
| | (0.015) | (0.011) |
| Constant | 0.494*** | 0.298*** |
| | (0.011) | (0.035) |
| Individual Controls | No | Yes |
| Household Controls | No | Yes |
| Clustered SE (PSU level) | Yes | Yes |
| Observations | 8,774 | 8,774 |
| R-squared | 0.018 | 0.467 |

**Notes:** The dependent variable is a binary indicator for early marriage. Column (1) shows the baseline regression without controls; Column (2) includes controls for education, place of residence, religion, caste, household wealth, years lived, and relationship to household head. Standard errors are clustered at the PSU level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

We assigned individuals aged 23 to the treatment group and those aged 24-26 to the control group, restricting the sample to individuals aged 23-26. Because these age groups were not eligible for the MKUY scheme during the study period, any significant impact observed in this placebo test would suggest potential biases in our primary estimates. If our main identification strategy is valid, the triple interaction term in this placebo setting should be statistically insignificant.

Table 8 presents the results of the placebo test. Notably, the coefficient on the Triple Interaction term is statistically insignificant in both the baseline regression and the regression with controls. There was no significant impact of the MKUY program on child marriage when the false treatment group is considered. Thus, we are confident that the estimates presented in table 6 can be interpreted as the causal impact of being exposed to the MKUY program. So robustness test provides some reassurance that our main results are not driven by spurious correlations or pre-existing trends unrelated to the MKUY scheme.

# 8 Limitations

While this study employs a robust triple-difference methodology to assess the impact of the Mukhyamantri Kanya Utthan Yojana (MKUY) on early marriage, several limitations warrant consideration regarding the causality of the findings.

## 8.1 Parallel Trend Assumption

First, the parallel trends assumption, crucial for the validity of the difference-in-differences (DiD) and triple-difference-in-differences approaches, may not be fully satisfied. While the parallel trend test for child marriage indicated no reason to reject the null hypothesis, however, this assumption is less likely to be met concerning the wealth index. This raises concerns that pre-existing differences in economic status between the treatment and control groups could influence the results, potentially biasing the estimated impact of the MKUY scheme. As Wooldridge (2009) note, a key challenge in program evaluation is ensuring that the treatment and control groups are comparable.

## 8.2 Generally Declining Child Marriage Rate

Second, the study acknowledges that India's child marriage rates have been generally declining. This broader societal trend makes it challenging to isolate the specific contribution of the MKUY scheme from other concurrent interventions or underlying societal shifts. The analysis may not fully capture or differentiate the influence of these wider societal changes from the specific effects of the scheme. Serial correlation in the error terms can also lead to underestimated standard errors in DiD models, potentially overstating the statistical significance of the findings.

## 8.3 Omitted Variable Bias

Finally, omitted variable bias poses a significant threat to the causal interpretation of the results. While the analysis controls for various individual and household-level characteristics, it is possible that unobserved factors also influence child marriage rates. Other key determinants include the dowry system, gender inequality, poverty, weak enforcement of laws, and the perceived low value of girls. The dowry system, for instance, can incentivize parents to prohibit daughters from higher education to avoid dowry payments, potentially counteracting the MKUY's goals. The influence of these unobserved factors could confound the estimated impact of the MKUY scheme, leading to an over- or underestimation of its true effect. This underscores the importance of carefully examining pre-treatment trends and considering potential confounding factors.

Due to the absence of a unique identifier to link individuals across rounds, the data do not form a panel but instead represent repeated cross-sections. Consequently, our analysis is limited in its ability to address the potential influence of unobserved or unobservable factors that may confound the relationship between the MKUY scheme and early marriage.

## 8.4 Further Scope for Study

Several avenues exist for future research to address the limitations outlined above and provide a more comprehensive understanding of the MKUY's impact. First, while this study relies on a robust DDD framework, future research should seek to obtain or construct panel data to control for time-invariant unobserved heterogeneity at the individual level. Panel data would allow to include individual fixed effects, providing a more rigorous assessment of the program's effect.

Second, future studies could explore the impact of the MKUY on a wider range of outcomes, such as female labor force participation, fertility rates, and women's empowerment. This would provide a more holistic view of the program's effects. Finally, more qualitative research would help add context to this topic, as it would be beneficial to collect more robust data on key determinants of child marriage.

# 9 Conclusion

This study set out to examine whether conditional cash transfers, specifically the Mukhyamantri Kanya Utthan Yojana (MKUY) in Bihar, can effectively delay early marriage among girls. Leveraging nationally representative data from NFHS-4 and

NFHS-5, and employing difference-in-differences as well as triple-difference estimation strategies, the analysis finds evidence that MKUY is associated with a statistically significant decline in early marriage among the targeted age group and wealth segments. The most compelling support comes from the triple-difference estimates, which suggest that girls aged 17–22 in poorer households in Bihar experienced an 8.1 percentage point lower likelihood of early marriage relative to comparable groups in Madhya Pradesh.

Yet, the interpretation of these findings warrants caution. While parallel trends hold more convincingly across state-age dimensions than across wealth groups (i.e. parallel trend assumption is not met), broader social changes may confound the scheme's measured effect. These limitations, together with the reliance on repeated cross-sections, imply that the results should be interpreted as associations rather than definitive causal effects.

Importantly, this paper demonstrates that economic incentives aligned with educational attainment can serve as effective deterrents to early marriage. The MKUY, by conditioning substantial benefits on remaining unmarried until after graduation, appears to have shifted household behavior—especially among cohorts positioned at the threshold of marriageable age. The heterogeneity analysis suggests there appears to be a similar influence of MKUY scheme across different the treatment group.

Beyond its quantitative findings, this study reinforces the notion that effective policies must account for the complex interplay between poverty, education, and social norms. While MKUY shows promise as a conditional cash transfer, future research should use long-term data and more detailed information to better understand how and why it works. In the end, this study is a small but necessary step toward understanding how financial incentives can reshape social outcomes. After all, as Steven Levitt reminds us, *Incentives are the cornerstone of modern life.*

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