# Impact of Early Childhood School Intervention on Enrollment and Learning Outcomes:

## Evaluation of a Public Program in India

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# Introduction

- Why is 'Early Childhood Education' (ECE) important?

I.  Foundations for learning are laid in the early years of life, during infancy.

II.  Better learning outcomes (Berlinski et al., 2009 ), and Improved health outcomes (Elango et al., 2015).

III.  Dynamic complementarity: Children who benefit from early human capital investments may benefit more from later investments (Cunha and Heckman, 2007)

IV.  Facilitates the process of socialization and self-control necessary to make the most of classroom learning (Currie, 2001).

V.  More equitable educational outcomes for marginalized groups (Berlinski et al., 2008).

# Motivation and Research Gap

- About 50% of children in the pre-primary age group (children between 3 and 6 years) are deprived of pre-primary education globally. In low-income countries, only one in every five children has access to pre-primary education (UNICEF 2019).

- Evidence comes from high-dosage, holistic ECE programs in developed countries.

- The analysis of an ECE intervention in a low and middle-income context is essential as a high proportion of the world's children reside in these countries.

- Relevant for India: ECE programs are not available to millions of young children, particularly children from socio-economically disadvantaged backgrounds.

- National Education Policy (NEP) 2020.

# Contribution of This Study

- Evidence from a lower-middle income developing country setting, which is substantially different from high-income countries.

- Some of the existing pieces of evidence are based on randomized-control trials having small sample sizes that would not permit generalizations (Heckman, 2011). The present study uses DISE (District Information System for Education) and ASER (Annual Status for Education Report) data which are nationally representative databases with large sample sizes.

- Targeted population: Question of generalizability (Baker, 2011). Here, the program in question has a free and universal rollout aimed at the general population.

- The first study to causally evaluate a specific early childhood government intervention in the context of India and suggest appropriate policy reforms.

# Program Description

- The government of West Bengal (WB) introduced a free one-year pre-primary education in government schools in the academic session of 2013.

- A child aged between 5 and 6 years on the first day of the academic session (i.e., on the 1st of January 2013) would be eligible to take admission in the pre-primary section.

- Before 2013, children aged five, could get admission in grade 1. However, starting in 2013, only six-year-old students could enroll in grade 1 of the government schools.

- If, due to the unavailability of space, schools cannot accommodate them in a separate classroom, they could sit with grade 1 students.

- The pre-primary students are also entitled to receive benefits under the mid-day meal scheme.

# Data

- For Learning outcomes: Annual Status of Education Report (ASER) from 2009 to 2018. A yearly survey that covers a random sample of about 20–30 households from each of the 20 villages selected from each of about 550 rural districts of India.

- From each household surveyed in ASER, all children in the age group 3 to 16 are also surveyed, and the learning outcomes of children in the age group 5 to 16 are assessed. Test score data comprises of four levels.

- For enrollment: District Information System for Education (DISE) database from 2009 to 2017. DISE dataset gathers detailed information on different school-level characteristics ranging from school infrastructure, facilities, enrollment, and teachers for all the districts.

# Figure 1: Enrollment Trends

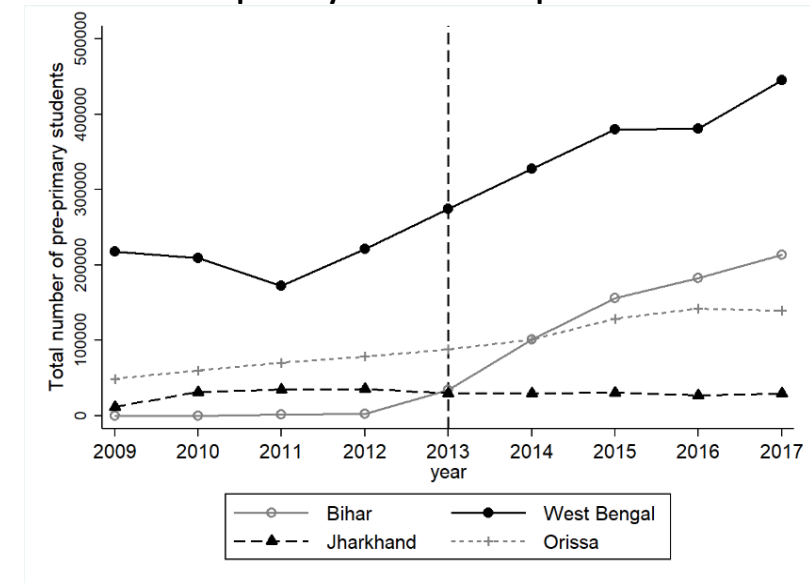**Panel A: Availability of pre-primary in government schools**
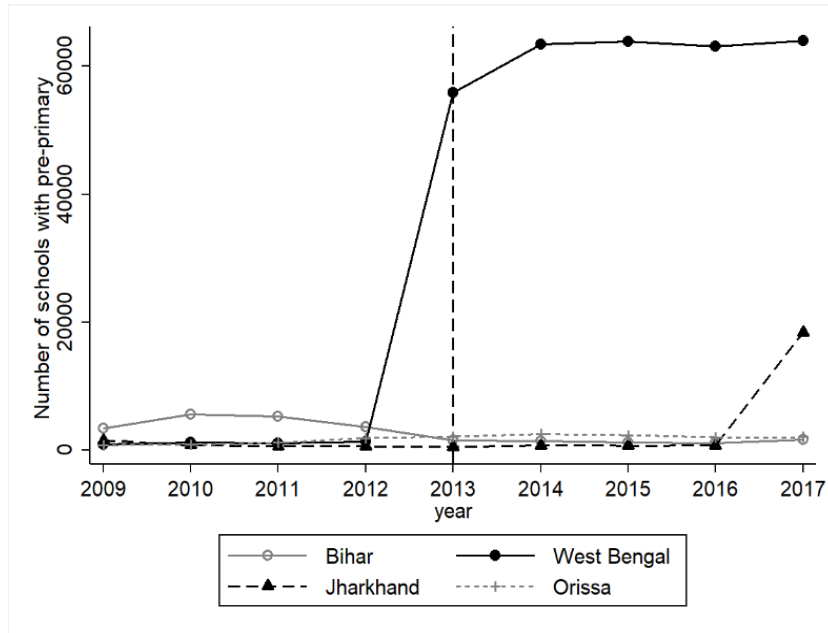


**Panel B: Pre-primary enrollment in government schools**
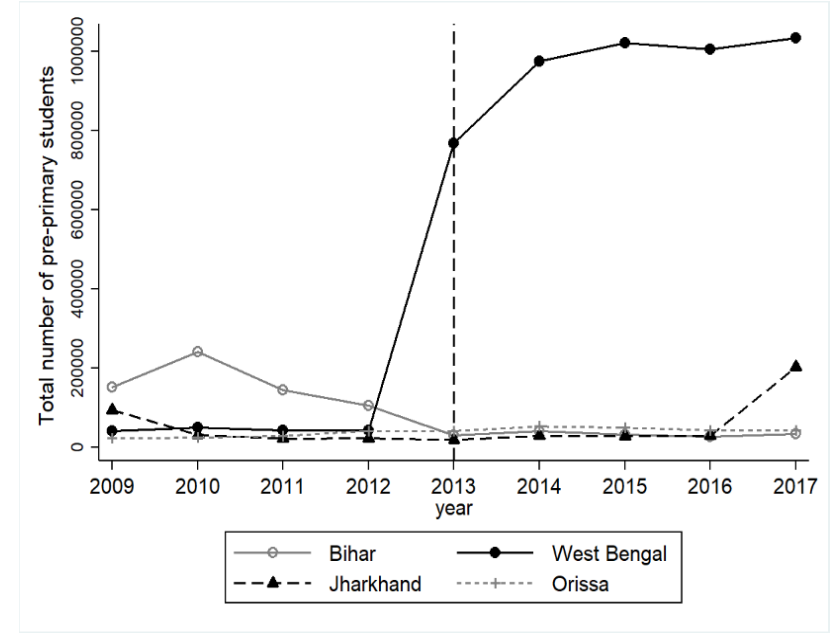


**Panel C: Availability of pre-primary in private Schools**
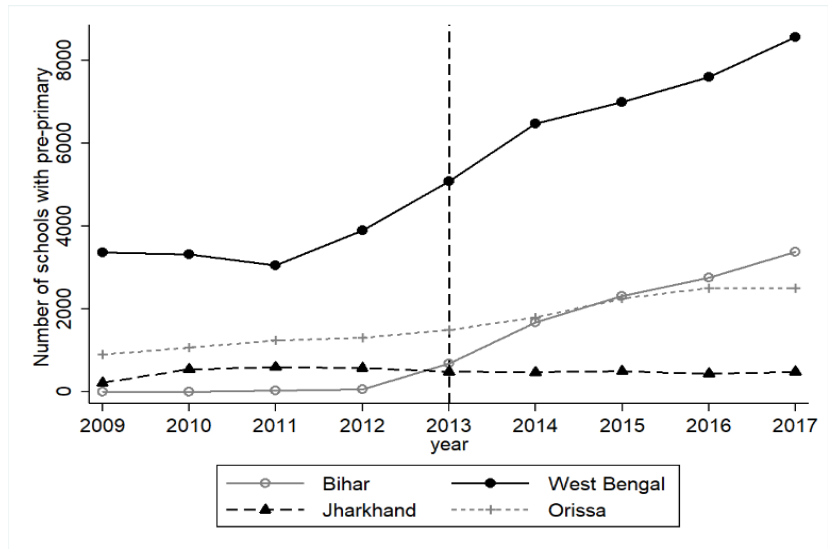


**Panel D: Pre-primary enrollment in private schools**

# Empirical Methodology

- **Double Difference**

$$y_{idst} = \beta_0 + \beta_1.post_t + \beta_2.(post_t \times wb_s) + \vartheta X_{idst} + \partial_{ds} + \gamma_t + (\partial_{ds} \times t) + \epsilon_{idst} \qquad (1)$$

- **Triple Difference**

$$y_{idst} = \beta_0 + \beta_1. govtschool_{ids} + \beta_2.post_t + \beta_3.(wb_s \times govtschool_{ids} \times post_t) + \beta_4.(govtschool_{ids} \times post_t) +$$
$$\beta_5.(post_t \times wb_s) + \beta_6.(govtschool_{ids} \times wb_s) + \vartheta X_{idst} + \gamma_t + \partial_{ds} + (\partial_{ds} \times t) + \epsilon_{idst} \qquad (2)$$

- **Synthetic Control**

To avoid the arbitrary choice of control states, the synthetic control method (SCM) has been used that takes a linear combination of states that is found to form a better control group for WB than ad hoc choice of states.

Variables

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# Table 1: Impact on the Availability and Enrollment in Pre-Primary

|  | (1) Availability of pre-primary schools | (2) Log (1+number of pre-primary students) |
|---|---|---|
| **Panel A: DD Specification** | | |
| West Bengal x Post | 0.91*** | 2.06*** |
| | (0.04) | (0.11) |
| School-level controls | Yes | Yes |
| Fixed effects | Yes | Yes |
| No of Observations | 1,989,024 | 1,989,024 |
| | | |
| **Panel B: DDD Specification** | | |
| West Bengal x Government school x Post | 0.72*** | 1.77*** |
| | (0.06) | (0.21) |
| School level controls | Yes | Yes |
| Fixed effects | Yes | Yes |
| No of Observations | 2,107,532 | 2,107,532 |

Notes: The fixed effects include district-fixed effect, year-fixed effect, and district-specific linear trend. Standard errors are clustered at the district level. ***=significant at 1% level, **=significant at 5% level, *=significant at 10% level. Source: DISE 2009–17; authors' own calculations.

Event study

# Table 2: Impact on Learning Outcomes

| | Math score | | Reading score | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **Panel A: DD Specification** | | | | |
| West Bengal x Post | -0.24*** | -0.26*** | -0.11 | -0.13** |
| | (0.05) | (0.05) | (0.07) | (0.06) |
| Control variables | No | Yes | No | Yes |
| Fixed effects | Yes | Yes | Yes | Yes |
| No of Observations | 62,413 | 62,413 | 62,413 | 62,413 |
| | | | | |
| **Panel B: DDD Specification** | | | | |
| West Bengal x Government school x Post | 0.07 | 0.05 | 0.03 | 0.01 |
| | (0.05) | (0.05) | (0.07) | (0.08) |
| Control variables | No | Yes | No | Yes |
| Fixed effects | Yes | Yes | Yes | Yes |
| No of Observations | 72,276 | 72,276 | 72,276 | 72,276 |

Notes: The Control variables include child-level, household-level, and village-level controls. The fixed effects include district-fixed effect, year-fixed effect, and district-specific linear trend. The standard errors are clustered at the district level. ***=significant at 1% level, **=significant at 5% level, *=significant at 10% level. Source: ASER 2009–18; authors' own calculations.

Event study

# Table 3: Impact on School Infrastructure

| | (1)<br>Log (1+Total number of classrooms) | (2)<br>Log (1+number of pre-primary teachers) | (3)<br>Log (1+number of total teachers) |
|---|---|---|---|
| **Panel A: DD Specification** | | | |
| West Bengal x Post | -0.09*** | 0.18*** | -0.04* |
| | (0.02) | (0.04) | (0.02) |
| School-level controls | Yes | Yes | Yes |
| Fixed effects | Yes | Yes | Yes |
| No of Observations | 1,989,024 | 1,989,024 | 1,989,024 |
| | | | |
| **Panel B: DDD Specification** | | | |
| West Bengal x Government school x Post | -0.07 | 0.29*** | -0.47*** |
| | (0.07) | (0.07) | (0.12) |
| School-level controls | Yes | Yes | Yes |
| Fixed effects | Yes | Yes | Yes |
| No of Observations | 2,107,532 | 2,107,532 | 2,107,532 |

Notes: The fixed effects include district-fixed effect, year-fixed effect, and district-specific linear trend. Standard errors are clustered at the district level. ***=significant at 1% level, **=significant at 5% level, *=significant at 10% level. Source: DISE 2009–17; authors' own calculations.

Event study

# Figure 2: Synthetic Control for Enrollment

**Panel A:  Availability of pre-primary in government schools of West Bengal and synthetic control**
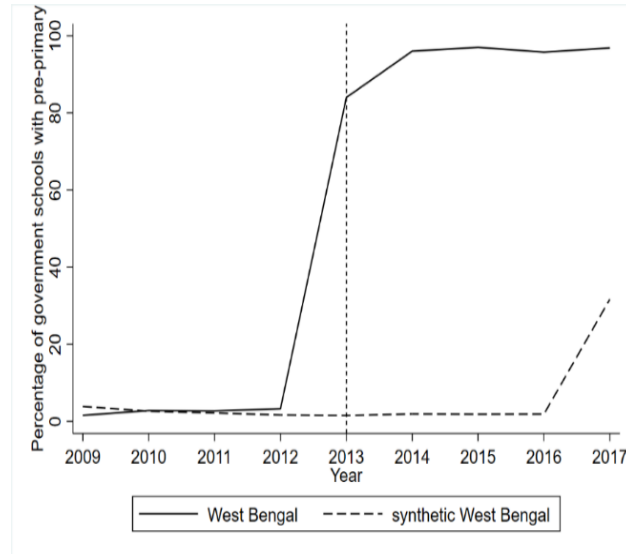


**Panel B:  Pre-primary enrolment in government schools of West Bengal and synthetic control**
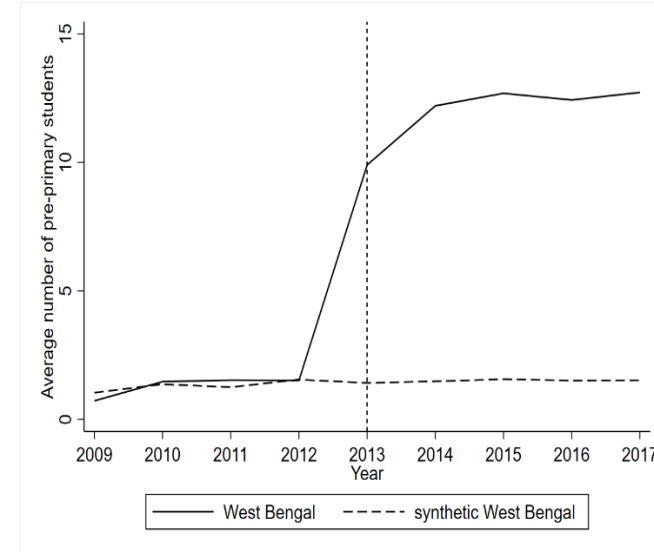


**Panel C: Gap between West Bengal and synthetic control in the availability of pre-primary in government schools**
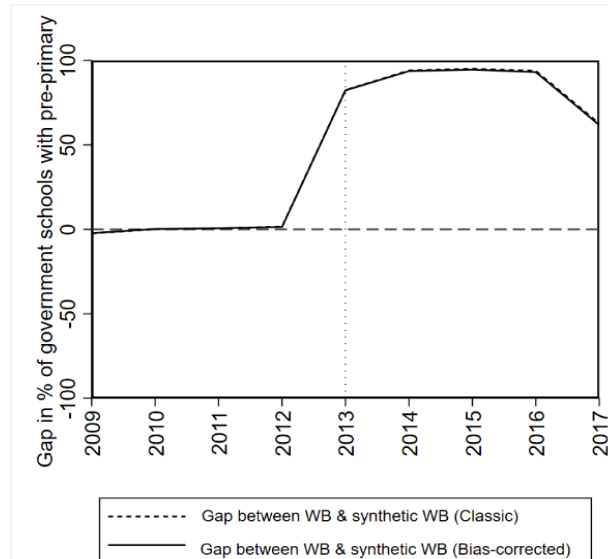


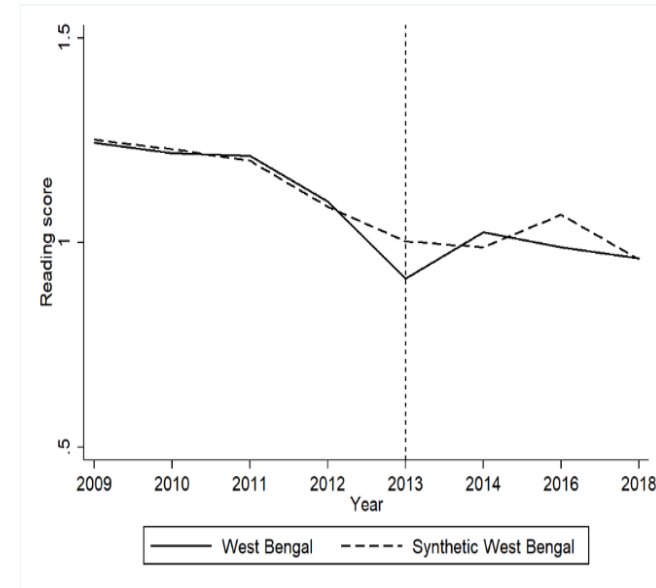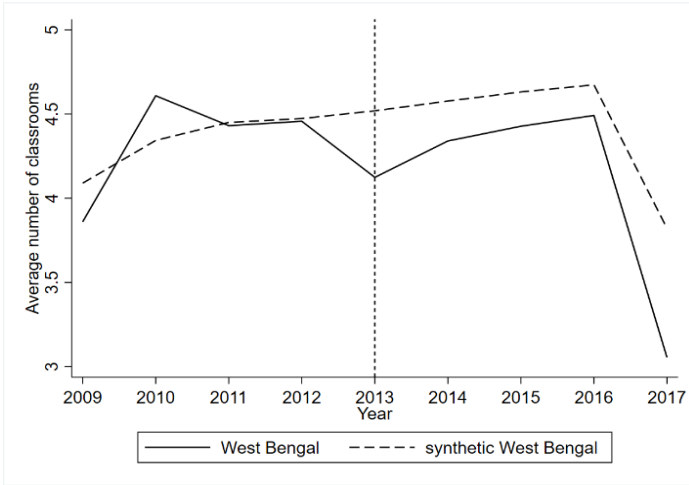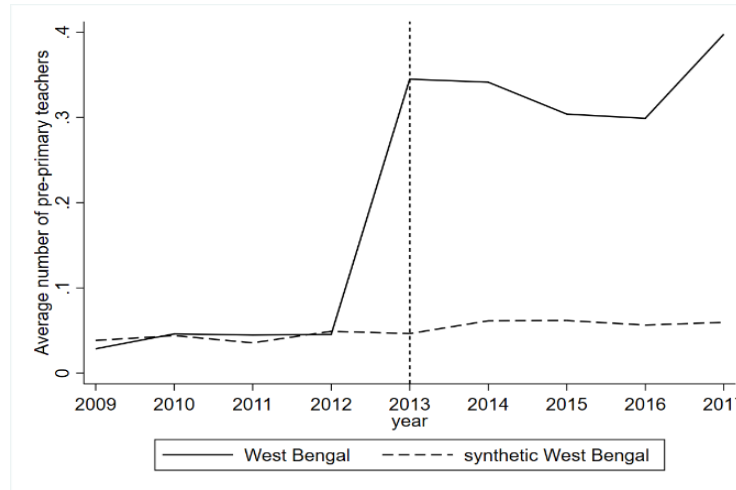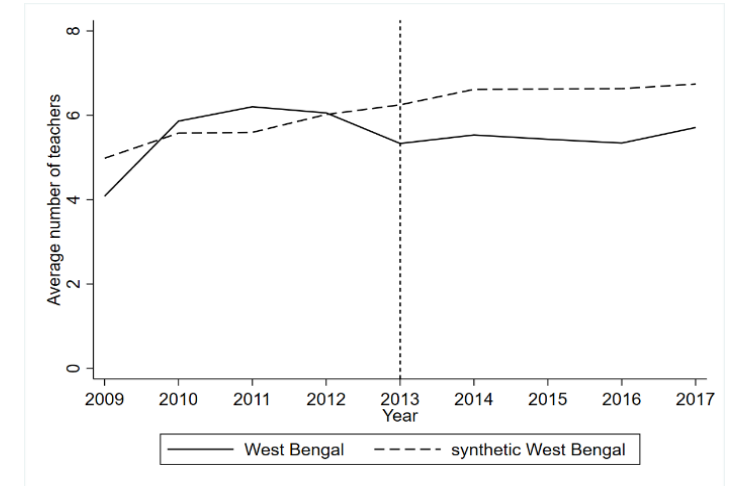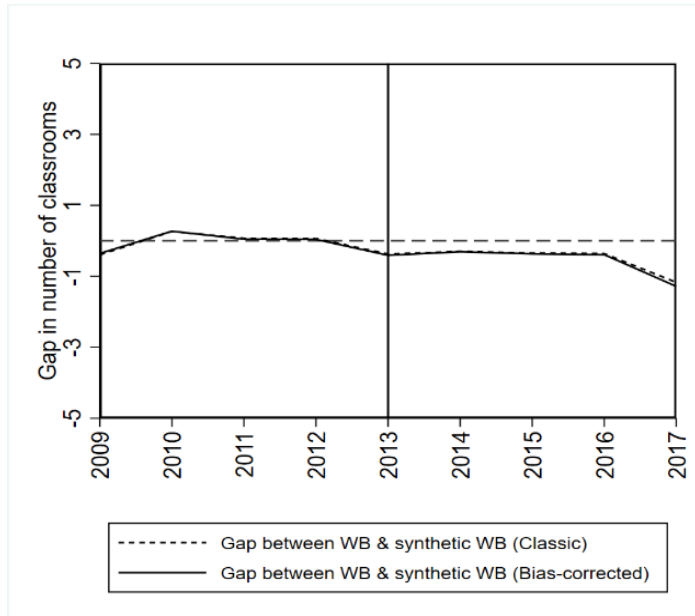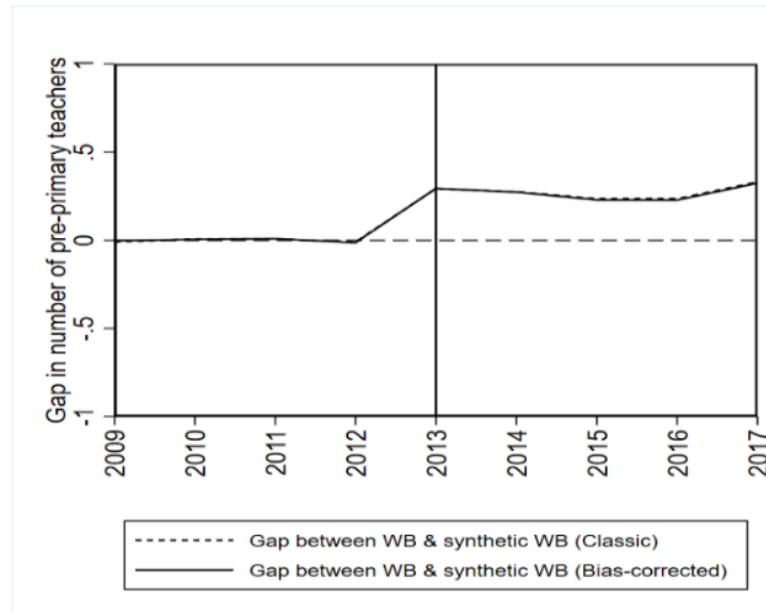**Panel D: Gap between West Bengal and synthetic control in pre-primary enrolment in government schools**



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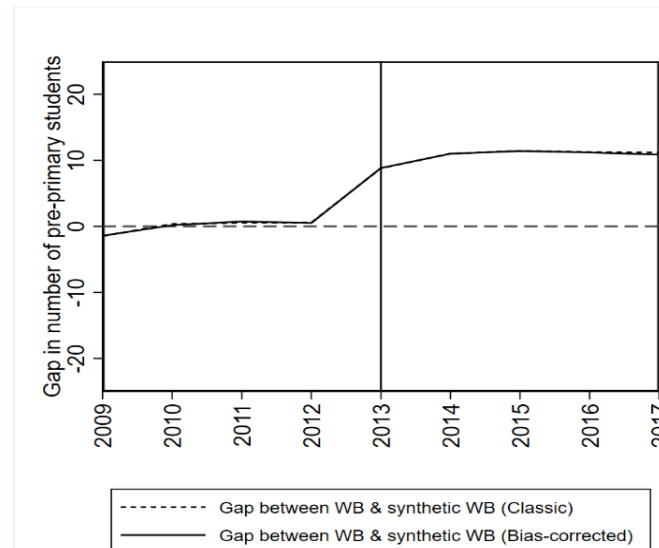
# Figure 3: Synthetic Control for learning outcomes

**Panel A: Math score of 5-6 years old in government schools of West Bengal and synthetic control**
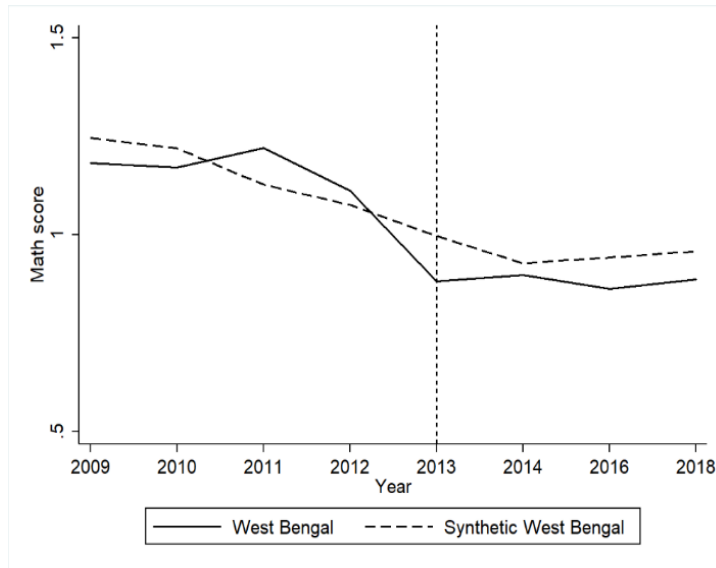
**Panel B: Reading score of 5-6 years old in government schools of West Bengal and synthetic control**

**Panel C: Gap in math score of 5-6 years old in government schools of West Bengal and synthetic control**
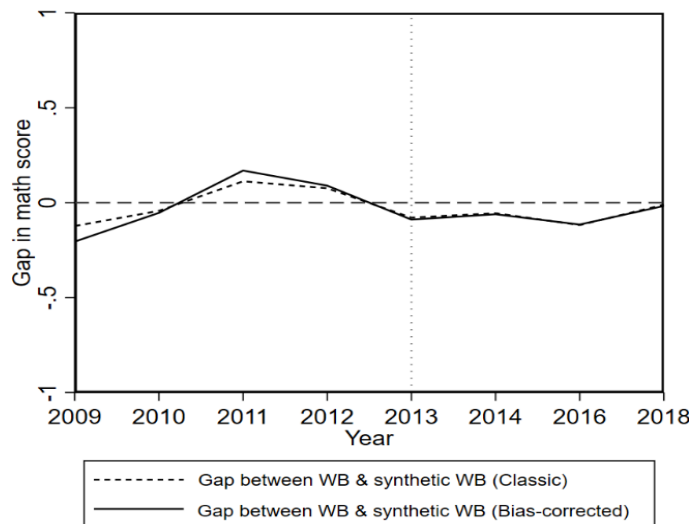
**Panel D: Gap in reading score of 5-6 years old in government schools of West Bengal and synthetic control**
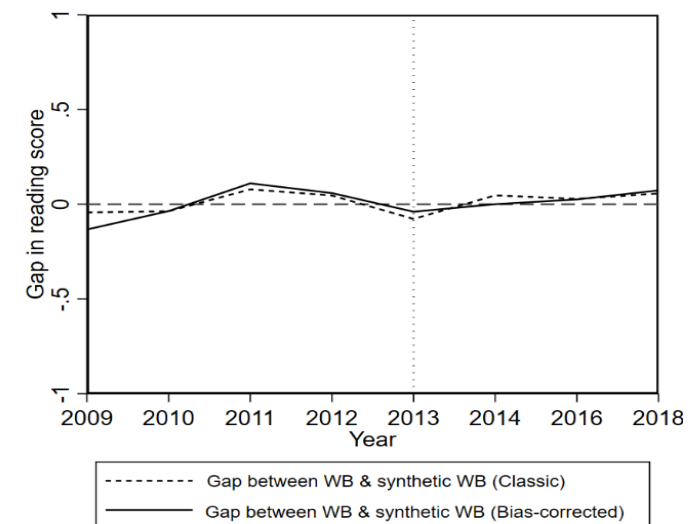
# Figure 4: Synthetic Control for School Infrastructure

**Panel A:  Availability of pre-primary in government schools of West Bengal and synthetic control**

**Panel B:  Average number of pre-primary teachers in government schools**

**Panel C: Average number of teachers in government schools**



**Panel D:  Gap in the number of classrooms in government schools with pre-primary between West Bengal and synthetic control**

**Panel E:  Gap in the number of pre-primary teachers in government schools between West Bengal and synthetic control**

**Panel F:  Gap in the number of pre-primary teachers in government schools between West Bengal and synthetic control**
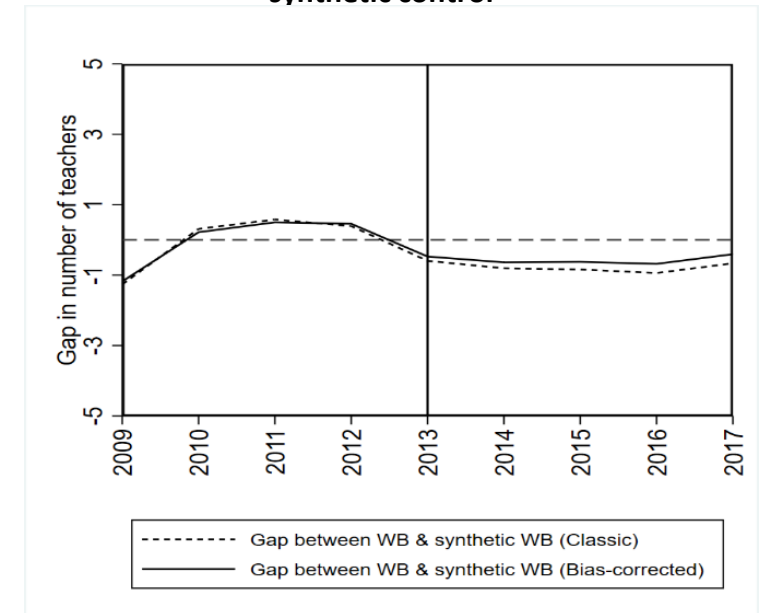
# Conclusion

- The program successfully sends children at an early age to school.

- Despite the positive influence on enrollment, it fails to have any impact on learning ability (math and reading scores) among government school children of West Bengal as compared to the control groups.

- This deterioration can be attributed to the declining school infrastructure that has taken place in government schools in West Bengal over the years after the program was announced.

- **Policy prescription**: if the benefits of a pre-primary program in the form of better learning outcomes are to be reaped, school infrastructure needs to be complemented with utmost priority.

# Thank You

# Table A1: Description of Variables

| Variables | Measure |
|---|---|
| ***Enrollment outcomes*** | |
| Availability of pre-primary | 1 if 'Yes', 0 if 'No' |
| Enrollment in pre-primary | Log (1+ number of pre-primary students) |
| | |
| ***Learning outcomes*** | |
| Math score | 0 = 'No skill', 1 = 'Recognize single digit', 2 = 'Recognize double digit' 3 = 'Perform subtraction', 4 = 'Perform division' |
| Reading score | 0 = 'No skill', 1 = 'Read letters', 2 = 'Read words' 3 = 'Read a grade 1 level text', 4 = 'Read a grade 2 level text' |
| ***Infrastructural variables*** | |
| Classrooms in the school | Log (1+ total classrooms in the school) |
| Teachers in the school | Log (1+ total teachers in the school) |
| Pre-primary teachers in the school | Log (1+ pre-primary teachers in the school) |
| | |
| ***Child-level controls*** | |
| Gender | 0 if 'Female', 1 if 'Male' |
| Age | Age of the child (integer values) |
| | |
| ***School-level controls*** | |
| Government school dummy | 1 if 'government school', 0 if 'private school' |
| Availability of electricity | 1 if 'Yes', 0 if 'No' |
| Availability of playground | 1 if 'Yes', 0 if 'No' |
| | |
| ***Household-level controls*** | |
| Household pucca or not | 1 if 'Yes', 0 if 'No' |
| Household size | Number of household members (integer values) |
| Availability of toilet | 1 if 'Yes', 0 if 'No' |
| Availability of electricity | 1 if 'Yes', 0 if 'No' |
| Possession of TV | 1 if 'Yes', 0 if 'No' |
| Mother went to school | 1 if 'Yes', 0 if 'No' |
| | |
| ***Village-level controls*** | |
| Availability of pucca road | 1 if 'Yes', 0 if 'No' |
| Availability of post office | 1 if 'Yes', 0 if 'No' |
| Availability of bank | 1 if 'Yes', 0 if 'No' |
| Availability of government school | 1 if 'Yes', 0 if 'No' |
| Availability of private school | 1 if 'Yes', 0 if 'No' |
| | |
| ***Other variables*** | |
| Post dummy | 1 if the observation is from 2013 or after, 0 otherwise |
| West Bengal dummy | 1 if the observation is from West Bengal, 0 otherwise |

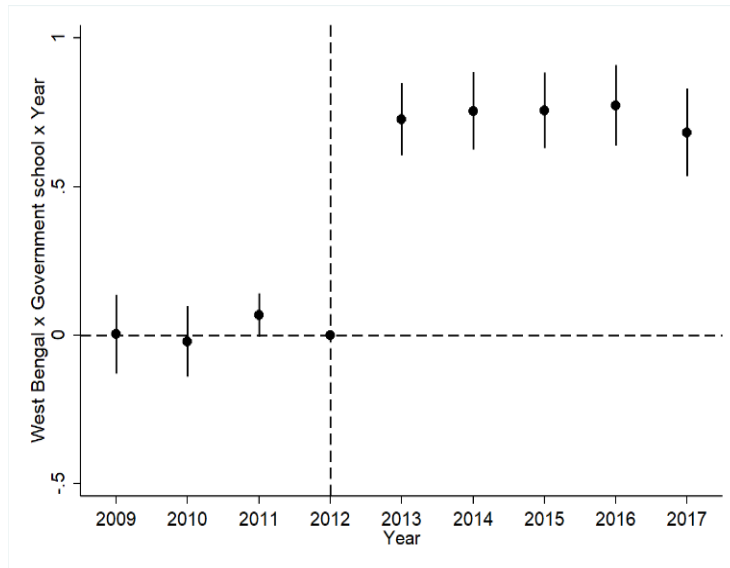# Appendix Figure A1: Event Study Analysis for Enrollment

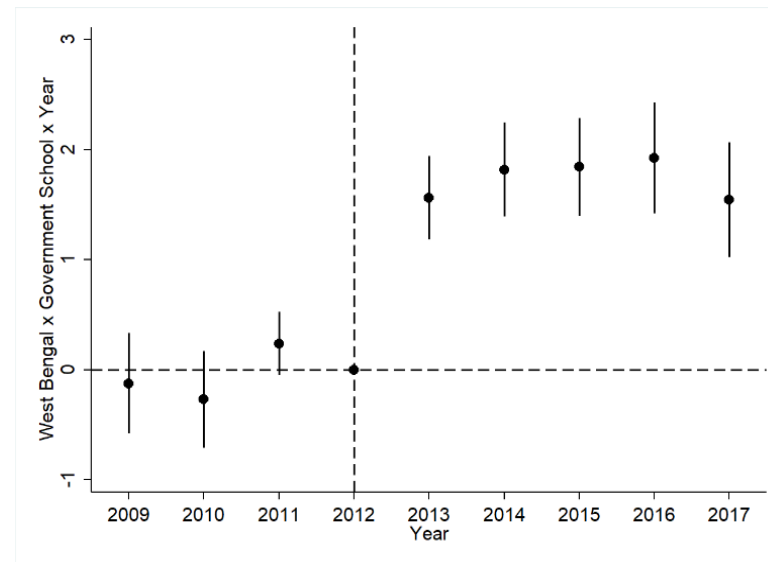**Panel A:  Availability of pre-primary (DD)**
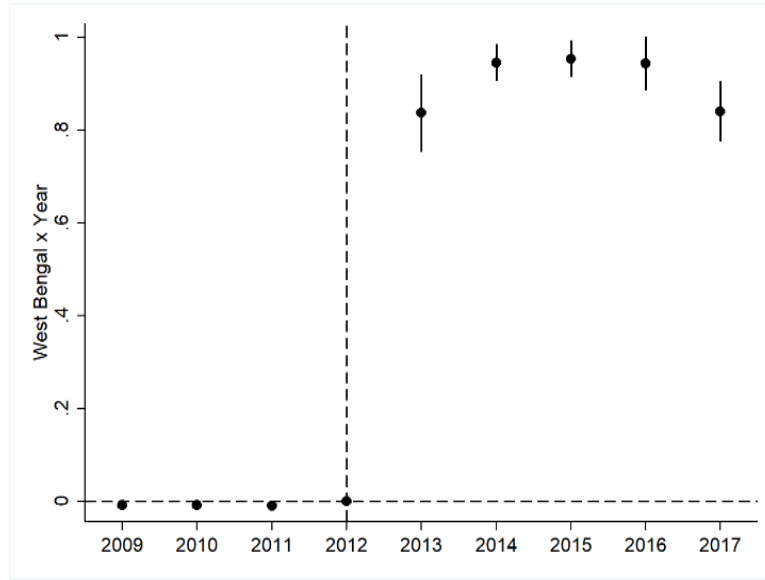
**Panel B: Pre-primary enrollment (DD)**
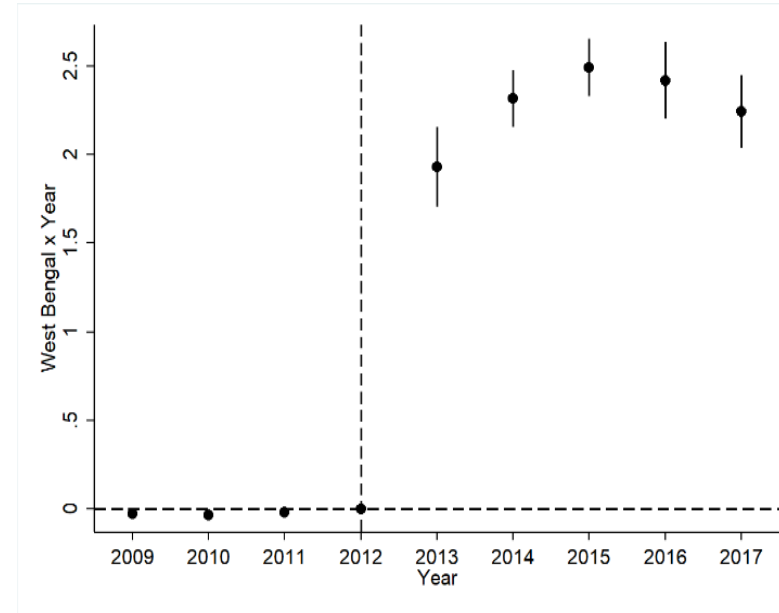
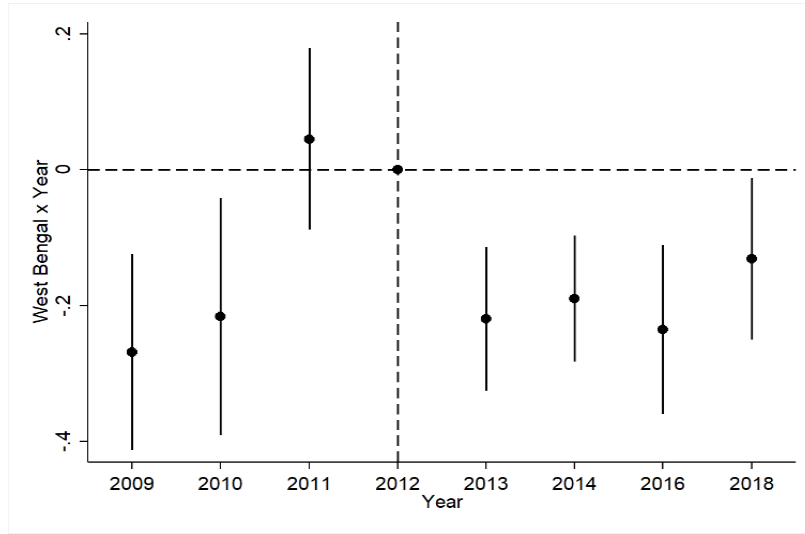**Panel C:  Availability of pre-primary (DDD)**

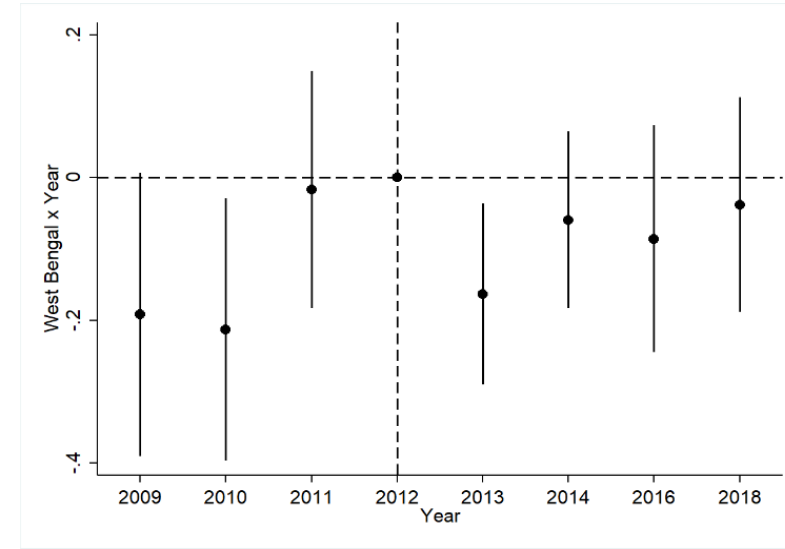**Panel D: Pre-primary enrollment (DDD)**



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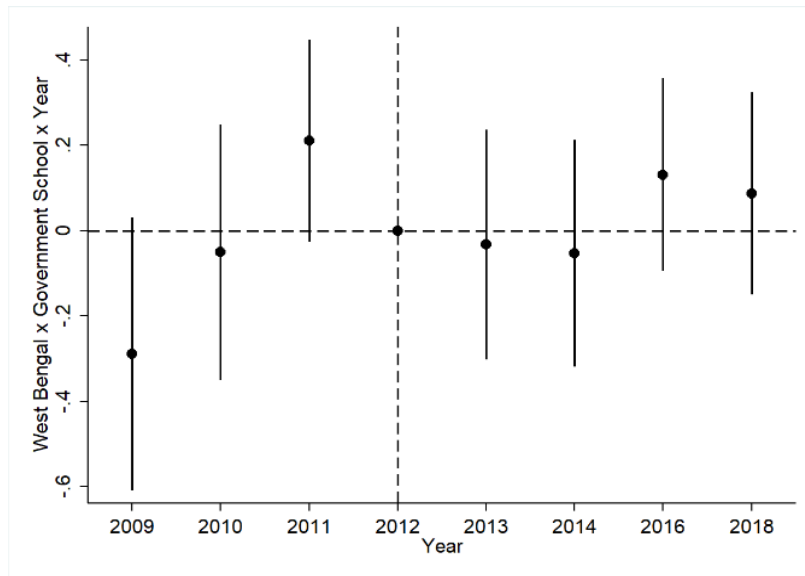# Appendix Figure A2: Event Study Analysis for Learning Outcomes
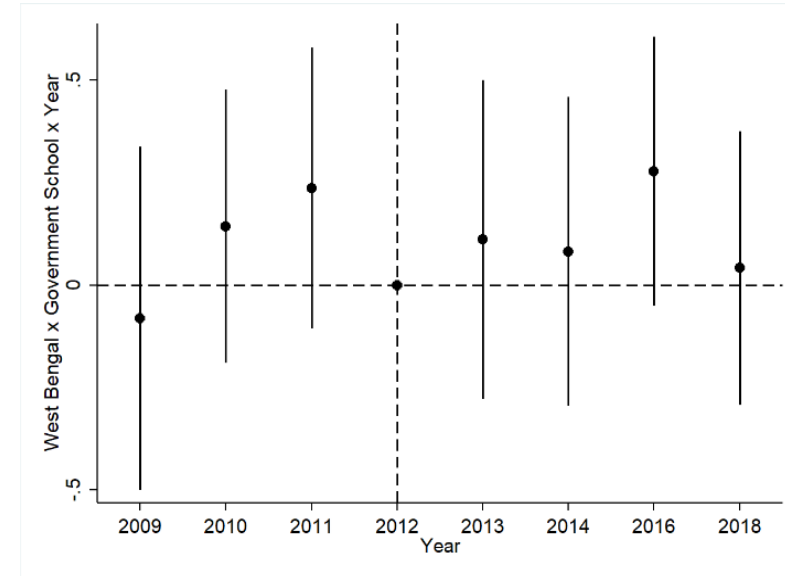
**Panel A:  Math score (DD I)**

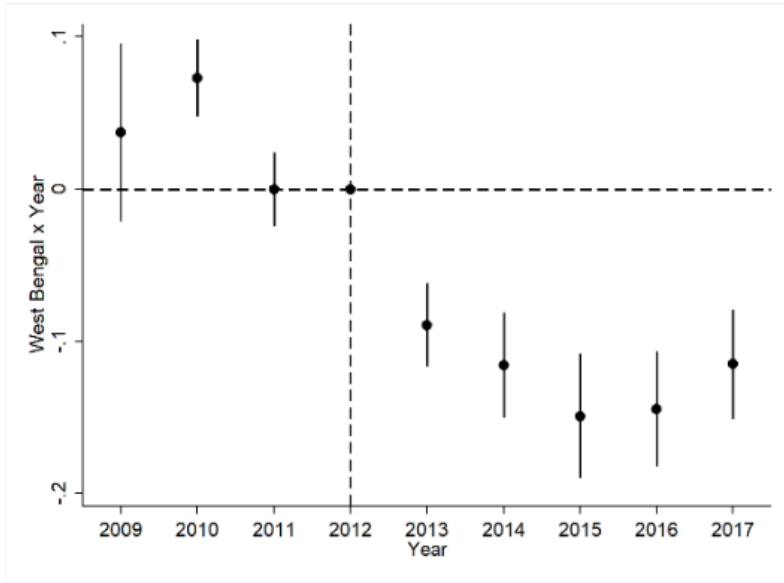**Panel B: Reading score(DD I)**

**Panel C:  Math score (DDD)**

**Panel D: Reading score (DDD)**



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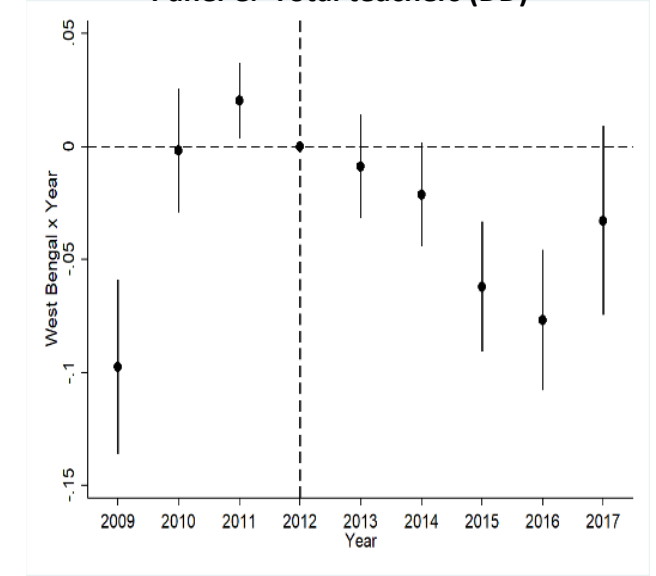# Appendix Figure A3: Event Study Analysis for School Infrastructure
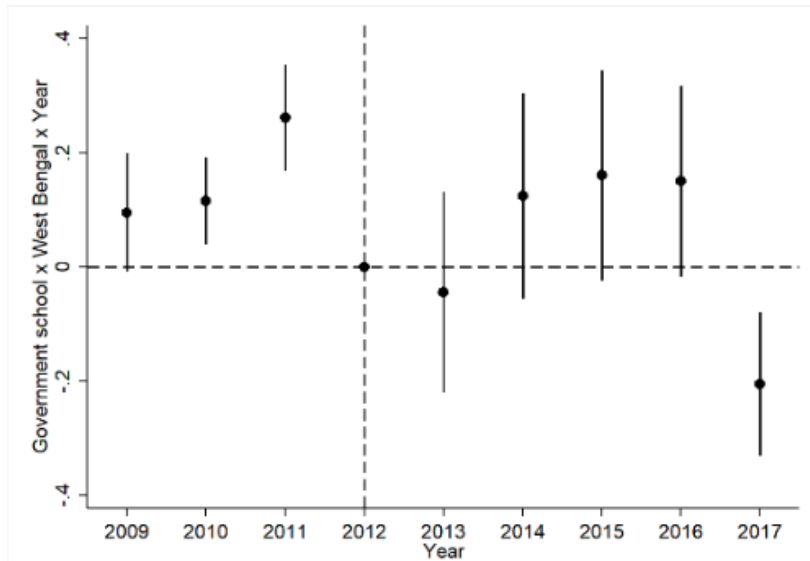


Panel A: Number of classrooms (DD)

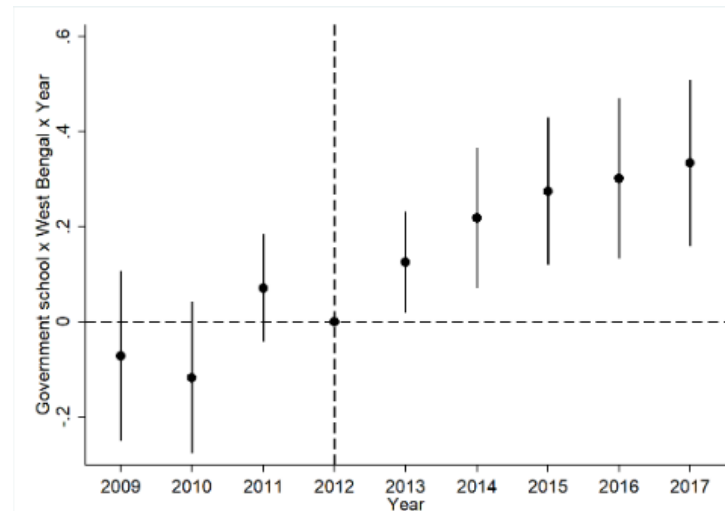Panel B: Pre-primary teachers (DD)
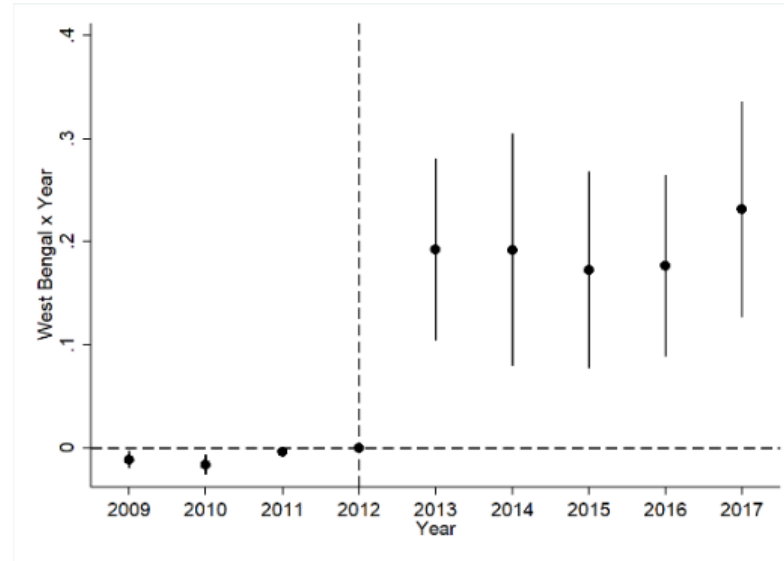
Panel C: Total teachers (DD)

Panel D: Number of classrooms (DDD)

Panel E: Pre-primary teachers (DDD)

Panel F: Total teachers (DDD)