Garima Agarwal
Azim Premji University, Bangalore April 28, 2025

Dear members of the Selection Committee,

I am an early career Assistant Professor in Economics at Azim Premji University, Bangalore, India and it is with great interest that I am applying for the Review of Economics and Statistics Fellowship for the NBER Summer Institute 2025.

I received my Ph.D. in Economics at the Delhi School of Economics in 2022 and held the Stephan Klasen Postdoctoral Fellowship at the Georg-August-Universität Göttingen for 2022-23. I am a labour economist interested in development and gender. My research aims to understand and address barriers to human capital accumulation and economic participation for girls and women. While my current research is based in India, I feel the questions are relevant across other country settings as well. Over the next few years, I aim to expand my research on these themes to the global context with the overall goal of understanding the unique and universal constraints for women across the socioeconomic spectrum. The vast diversity within India has allowed me to pursue projects toward this end.

My doctoral thesis considers barriers to school participation for adolescent girls on account of biological constraints such as puberty and menstruation. In my job market paper, I examine whether the provision of modern menstrual products impacts female school participation using quasi-experimental methods. I evaluate a state-level free sanitary napkin distribution program in India using a novel dataset of ten years of daily attendance from public schools in Delhi. I find that access to sanitary napkins significantly improves school attendance for girls in the initial stages of puberty. This paper highlights the importance of well-timed interventions that support girls through crucial life events to ensure future economic engagement. In subsequent chapters, I consider other aspects of how menstruation shapes educational participation for adolescent girls using administrative attendance data, publicly available microdata and primary data which I collected at the time of pandemic-related school closures.

Under the broad umbrella of human capital accumulation for women, I am currently working on projects related to (1) sibling composition and adolescent education outcomes, (2) youth aspirations and the school-to-work transition, (3) labour market frictions for entry-level blue collar jobs, and (4) gender differences in competitiveness and performance for young adolescents.

I have over a decade of experience in working in development research in India. During this time, I have built strong networks with local government and NGO stakeholders, and am confident that I can facilitate large projects across the country. I am keen to associate with collaborators who may have similar expertise in other study settings to pursue projects that can further my research agenda. Being based in India, funding and location constraints make it difficult to regularly interact with potential mentors and peers. An opportunity like the NBER Summer Institute would provide unparalleled access to colleagues at the frontier of the field, and I am very excited about the possibility of exploring common interests with the community! In particular, the sessions on Development Economics, Labour Studies, Gender in the Economy and Economics

of Education are extremely relevant to my research interests, and I would highly value the opportunity to discuss my work with the organizers and participants.

I am passionate about my research agenda and would immensely appreciate the opportunity to be part of the NBER Summer Institute research community to further my academic goals. Thank you very much for your consideration. Please do not hesitate to contact me for any other information you may need to review my application. I look forward to hearing from you.

Sincerely,



Garima Agarwal
Assistant Professor in Economics
Azim Premji University, Bangalore

Summary of information:

1. Name: Garima Agarwal
2. Email: garima.agarwal@apu.edu.in
3. Current Affiliation: Assistant Professor, Azim Premji University, Bangalore, India
4. PhD date: March, 2022
5. Website: Link
6. SI 2025 Sessions: Development Economics, Labour Studies, Gender in the Economy and Economics of Education

List of attachments:

1. CV
2. Paper - Sanitary Napkin Distribution and Girls' School Participation - Evidence from a Public Program in India

GARIMA AGARWAL

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(Updated April 2025)

WORK AND TEACHING EXPERIENCE

Assistant Professor, Economics *July 2023 -*
Azim Premji University, Bangalore
Postgraduate: Applied Econometrics using Stata, Econometrics of Cross-Section and Panel Data
Undergraduate: Intermediate Microeconomic Theory, Introduction to Economics, Public Reasoning

Visiting Faculty, Economics *2024-5*
University of Göttingen
Undergraduate: Introduction to Gender and Development

Stephan Klasen Postdoctoral Fellow (Development Economics) *April 2022 - March 2023*
University of Göttingen

Assistant Professor, Economics (Ad hoc) *August 2016 - March 2022*
Shri Ram College of Commerce, University of Delhi
Undergraduate: Introductory & Applied Econometrics, Statistical Methods in Economics, Introductory & Intermediate Microeconomics, Development Theory & Experience , Data Analysis

RESEARCH INTERESTS

Labour, Development, Gender, Education

EDUCATION

Delhi School of Economics, University of Delhi *2014 - 2022*
Ph.D. in Economics
Dissertation title: Biological constraints to school participation for adolescent girls in India
Supervisor: Prof. Rohini Somanathan; Co-supervisor: Prof. Sudhir Shah

Delhi School of Economics, University of Delhi *2011-13*
M.A. Economics

St. Stephen's College, University of Delhi *2008-11*
B.A. (Honours) Economics

WORKING PAPERS

"Sanitary Napkin Distribution and Girls' School Participation - Evidence from a Public Program in India" (Job Market Paper - Latest Draft)

"Absenteeism, Menstruation and School-level Programs - Findings from a Primary Survey in Delhi"

WORK IN PROGRESS

"Sibling Competition or Caregiving? The Role of Gender and Birth Order in Adolescent Education Outcomes"

Youth Aspirations and School-to-Work Transitions in India with Rosa Abraham (For State of Working India Report, 2025, Centre for Sustainable Employment)

"Identifying Menstrual Absence in Daily Individual Attendance Data" with Deepayan Sarkar and Rohini Somanathan

"Evaluating India's Menstrual Hygiene Scheme" with Hemanshu Kumar

POLICY WRITING

"Let a sisterhood of women flourish for true progress", Opinion Column, *The Hindustan Times (Online)*, March 8, 2025

"Plugging education gaps as schools reopen", Opinion Column, *The Indian Express (Online)*, July 19, 2021

"Desirability of cognizance level punishment for crime against women", Journal of Undergraduate Research and Innovation, University of Delhi, Vol 1(2), pp 51-69, May 2015

"A unique, informal banking system of rickshaw drivers in cities" with Shashank Bhatt, Skand Goel and Arushi Kaushik, *Ideas for India*, June 4, 2014

"All Lives Have Equal Value: A Student Economist's View", *Impatient Optimists, Bill and Melinda Gates Foundation Blog*, December 3, 2014

"Voices of Youth: How Can We Mainstream and Sustain Student Learning in India?", *World Bank Blog*, August 16, 2012

RESEARCH GRANTS AND FELLOWSHIPS

Schooling and Behavioral Outcomes for Females after Puberty *April 2016 - June 2021*
Funded by Azim Premji University under ID E182 ($10,448)

Doctoral Research Fellowship *July 2014 - July 2016*
Awarded by Centre for Development Economics, Delhi School of Economics

Krishna Raj Fellowship *May 2012 - June 2012*
with Adway De, Shashank Bhatt, Skand Goel and Arushi Kaushik under the mentorship of Anirban Kar
Awarded by Delhi School of Economics

AWARDS AND QUALIFICATIONS

Harsh Malhotra Prize for Best Paper, Delhi School of Economics, University of Delhi *2022*

UGC National Eligibility Test (NET) for Lectureship, India *2013*

George K. George Kollamkulam Memorial Prize for contributing to the overall life of the college, St. Stephen's College, University of Delhi *2011*

Aditi Shiveshwarkar for academic performance and participation in extra-curricular activities, St. Stephen's College, University of Delhi *2009*

CONFERENCES AND WORKSHOPS

Invited Talk, Development Lunch Workshop, Becker Friedman Institute, University of Chicago *2025*

Invited Talk, Contemporary Issues in Labour Economics Conference, Centre for Studies in Social Sciences, Kolkata *2025*

Invited Talk, Development Economics Workshop, IIT-Hyderabad *2024*

Invited Talk, LEAP Lunch Seminar Series, Bocconi University *2024*

Invited Talk, Workshop on "Socioeconomic Inequality in India - Causes and Consequences", Centre for Modern Indian Studies, University of Göttingen *2024*

CSAE Conference - Economic Development in Africa, University of Oxford *2024*

Invited Talk, Economics Seminar Series, University of Warwick *2024*

Panel Member, Discerning the Impact of Digitalization on Female Labour Force Participation, ICRIER and ADBI *2024*

Oxford Development Economics Workshop, CSAE, University of Oxford *2022*

Development Economics Seminar Series, University of Göttingen *2022*

Doctoral Conference, Society for Economics Research in India (SERI) *2021*

IGC Patna Summer School in Development Economics *2021*

Seminar in Applied Microeconomics - Virtual Assembly and Discussion (SAMVAAD) *2020*

Public Policy and Development Workshop, CAGE Warwick and Delhi School of Economics *2019*

Invited Talk, Centre for Economic Research, St. Stephen's College, University of Delhi *2019*

Annual Conference, Department of Economics, Shri Ram College of Commerce *2019*

International Conference on South Asian Economic Development, South Asian University *2018*

Annual Conference on Economic Growth and Development, Indian Statistical Institute, Delhi *2018*

Winter School, Delhi School of Economics *2018*

CoRe, PhD Colloquium, IGIDR, Mumbai *2018*

Advanced Graduate Workshop, INET and Azim Premji University *2018*

Workshop, Growth & Economic Opportunities for Women (GrOW), University of Göttingen *2016*

IGC-ISI Summer School in Development Economics, Indian Statistical Institute, Delhi *2015*

Youth delegate, Economic Cooperation Committee, BRICS Youth Summit, Russia *2015*

Youth delegate, Asia – Commonwealth Youth Forum and Youth Ministers Meeting, India *2015*

SERVICE AND LEADERSHIP

Referee for Journal of Development Studies, PLOS ONE, Economic Modelling, Indian Economic Review, Progress in Development Studies

Economics Thesis Coordinator (Undergraduate and Post Graduate), Azim Premji University *2025*

Economics Seminar Series Coordinator, Azim Premji University *2024*

Group Leader, Advanced Graduate Workshop, INET and Azim Premji University *2023*

Referee for Student Journal Strides, Shri Ram College of Commerce

Graduate Seminar Coordinator, Delhi School of Economics *2018*

OTHER PROFESSIONAL EXPERIENCE

Consultant, Decision Analytics, EXL Service, Gurgaon, India *August 2013 - February 2014*

Economist (Intern), Cambridge Economic Policy Associates, New Delhi, India *May 2012 - June 2012*

ACADEMIC REFERENCES

1. Prof. Rohini Somanathan
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   University of Delhi
   Delhi 110007, India
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2. Prof. Sebastian Vollmer
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   Göttingen 37073, Germany
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3. Dr. Parikshit Ghosh
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   Delhi School of Economics
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Sanitary Napkin Distribution and Girls' School Participation - Evidence from a Public Program in India

Garima Agarwal*

April 28, 2025

ABSTRACT

This paper examines whether access to modern menstrual products promotes female school participation. I evaluate a state-level free sanitary napkin distribution program in India using a novel dataset of ten years of daily administrative records from single sex public schools in Delhi. I follow a difference-in-differences approach and estimate a two-way fixed effects specification for each grade with boys as a control group for girls. I find positive and significant impact on daily attendance for girls in grades 6-9, a time when they are most likely to experience their first menstrual period. An improvement in attendance at pubertal grades is also followed by relatively better academic performance for girls in an important national examination at a later stage. The key mechanism of impact is likely to be access to a previously unaffordable or inaccessible input rather than a change in social norms or health capital.

JEL codes: H42, I21, I28, I38, J16, O12
Keywords: education, secondary schooling, school participation, gender, attendance, adolescent girls, sanitary napkins, female targeted transfer, puberty, menstruation, India

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1 Introduction

Puberty is an important life event that marks the transition into adulthood. For girls, this is characterized by the onset of menstruation, which indicates sexual maturity and makes gender identity salient. Girls' subsequent economic participation may then be determined by the sociocultural norms associated with this new status along with the availability of resources and water, sanitation and hygiene (WASH) infrastructure to manage periods (Sommer, 2010; Garg and Anand, 2015). In the absence of these facilitating factors, schooling is a critical dimension on which adverse effects may first be visible (Field and Ambrus, 2008; Khanna, 2021). Across diverse contexts, girls feel anxious about attending school during their period and report lower engagement and even absenteeism of varying degree (Mason et al., 2013; Dolan et al., 2014; Miiro et al., 2018; Vashisht et al., 2018; Karki and Espinosa, 2018). Addressing these concerns through targeted interventions could well play a crucial role in ensuring that girls reach their full potential in education as well as in later life.

In this paper I ask if relaxing the constraint around access to modern menstrual products can influence female school participation in under-resourced settings. My study is situated in the largely urban state of Delhi in India where the government launched the Kishori Scheme in December, 2011 across all public schools. These schools charge little or no tuition fee and typically serve low-income households. Under the program, all girls enrolled in public schools in secondary grades (6-12) receive a pack of ten sanitary napkins to take home every month and participate in training and sensitization campaigns around menstrual health. I use a novel administrative dataset of grade-level daily aggregate attendance from all public schools under the state government for ten academic years (2008-17) around the program. Such data is not commonly available in developing country contexts and is particularly well suited to answer the research question.

I estimate a difference-in-differences (DID) specification for each grade 6-9 to compare attendance rates for girls and boys in the same grades before and after program launch.

Given the timing of puberty, these middle grades represent a window of opportunity where the program is most relevant. Separate grade-wise analysis is useful to focus on students at similar stages in their schooling and biological life cycle. Further threats to identification from individual or school specific unobservables are addressed by focussing on a sample of all pairs of matched single sex schools that share a school building in different shifts.[1,2] Since students are assigned to schools based on residential distance, girls and boys studying in the same school location are likely to come from similar neighbourhoods, share socioeconomic characteristics and experience the same physical infrastructure at school. In addition to attendance, I also consider program effects on academic performance at a later crucial stage. Sample schools are representative of the wider school system in Delhi since a large majority of public schools are single sex and further, sample schools have comparable characteristics to non-sample schools.

I find that daily attendance, on average, goes up significantly by 1.5 to 2.4 percentage points (0.12 to 0.19 standard deviations) for girls in grades 6-9 while the program is in operation. These grades coincide with the onset of puberty and menstruation for most girls, which is when program support may be especially useful. Gains in daily attendance at pubertal grades further translate into an improvement in academic performance at a later stage. The share of girls that pass the grade 10 national board examination goes up significantly by 2.9 percentage points during program years, compared to boys. In fact, these effects show up about two years following program launch on account of cohorts that benefit from the intervention during initial years of puberty. This study finds significant program impact using a sample of single-sex schools in an urban context where social constraints around menstruation and girls' schooling may be less restrictive than in other settings such as coeducational schools or rural areas. It is possible that program effects are even larger when constraints are more binding.[3] However, this is an

[1] This arrangement is such that a girls school is held in the morning and a boys school in the afternoon in the same school building. Concerns around selection are limited given that in the population of schools, there are practically no girls schools that operate in the afternoon and boys schools almost never operate in the morning.

[2] Attendance data does not provide a gender disaggregated split for schools and hence, co-educational schools are excluded from the analysis.

[3] On the other hand, the lack of enabling factors in more restrictive settings may limit program impact.

empirical question that needs further research.

I discuss the validity of the difference-in-differences results by providing evidence for pre-program parallel trends through an event study analysis using 44 pre-periods. Estimates are robust to incorporating treatment effect heterogeneity using the imputation method developed by Borusyak et al. (2021). I also show results from a series of falsification tests that vary placebo treatment timing in the pre-program period. There is no strong evidence to reject the parallel trends assumption (PTA). The other developments in DID methods pertain to staggered treatment timing (Roth et al., 2023) and are not directly applicable in the present case which lends itself to the standard two-way fixed effects specification with uniform treatment timing across units.

I perform several robustness checks to confirm the main results. First, a placebo test shows that the program does not impact attendance for lower grades (3-5) where students do not directly benefit from the program. Further, there are no significant effects on attendance at higher grades (10-12) either. This may indicate that such programs are especially useful to girls in the initial stages of puberty. However, it is possible that the lack of effects is explained by student drop-out at higher grades. Second, I show that program effects are not driven by gender-specific factors unrelated to the intervention by estimating a triple differences specification using students in lower grades (3-5) as a control group for students in grades 6-9. While younger girls do not receive free napkins, their attendance captures the effects of other contemporaneous changes that affect girls, in general. Results are very similar to those from the main DID. Moreover, school characteristics do not change differentially for girls schools over the study period. Third, changes in student composition are unlikely to explain effects since there are no significant differential changes in enrolment for girls at relevant grades in response to the program. Finally, results are robust to an alternative definition of the attendance variable. I further show that effects are driven by a reduction in the share of unplanned and not planned absences from school. Menstrual absenteeism, which is targeted by the program, is most likely to be unexpected and fall in the former category.

Impact on attendance may be driven by three potential mechanisms. First, the provision of previously unaffordable or inaccessible napkins may improve girls' mobility. Traditional products such as cloth pads may not last effectively through the school day and are perceived to be associated with a greater risk of leakage thereby causing fear and perhaps lower attendance (Mason et al., 2013; Hennegan et al., 2019). Switching to modern products may also reduce laundry time and provide girls more privacy (Oster and Thornton, 2009). Second, the program may facilitate a school environment that is more sensitive to the needs of menstruating girls by fostering support between peers and with teachers. Under the program, schools hold awareness sessions on menstrual hygiene with students. Third, if napkins help maintain better menstrual hygiene, then girls' health capital may improve from usage and this may lead to lower morbidity-related absenteeism (Torondel et al., 2018; Das et al., 2015). Although all three channels can operate simultaneously, the first depends critically on napkin distribution, while the other two may continue to operate through a temporary withdrawal of the program. An unexpected year-long interruption in napkin distribution allows me to disentangle the primary channel of impact. During this time, the gains in attendance experienced by grades 6-9 in program years seem to disappear and attendance becomes comparable to pre-program levels. This suggests that other channels may not be strong enough to sustain impact on attendance when access to napkins is withdrawn. Further, a subsample analysis shows that program effects are driven by schools in poorer districts, thereby reinforcing the plausibility of the proposed affordability mechanism.

The paper contributes to the rich literature on improving female school participation at the secondary level. Much of this work uses enrolment as an outcome variable to study gender-neutral interventions such as school construction (Duflo, 2001) and conditional cash transfers (Khandker et al., 2003; Schultz, 2004; Chaudhury and Parajuli, 2010),[4] and gender-specific interventions such as the provision of school sanitation facilities and safe transport (Adukia, 2017; Muralidharan and Prakash, 2017). The latter resolve par-

[4]There are a few examples of conditional cash transfers that specifically target girls' attendance at this level (Filmer and Schady, 2008; Baird et al., 2011).

ticular concerns that become salient around the onset of puberty.[5] This paper specifically contributes to the growing literature on another intervention that is especially relevant for pubescent girls i.e. the provision of menstrual products.[6] Existing papers consider effects on school attendance in low and middle income countries through experiments that offer randomized access to a menstrual cups (Oster and Thornton, 2011), cups or sanitary napkins (Benshaul-Tolonen et al., 2021), or sanitary napkins coupled with puberty education (Montgomery et al., 2016; Austrian et al., 2021). The choice of product may be critical as results show that menstrual cups do not affect attendance, while findings from sanitary napkin provision are mixed. In general, study samples track girls in a narrow age band for relatively short durations of 1-3 years. Apart from raising the question of external validity over time, this precludes an analysis of long-term future outcomes as well. Issues such as small sample size, attrition and sample selection also make it difficult to interpret results. Moreover, experimental findings may not generalize to large public programs due to implementation challenges.[7] Moving from a proof of concept to scalable policy may involve a combination of methods and multiple rounds of iteration to arrive at an appropriate design (Barrett and Carter, 2010; Banerjee et al., 2017). Building on existing studies, this paper provides rigorous evidence of the impact of improved menstrual product access on school attendance using data from a government intervention run at scale over a sustained period of time. To the best of my knowledge, this is the first paper to do so. Sanitary napkins are culturally appropriate in the study context. Further, the nature of the data allows an analysis of heterogeneity of program impact by grade.

My work closely relates to a recent working paper that evaluates the impact of installing

[5]Recent work suggests that the onset of puberty may be linked to early marriage and reduced school enrolment for girls (Field and Ambrus, 2008; Khanna, 2021). This body of evidence is in line with the literature around the biological constraint of child-birth, the associated "fertility dip" in female labour force participation and policy instruments to mitigate this (Goldin and Katz, 2002; Bailey, 2006; Vu and Glewwe, 2022; Marcos, 2023).

[6]There is some work that evaluates the effects of menstrual product use on absenteeism amongst adult workers (Krenz and Strulik, 2019; Czura et al., 2024).

[7]The main methodological concerns with experiments discussed in the literature include 'faux' exogeneity and threats to external validity through susceptibility to economy-wide factors, especially over time (Barrett and Carter, 2010; Pritchett and Sandefur, 2014; Rosenzweig and Udry, 2020).

napkin vending machines at school on female drop out rates in the Indian state of Kerala (Agarwal et al., 2022). In line with my results, the paper finds significant program effects that coincide with puberty. However, I use daily attendance as an outcome variable to compare girls with boys in the same grade across similar schools, while Agarwal et al. (2022) use annual enrolment to compare girls in the same grade across treated and untreated schools. Given the nature of the vending machine intervention, it is challenging to ascertain the degree of exposure to sanitary napkins for girls in treated schools without detailed data on student-level machine access. Moreover, schools opt in to treatment in the Kerala context thereby raising selection concerns that authors address by constructing various control groups matched on characteristics. In contrast, the program design in my setting resolves these issues since girls receive a fixed number of napkins to take home every month and all public schools in the state are treated at a single point in time. By exploiting the set of schools that operate out of shared buildings, I also make use of naturally matched treatment and control units.

Further, I provide a novel way to test for the mechanism of program impact by exploiting a temporary interruption in napkin distribution. While anecdotally, the program helps improve school environment and girls' menstrual hygiene, results show that impact on attendance critically depends on access to napkins, which may be unaffordable without the program. Low-cost enabling inputs such as sanitary napkins may, thus, facilitate the slow and difficult process of changing norms. This program improves attendance by 0.65-1.04 percentage points for every 1 USD spent per girl annually, which is comparable, if not somewhat higher than other cost-effective interventions for this age group.[8] Finally, the

[8]I calculate this by dividing program effects (1.5-2.4 percentage points) by the government's annual per capita napkin procurement cost (USD 2.3). Other costs are unlikely to be large given schools implement the program with existing administrative capacity. Since attendance outcomes are measured in different ways across studies, it is difficult to provide precise comparisons with other interventions. However, some back-of-the envelope calculations along similar lines provide suggestive benchmarks. Experimental findings on sanitary napkin provision in other contexts yield effects in the range of 0.33 percentage points for every 1 USD spent per girl annually (Babagoli et al., 2022). Conditional cash transfers targeted at girls in the same age group yield per dollar effects of 0.71 (Filmer and Schady, 2008) and 0.08 percentage points (Baird et al., 2011). These programs often have explicit attendance requirements which may directly drive results. Further, interventions such as the provision of school uniforms and school meals are usually targeted at younger children and may not be strictly comparable to effects on adolescents. Nevertheless, a similar calculation based on Evans and Ngatia (2021) yields an effect of 1.67 percentage points per dollar spent.

paper shows that support at initial stages of puberty when girls are in formative grades can lead to better outcomes when they are older. This highlights the need for well-timed programs that relieve gender-specific constraints. Given the launch of similar programs in other developing and developed country contexts including India, Kenya, England and Scotland, it becomes important to understand the channels of impact (Kalia, 2023; BBC News, 2017; Scottish Government, 2018; UK Government, 2023). Therefore, my results are informative and policy relevant across diverse settings.

The rest of the paper is organized as follows. Section 2 provides background information on the Kishori Scheme and Section 3 describes the data used for analysis along with descriptive statistics. Section 4 details the empirical framework and Section 5 presents results along with a discussion on these findings. Section 6 details robustness checks, Section 7 provides a mechanism analysis and Section 8 concludes.

2 Program background

In December, 2011, the Delhi government implemented the Kishori or adolescent girls' Scheme across all public schools in the state to improve the level of menstrual hygiene (Directorate of Education, Government of NCT of Delhi, 2011). Besides this, potential benefits to overall school engagement through greater presence in classes and participation in sports were also recognized (HT Correspondent, 2011). Under the program, all girls enrolled in grades 6-12 receive a free packet of ten sanitary napkins every month. Napkins are distributed at school for girls to take home. It is estimated that up to 800,000 girls may have benefitted from this endeavour with the government spending around INR 148 million (USD 1.99 million) to implement the program in 2014 (Department of Planning, Government of NCT of Delhi, 2016).

In 2011, the government ran a training and sensitization program for teachers and staff implementing the program across the state. Each school assigned a female faculty mem-

ber to oversee the functioning of the program which included tasks such as maintaining records of stock delivery and ensuring distribution. Monthly pad distribution took place exclusively in the presence of girl students within classrooms or at a central location in the school. Students would sign against their name to confirm receipt of their monthly entitlement. This helped ensure transparency in program implementation. Importantly, access to free napkins was not conditional on attendance levels.[9] Program guidelines directed schools to sensitize students about the proper use and disposal of sanitary napkins (Directorate of Education, Government of NCT of Delhi, 2011).[10]

Public schools in India charge little or no tuition fee and serve low-income families, in general. It is therefore, likely, that students' access to modern menstrual products is limited by household budget constraints. In fact, sanitary napkin use amongst the relevant student population appears to be low at the time of program launch. Data from the District Level Household and Facility Survey of 2007-08 (DLHS-3) show that sanitary napkins were being used by only around half of the girls from households lying below median wealth in Delhi. Around 61% of these girls reported using cloth (International Institute for Population Sciences, 2010).[11]

Around the time of program launch in Delhi, other states and even the Central Government explored menstrual hygiene programs of different types. However, Delhi's version is especially attractive for program evaluation given its simple and clear program design, which, importantly, remains stable over time. The Kishori program followed a school-based approach and offered free (not subsidized) napkins to a well defined target group i.e. girls in secondary grades (6-12) in state public schools. Further, at baseline Delhi ranks the highest amongst other states in terms of urban share, secondary school den-

[9]Teachers report that if girls were absent on the original day of distribution, they could collect their monthly entitlement when they came to school next.

[10]While I do not have school-level records of these sessions, anecdotal evidence suggests they were organized. Besides, it seems teachers have informal conversations with girls at the time of distribution.

[11]Figures pertain to unweighted estimates for unmarried girls aged 15-24 years who have begun menstruating and belong to households with wealth scores lying below the median level for the state of Delhi. Given that public schools in Delhi largely cater to the urban poor, it is reasonable to consider usage patterns of the below-median wealth group as a proxy for those of the population of public school-going girls. Menstrual product categories are not exclusive. Amongst the upper half of the wealth distribution, napkin use was around 86% and cloth use was around 19%.

sity and share of schools with girls toilets.[12] For the present exercise, this helps focus on the effects of free napkin distribution on school attendance since other major factors that influence the outcome variable are already addressed. Results from this study may, therefore, be lower bounds of program effects in more constrained settings.[13]

Figure 1 depicts the timeline of program implementation. The months 'before' December, 2011 constitute the pre-program period and the months between December, 2011 and November, 2016 cover a period of uninterrupted program implementation. Interestingly, the program was unexpectedly interrupted after this owing to bureaucratic issues regarding the renewal of the napkin supplier's contract. To the best of my knowledge, this was not related to any other public program. The matter was resolved almost a year later and the program resumed thereafter (Kausar, 2017). Hence, the period from December 2016 to November 2017 is labelled 'pause'.

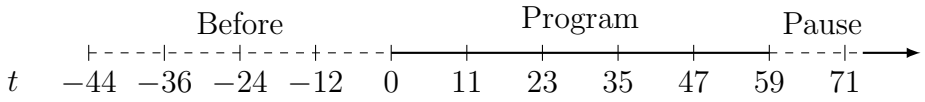


Figure 1: Kishori Scheme timeline - months since implementation

Notes: 1. This figure shows the timeline of program implementation with time measured in months since program launch in December, 2011 ($t = 0$). 2. The period where $t < 0$ is 'Before' program launch, $t \in (0, 59)$ represents the 'Program' period and $t \in (60, 74)$ represents the period during which the program is on 'Pause'. The program resumes from $t = 75$ onwards.

The government spent INR 14.5 on each packet during the initial years of the program which amounts to a per capita expenditure of INR 174 or about USD 2.3 annually (Directorate of Education, Government of NCT of Delhi, 2012, 2014a).[14] While the quality of these napkins was not identical to high-end market options, they were up to reasonable standards. A similar pack would cost INR 30-80 on the market (Kausar, 2017), amounting to an annual expense of USD 4.9-13. Even though it is unlikely that ten napkins would be enough for an entire menstrual period, free napkins would have reduced household expenditure on napkins at least partially. Moreover, this appears to come at

[12]Data from the District Information System for Education (DISE) from 2010-11 is used to compute state ranks.

[13]Alternatively, it may be the case that the other factors mentioned are important enabling conditions for large-scale program take-up. This is an empirical question that deserves further research.

[14]Per packet cost was raised to INR 17 in 2014 (Directorate of Education, Government of NCT of Delhi, 2014b).

a reasonable cost to the government.

3 Data and Descriptive Statistics

Data for this analysis spans 10 academic years from 2008 to 2017 and is sourced from the digital records of the Department of Education (DOE), Delhi.[15] This dataset provides anonymized daily aggregate attendance numbers for each grade in a school i.e. total numbers of students present or absent on a given day.[16] Limited school characteristics like gender composition (girls/boys/coeducational), district, building id and shift timing are mentioned as well. Schools record attendance for all enrolled students in physical attendance registers and are required to communicate aggregate figures to the DOE every day. Daily submission of data reduces concerns around strategic misreporting by schools. Moreover, napkin entitlement is not directly linked to girls' attendance so schools do not have any incentive to inflate their daily figures to get additional packets.

Data on school infrastructure, teacher characteristics, student composition and performance are taken from the District Information System for Education (DISE). This database provides school-level information across India using standardized variable definitions. For information on academic performance for grade 10, I use data provided by the DOE, Delhi (Education Department, Government of NCT of Delhi, 2022).

Since the school data available from the DOE does not provide a gender-wise split of daily attendance numbers, coeducational schools are excluded from the analysis. I now describe the study sample.

Sample schools

The sample consists of all pairs of single sex schools with grades 1-12 that operate out of a

[15] An academic year in Delhi starts in April of one calendar year and ends in March of the next.

[16] Attendance is recorded in four categories - present, absent, on leave or 'name struck off' (NSO). The difference between being absent and on leave is that the latter involves a prior application. The NSO tag is given to a student after a prolonged absence when the school considers them off the rolls. Schools report aggregate numbers of students in each attendance category at the grade level.

shared school building in different shifts. The girls school is held in the morning shift and boys school in the evening shift.[17] These are distinct schools with separate sets of teaching staff, but access the same physical infrastructure in the building. The sample is composed of 52 such pairs i.e. 104 schools. These schools have a combined average enrolment of over 200,000 students annually. This accounts for about 14% of the public school students in the state. Since around 83% of the schools in Delhi are single sex, sample schools are representative of the majority of schools under the state government.[18] Accounting for the shared building helps control for unobserved heterogeneity across building locations. Male and female students who share a building have access to common school infrastructure. Moreover, since assignment to schools is based on residential distance, the two groups are also likely to come from the same neighbourhoods and therefore, have similar family composition, socio-economic status and living conditions. This can be seen in Table A1 (in the Appendix) that lists pre-program school characteristics from the DISE database from 2009-10 as per data availability. These pairs of girls and boys schools are comparable in terms of resources and student composition as differences in mean values are insignificant for relevant variables. Differences are significant for the percentage female teachers and pass percentage for grade 10. It appears that girls schools almost exclusively have female teachers (91%) while boys schools have almost none (3%). This pattern remains in post-program years as well. While the difference in grade 10 pass percentage is statistically significant, the magnitude is quite small (0.7 percentage points) and may be ignored for all practical purposes.

Since the intervention is beneficial for girls in the initial stages of puberty, the main analysis focuses on the middle grades i.e. 6-9.[19] However, data from lower (3-5) and higher (10-12) grades of the same schools are used for robustness checks.[20] Table A2

[17] In the summer, the timings for the morning shift are 7:00am-12:30pm while the evening shift is from 1:00pm-6:30pm. The duration is 20 minutes less in the winter.

[18] I show that sample schools are comparable to non-sample single sex schools in Appendix B.

[19] I provide a detailed discussion of grade-wise age distribution of students in Section 5.2 of the paper.

[20] Grades 1-2 are excluded from analysis since student composition at this stage is likely to fluctuate given the dynamics around entry into schooling. Moreover, students are too young to be affected by the gendered constraints around puberty. Therefore, the attendance of younger girls does not provide a more informative counterfactual for the attendance of treated girls, compared to that of boys in the same grades.

summarizes enrolment and attendance by grade. Mean annual enrolment for grades 6-9 is around 291 students.[21] While mean enrolment for higher grades is 242 students, it is substantially smaller for lower grades at 61 students.[22] Girls schools have marginally greater enrolment than boys schools at all grades. I define a variable to denote the daily percentage of the class that is present.[23] The daily values of present percentage are averaged to get a value representing a typical day in the month.[24] This is the outcome variable used for analysis. While sample schools have an overall mean attendance rate of 78% for grades 6-9, girls schools do better than boys schools at every grade. For these grades, the average attendance gap is around 8 percentage points in favour of girls. Average attendance is 81 and 79 percent for lower and higher grades respectively. The gap in favour of girls is 6 percentage points for both lower and higher grades.

4 Empirical Framework

4.1 Estimation Strategy

4.1.1 DID estimation of program impact on attendance

Estimates of program impact on attendance are based on data from April 2008 to November 2016 (periods -44 to 59 in Figure 1) i.e. all periods before program launch and the entire period of uninterrupted program implementation from December, 2011. Since the

[21] Annual enrolment is proxied by the total number of students recorded in the attendance database i.e. students present, absent or on leave. The figure for August, a mid-year month, is considered to avoid capturing fluctuations associated with transfers at the start of the academic year. This is in line with Adukia (2017).

[22] There are many more primary schools in India as compared to secondary schools. The observed jump in enrolment for secondary grades is most likely on account of the transfer of non-DOE primary school students to DOE schools.

[23] While calculating the base for present percentage, the category 'on leave' is omitted to focus on the effect of the program on unplanned absence. Menstrual absenteeism is most likely to be of this nature. In a later robustness check, I consider an alternative definition of present percentage by incorporating students 'on leave' as well.

[24] Since months may differ in the number of total working days due to month length or school holidays, averaging in this way makes attendance data more comparable across time. Further averaging over the entire academic year would reduce the sample size drastically and is, therefore, avoided.

program is implemented at the same time across all schools, I use a two-way fixed effects (TWFE) specification to estimate a difference-in-differences (DID) model for program impact. I account for pre-existing level differences in attendance rates for girls and boys along with unit-specific factors and gender-neutral trends in attendance. Program impact is essentially the difference between girl-boy attendance gaps before and after program launch. The following TWFE specification is estimated separately for each grade (6-9) through ordinary least squares (OLS):

$$\mathrm{y}_{ibt} = \alpha + \beta \mathrm{girl}_i + \delta(\mathrm{girl}_i \times \mathrm{program}_t) + \lambda_b + \gamma_t + \epsilon_{ibt} \tag{1}$$

where y_{ibt} is the present percentage in school i in building b at month t, girl_i is an indicator for a girls school and the interaction indicates observations from girls schools that fall in the program period. The parameter λ_b denotes school building fixed effects that capture aggregate student and school specific unobservables. These fixed effects ensure that the attendance of girls and boys are compared within the same building. Parameter γ_t denotes fixed effects for months since program launch and captures time specific and seasonal variation in the outcome variable. ϵ_{ibt} represents the random error term.[25]

Following Bertrand et al. (2004), since the number of clusters is large enough ($N = 52$), standard errors are clustered at the building level to account for serial correlation in attendance across girls and boys schools that operate in the same building. Another advantage of this is to allow for cross-sectional heteroskedasticity.[26] Later, I confirm that results are robust to using cluster bootstrapped standard errors. This method works well

[25]Later, I also incorporate a school-specific linear time trend ($\pi_i t$) in equation (1) to account for different time paths of the outcome variable across schools.

[26]Bertrand et al. (2004) show that conventional DID methods understate standard errors and discuss possible remedies. Clustering essentially allows for an unrestricted variance-covariance matrix of errors over time within building. This accounts for any correlation between outcomes for girls and boys in the same building across time. I also allow for cross-sectional heteroskedasticity i.e. these matrices can differ across building.

even when the number of clusters is small (Cameron et al., 2008). The coefficient δ denotes the intent-to-treat (ITT) estimate of program impact. While napkins are provided to all girls under the program, available data does not record actual usage. ITT estimates are likely to underestimate true program effects since the study sample includes users and non-users of free napkins.

4.1.2 DID estimation of program impact on academic performance

In addition to attendance, I also consider the impact of the program on academic performance. The specification below is similar to (1), except that instead of monthly data it is estimated using annual data on pass percentage in grade 10 board examinations for school i in building b in academic year j. The interaction indicates observations for girls schools in program years, 2011-16. Pre-program years are 2008-10. I include fixed effects λ_b and γ_j for building and academic year, respectively. Standard errors are clustered at the building level. The coefficient δ denotes the differential change in girls' pass percentage compared to that of boys during program years.

$$\mathrm{y}_{ibj} = \alpha + \beta \mathrm{girl}_i + \delta(\mathrm{girl}_i \times \mathrm{program}_j) + \lambda_b + \gamma_j + \epsilon_{ibj} \tag{2}$$

I also estimate an event study version of this equation to check which years may drive impact. Coefficients δ_τ capture the differential effect on pass percentage for girls τ years after program launch. The reference category is the effect in 2010, the last untreated year. The coefficient η_{-1} is, therefore, normalized to zero.

$$\mathrm{y}_{ibj} = \alpha + \beta \mathrm{girl}_i + \sum_{\tau=-2}^{-1} \eta_\tau(\mathrm{girl}_i \times \mathrm{year}_\tau) + \sum_{\tau=0}^{6} \delta_\tau(\mathrm{girl}_i \times \mathrm{year}_\tau) + \lambda_b + \gamma_j + \epsilon_{ibj} \tag{3}$$

4.2 Discussion on Identification

The Kishori Scheme is applicable to all girls in grades 6-12 across government schools in Delhi from December, 2011. Simple before-after comparisons in attendance rates would not account for trends in attendance that operate independently from the program. In order to assess program impact, a control group of students with similar characteristics is required. Boys in the same grades as beneficiary girls are useful for this. The strategy of using males as a control group for females has been followed in Jayachandran and Lleras-Muney (2009) and Muralidharan and Prakash (2017). I am further able to refine the identification strategy by making use of the novel system of shared building for single sex schools in Delhi. As explained before, students studying in the same school building not only share common infrastructure, but are also likely to have similar background characteristics. Given these are unobserved in the main dataset, the proposed empirical strategy allows controlling for them.[27] Given the non-staggered nature of program implementation, the standard TWFE model appears most suitable for deriving DID estimates of program impact.

I add to the existing literature on the effect of menstrual product access by studying the effects of a state-run scaled-up program using a relatively long series of attendance data. Further, treatment status for schools depends on the government's decision to launch the program. This is uniform for all schools, thereby alleviating concerns around spillovers across units and time i.e. violations of the stable unit treatment value assumption (SUTVA).

4.2.1 Parallel trends assumption

Event study analysis

The identifying assumption for unbiased estimates of program impact through the DID

[27] An ideal control group in this setting may have been, for instance, girls in grades 6-12 in public schools in a neighbouring state who do not receive the napkin intervention. This strategy could not be pursued given the unavailability of similar attendance data from other states.

model is that the gender difference in attendance would have remained the same in the absence of the program. To motivate this, I check for pre-program parallel trends in attendance rates for boys and girls by estimating equation (4) using OLS. This is similar to the main DID specification, except that the binary program indicator is replaced by treatment leads and lags. As before, I incorporate building and time fixed effects, and standard errors are clustered at the building level.

$$\mathrm{y}_{ibt} = \alpha + \beta \mathrm{girl}_i + \sum_{\tau=-q}^{-1} \eta_\tau (\mathrm{girl}_i \times \mathrm{time}_\tau) + \sum_{\tau=0}^{m} \delta_\tau (\mathrm{girl}_i \times \mathrm{time}_\tau) + \lambda_b + \gamma_t + \epsilon_{ibt} \qquad (4)$$

The data span all months from April 2008 to November 2016 and the program is implemented in December, 2011. This allows 44 leads (q) and 60 lags (m) indexed by τ. The coefficient η_{-1} is normalized to 0 i.e. the last untreated month is considered as the base period. Each estimated program effect denotes the differential attendance of girls compared to boys at each point in time for a particular grade, controlling for the difference in the base period. For the parallel trends assumption (PTA) to hold, program effects for the pre-periods (η_τ) should be insignificant. If the program leads to improved attendance for girls, post-program coefficients (δ_τ) should be positive and significant.

Figure 2 plots the treatment effects for the first 12 leads and lags for grades 6-9 along with 95% confidence intervals.[28] The standard TWFE model assumes treatment effect homogeneity but this may not be true. While not a big concern in the present setting where the treatment is non-staggered, I nevertheless allow for treatment effect heterogeneity across schools and over time using the imputation method of Borusyak et al. (2021).[29] Adjusted estimates of program impact are plotted in Figure 2 as well. Pre-program OLS estimates are insignificant but not always small. However, there does not appear to be

[28] This simplification is only for visual representation. Figure A1 in the Appendix, plots OLS coefficients for all leads and lags for grades 6-9.

[29] Roth et al. (2023) discusses the recent literature on evaluating the parallel trends assumption. Most concerns are especially critical in settings where the treatment is staggered over time, which is not the case in the present setting.

any systematic upward trend in the months leading up to the program that may bias estimates of program effects in the post period. Estimates from the imputation method are still insignificant and not systematically trending upward. Hence, the PTA is not rejected.

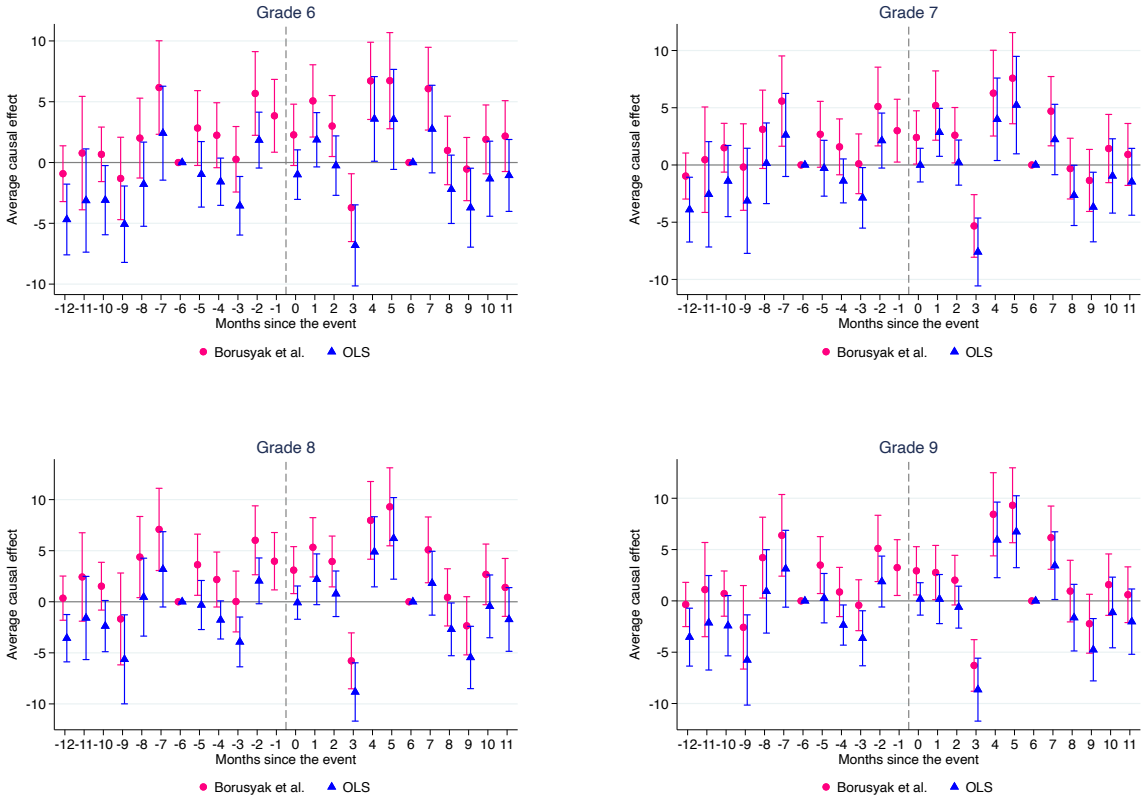


Figure 2: Event Study analysis of Program Impact on Attendance

Notes: 1. These figures show the test for pre-program parallel trends in attendance for girls and boys through an event study model using OLS estimation of equation (4) with the base November, 2011, and the robustness of these results using the imputation method of Borusyak et al. (2021). Point estimates represent the differential attendance for girls compared to boys at each point in time, controlling for the difference in the base period. 2. While coefficients for all time periods are estimated, only the first 12 leads and lags are shown here. The zero coefficients 6 months before and after program launch are from a month of summer vacation where no attendance data exists. 3. Building and time fixed effects are included and standard errors are clustered at the building level. 4. 95% confidence intervals are plotted.

Falsification tests

Additionally, I check for pre-trends by assigning a placebo treatment time in the pre-period. Using data prior to December, 2011, when the program was actually launched, I repeatedly estimate equation (1) by assuming that the first treated period varies over months of academic year 2009 i.e. from April, 2009 to March, 2010 or $\tau \in [-32, -21]$. Table A3 shows the estimation results for each grade and treatment timing. Program effects are insignificant for all models except for grades 8 and 9 when treatment begins

in March, 2010.

4.2.2 Other concerns

The following remaining concerns are discussed in detail in Appendix C. One, the proposed identification strategy compares girls who study in the morning shift with boys who study in the evening shift. Despite this collinearity, I discuss that it is unlikely that estimates of program impact are confounded by school timing. Second, while the main outcome variable is the share of students present, results may be biased if enrolment also responds to the program. I show that there are no significant changes in enrolment in the study period. Third, on the confounding effects of other programs, I argue that these are either launched before the Kishori Scheme, or too late in the study period to affect estimates of program impact.

In Section 6, I address the general concern that program effects are driven by contemporaneous gender-specific changes in school-level factors or other programs by estimating a triple differences specification using lower grades as an additional control group for grades 6-9.

5 Results

5.1 Estimates of Program Impact

For specification (1), Table 1 details regression results. Grades 6-9 show positive and significant program impact ranging between 1.5 and 2.4 percentage points as evident from the estimated δ coefficients. These represent effects between 0.12-0.19 standard deviations. Positive coefficients at a grade imply that, on average, when the program is operational, present percentage in that grade is higher for girls schools as compared to

boys, after controlling for pre-program attendance differences. Multiplying δ with the relevant average grade size shows that between 4-7 additional girls out of about 265, each from grades 6-9, are present in a typical school on any given day while the program is operational. Results are robust to using cluster bootstrapped standard errors, incorporating a school-specific linear time trend and to the exclusion of unusual months.[30,31,32] Moreover, results are qualitatively similar on using the full set of public schools as well.[33]

Table 2 shows the impact of the program on pass percentage for the board examinations in grade 10 using equation (2). During program years, pass percentage improves significantly by 2.9 percentage points for girls compared to boys. Disaggregating by year with 2010 as the reference category (equation (3)), Table A6 shows that these effects are concentrated in 2013-2016 i.e. two years after program launch.

Table 1: Program Impact on Attendance

Dependent variable = Present percentage				
	Grade 6	Grade 7	Grade 8	Grade 9
Girl × Program	1.539*	1.895*	2.426**	1.877*
	(0.892)	(0.953)	(0.991)	(1.015)
Building FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Girl Pre-Program Mean	85.243	86.121	85.697	87.121
Observations	8,675	8,597	8,609	8,602
Adj. R square	0.525	0.561	0.553	0.575

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
1. This table reports coefficients of program impact on girls' attendance based on estimating equation (1) using data from the DOE attendance database (2008-16).
2. The base category is boys before program launch.
3. Robust standard errors clustered at the building id level are reported.

[30]Results are robust to using cluster bootstrapped standard errors as suggested by Cameron et al. (2008). As Table A4 shows, the p-values of estimated δ coefficients from a wild bootstrap are, in fact, lower for grades 6-8 and marginally higher for grade 9 (still significant at 10%). Therefore, significant coefficients are not likely to be on account of understated standard errors due to serial correlation in outcomes.

[31]Table A5 shows that results for grades 6-8 are robust to the inclusion of a school-specific time trend that accounts for different time paths of outcomes across schools. The coefficient for grade 9 is qualitatively similar but significant at 15%. This assuages concerns regarding program effects being driven by baseline differences in school characteristics.

[32]Results are robust to the exclusion of the months of summer vacation and final exams i.e. May-June and March, respectively. These are unusual months where fewer working days exist. Results are available upon request.

[33]The results for grades 7-9 are robust to estimating equation (1) for the entire set of public schools. Program impacts range between 0.8-1.2 percentage points and are statistically significant. The coefficient for grade 6 is insignificant but positive. Results are available upon request. These findings confirm that sample schools are indeed representative of the school system. However, this is not my preferred specification since it pools together schools with vastly different grade composition, and, therefore, heterogeneous student entry and exit dynamics.

Table 2: Program Impact on Academic Performance

Dependent variable = Pass percentage	Grade 10
Girl × Program	2.931**
	(1.450)
Building FE	Yes
Year FE	Yes
Girl Pre-Program Mean	79.201
Observations	861
Adj. R square	0.308

Standard errors in parentheses;
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
1. This table reports coefficients of program impact on girls' academic performance based on estimating equation (2) using data from the DOE School Information Records (2008-16).
2. The base category is boys before program launch.
3. Robust standard errors clustered at the building id level are reported.

5.2 Discussion

On program impact, the key finding is that girls in grades 6-9 experience positive and significant gains in daily attendance during program years. I now provide some background to motivate why this result is plausible.

Estimates of the average age at menarche or first menstrual period range between 12.4 and 13.8 years for the population of interest (Khadgawat et al., 2016; Pathak et al., 2014). In Figure A2, I plot a grade-wise age distribution for students enrolled in government institutions in Delhi based on the second round of the India Human Development Survey (IHDS-II) from 2011-12. Estimates of the mean age at menarche are also plotted. It appears that most girls experience their first period in grades 6-9. It may well be the case that girls struggle while transitioning through puberty and support from school programs like Kishori is most useful at this time. Positive and significant program effects at these grades are, therefore, as expected.

Moreover, it is promising to establish the tangible benefits of girls' participation in school on a later life outcome. The program leads to positive and significant improvement in grade 10 pass percentage for girls. Further, these changes show up two years after initial

program launch and not immediately. Girls in grade 10 in these years belong to cohorts that benefit from the program in middle grades. It may be that access to the program improves attendance in those grades, which contributes later to better performance at grade 10.

These results highlight the short and potentially longer term value of well-timed interventions that relieve specific constraints for girls. The program may be especially attractive given that the input provided is relatively low-cost and addresses a constraint that is near universally experienced by all girls.[34] Attendance improves by 0.65-1.04 percentage points for every 1 USD spent per girl annually, which is in line with findings from other sanitary napkin interventions and programs such as conditional cash transfers and provision of school uniforms (Babagoli et al., 2022; Filmer and Schady, 2008; Baird et al., 2011; Evans and Ngatia, 2021). In fact, estimates of program impact from single sex schools in a relatively better-off urban context like Delhi may be lower bounds of effects in settings with stricter menstrual norms, poorer infrastructure and more limited product access. It also remains possible that at least some of these factors serve as important enabling conditions for program impact.

6 Robustness Checks

As discussed earlier, the program is likely to be most useful to girls in the initial stages of puberty i.e. in grades 6-9. I show that there are no significant program effects for lower or higher grades. The main results on program impact are robust to alternative specifications and variable definitions. These checks include incorporating an additional control group to rule out contemporaneous gender-specific changes in attendance, using an alternative attendance variable as the outcome and confirming that the program affects the kind of unplanned absenteeism menstruation is likely to be associated with.

[34]The cost of other program expenses is difficult to ascertain. However, since awareness sessions are run by existing school teachers, it is unlikely that these add substantially to overall cost.

6.1 Heterogeneity by grade

Figure A2 shows that students in grade 5 or below are most likely to be pre-puberty. This is near certain for girls in grades 1-2 and there may be a small chance that girls in grades 3-5 experience their first period at this time. Thus, grades 1-2 can be excluded from analysis as students do not face the same constraints as those in pubertal grades. Lower grades include 3-5. Higher grades are 10-12 and the figure further shows that girls have attained menarche by the time they enter these grades.

I estimate equation (1) for each of the lower and higher grades as well.[35] Since younger girls are not program beneficiaries, this is a placebo test. Table A7 shows that their attendance, expectedly, does not respond to the intervention.[36] Even though girls in higher grades benefit from the program, the table shows that there are no significant program effects for them. Figure 3 plot DID coefficients for all grades with 90 and 95% confidence intervals.

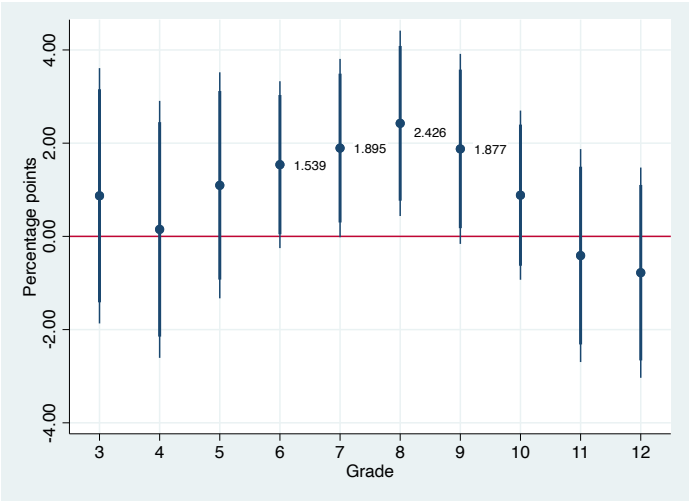


Figure 3: Program Impact on Attendance: Grades 3-12

Note: 1. DID coefficients (δ) from estimating equation (1) for grades 3-12 are plotted with 90 and 95% confidence intervals. For each grade, the coefficients represent the differential attendance for girls compared to boys, controlling for the difference in the pre-program period. 2. The base category is boys before program launch. 3. Tables 1 and A7 presents complete regression results.

The lack of program impact for older girls in grades 10-12 could be on account of a few

[35]Following the analysis of pre-program parallel trends for grades 6-9 in Section 4.2.1, Figures A3 and A4 similarly plot OLS coefficients for lower and higher grades, respectively. There are no systematic pre-program patterns in either of these graphs that lead to the rejection of the parallel trends assumption.

[36]DID coefficients for grades 1-2 are also insignificant. Results available upon request.

reasons. One possibility is that they have had more time to adjust to menstruation and may be better equipped to manage their period by this time. Therefore, the provision of free sanitary napkins may not appreciably affect their attendance even if it raises general well-being on dimensions I cannot measure with my data. Moreover, the cost of missing school may be higher at senior grades given the demands of the curriculum in preparing for the subsequent national-level board examinations. However, it could also be that the most vulnerable girls, who are likely to benefit most from the program, drop out of school before reaching these grades. Therefore, conditional on enrolment, girls in higher grades do not exhibit any attendance gains from the program.

6.2 Additional Control Group: Triple Differences

I estimate a triple differences model of program impact to check if DID results are driven by gender-specific improvements in attendance during the same time for reasons other than the Kishori program. I use students in primary grades (3-5) as an additional control group in the following specification:

$$\begin{aligned} \mathrm{y}_{ibcgt} = \alpha + \beta_1 \mathrm{girl}_i + \sum_g \beta_{2g} \mathrm{grade}_g + \beta_3 \mathrm{program}_t + \sum_g \beta_{4g} (\mathrm{girl}_i \times \mathrm{grade}_g) \\ + \beta_5 (\mathrm{girl}_i \times \mathrm{program}_t) + \sum_g \beta_{6g} (\mathrm{program}_t \times \mathrm{grade}_g) \\ + \sum_g \delta_g (\mathrm{girl}_i \times \mathrm{grade}_g \times \mathrm{program}_t) + \lambda_b + \gamma_t + \phi_c + \epsilon_{ibcgt} \end{aligned} \tag{5}$$

where y_{ibcgt} is the present percentage for cohort c in grade g in school i in building b at time t. The variables grade_g are indicators for each of grades 6-9, with lower grades (3-5) as the reference category. I include cohort fixed effects (ϕ_c) to control for any cohort-specific differences in attendance. A cohort is defined as a group of students that transitions through the school system together. For instance, students who are in grade 6 in 2011

move into grade 7 in 2012 and so on. The other terms are as before and standard errors are clustered at the building level. The variable program_t denotes the post-treatment period and will get dropped due to collinearity with the time fixed effects, γ_t. The coefficients of interest are δ_g for each grade. These represent the differential impact of the program for girls in grade g as compared to boys in the same grade, controlling for changes in the attendance gap for students in lower grades. Girls in grades 3-5 are not treated by the program, but start becoming aware of puberty and menstruation related constraints at this time, as discussed earlier. Their attendance may respond to any non-program changes in similar ways as that of older girls. These changes may include, for instance, the availability of sex-specific toilets, which benefit girls more than boys. Therefore, using this reference category helps net out contemporaneous gender-specific factors that are not driven by the program.[37]

For specification (5), Table A8 lists the three-way interaction coefficients for each grade. Similar to the results from the main specification, the program has positive effects ranging from 1.3-2.2 percentage points. Effects are statistically significant for grades 7-9. This suggests that program impact is not driven by other factors. Moreover, there are no significant changes in school infrastructure, teacher characteristics or student characteristics for girls schools during the study period (Table A9).[38]

6.3 Alternative definition of Attendance

As mentioned previously, in calculating the outcome variable for attendance, I use the total number of students present or absent as the base. DOE data also provides infor-

[37]I do not use Grades 1-2 as the control group because they are not structurally similar to the treated older students. At this early stage, entry into school is important and gendered patterns of attendance including those related to puberty may not be relevant. Thus, incorporating grades 1-2 does not capture the effects of non-program factors on girls in the grades of interest.

[38]I estimate equation (2) using DISE data for 2008-15 to construct outcome variables that measure the total numbers of classrooms and teachers available per 100 students; percentage of female teachers, teachers who are graduates and above, and students from disadvantaged groups. Since data on boys toilets are not available for 2008-2009, the analysis on toilet availability is based on data from 2010-2015. I omit academic year 2016 since the program is interrupted in this year.

mation on the number of students on leave on a given day. While the absent category captures unplanned absences, the leave category is used when a prior application has been submitted by the student i.e. for planned absences. An alternative outcome variable may proxy enrolment as the total number of students present, absent or on leave, and use this as the base of the present percentage variable. Table A10 shows results from estimating a triple differences specification of program impact using this alternative dependent variable. Program effects are positive and significant for grades 6-9 and are also of similar magnitude.

6.4 Planned versus Unplanned Absenteeism

Using data on planned and unplanned absences, as described above, I create additional outcome variables capturing absent percentage and leave percentage i.e. the share of students absent or on leave, respectively. Given the nature of menstrual absenteeism, it seems reasonable that individuals do not know beforehand exactly when they may need to miss school due to their period and are, therefore, unlikely to submit a prior application for leave on this account. Therefore, the program is expected to lower unplanned but not planned absenteeism. Table A11 shows results from estimating a triple differences specification of program impact using the two outcome variables. The first column shows that unplanned absence is significantly lower for girls in grades 7-9 during program years. The second column shows no significant changes in planned absence for these grades. These findings suggest that the program is likely to have operated as expected and played a role in preventing absenteeism due to unexpected period-related issues.

7 Mechanisms

I consider three possible mechanisms through which the program may have impact. The first is by improving mobility on account of access to sanitary napkins; the second is by

creating a more supportive school environment for menstruating girls; and the third is by raising health capital for girls by facilitating better menstrual hygiene and lower morbidity. These are motivated by anecdotal evidence based on conversations with stakeholders in the education system. Teachers implementing the Kishori Scheme at schools in East Delhi had the following to say about the program when interviewed in May 2016: *"Before the Scheme, girls used cloth but now most use pads. They come from large families and often don't have the money to spare for pads. Although, one packet is not enough, they manage. Girls come to collect pads regularly now and also share their problems. We start awareness sessions with girls from class 6."* Regarding the benefits from such sessions, another teacher said *"There has been a change in the mindset of teachers who used to hide the issue earlier."* A newspaper report from 2017 quotes the vice-principal of a government school in Delhi in giving credit to the scheme for having helped girls *"maintain personal hygiene, kept them [girls] regular in school, and eased the financial burden of some really poor families."* Further discussing the issue of the withdrawal of the program, she added that prior to the introduction of the program, teachers would send girls home when on their period. They may have had to revert back to this practice owing to the non-functionality of the program (Kausar, 2017).

As mentioned earlier, the program is withdrawn for about a year owing to bureaucratic issues (See Figure 1). I exploit this temporary withdrawal to identify the main channel of program impact on attendance using the following DID specification for each grade.

$$\mathrm{y}_{ibt} = \alpha + \beta \mathrm{girl}_i + \delta(\mathrm{girl}_i \times \mathrm{pause}_t) + \lambda_b + \gamma_t + \epsilon_{ibt} \tag{6}$$

where the interaction denotes observations from girls schools during the Pause period i.e. from December, 2016 to November, 2017. The reference category for this specification is boys in the pre-program period. Building and time fixed effects are as before and standard errors are clustered at the building level. The coefficient δ denotes the differential change

in girls' attendance compared to that of boys in the pause versus pre-program periods for each grade.

Table 3 shows that there are no significant δ coefficients, i.e. attendance during the pause period becomes comparable to pre-program levels. The gains in attendance for grades 6-9 during program years appear to be lost during the one year in which the program is paused.[39] It seems plausible that the channels of improved school environment and health capital would continue to operate even if access to napkins is withdrawn, at least in the short run. Findings suggest that the primary mechanism of impact may then be access to sanitary napkins. While the other two channels may also be operational, they may not be able to sustain program impact without the enabling input that the program provides.[40] Perhaps access to critical inputs can initiate and support long-term changes in norms and other important outcomes that may not be sustainable on their own.

Table 3: Impact of Program Withdrawal on Attendance

Dependent variable = Present percentage	Grade 6	Grade 7	Grade 8	Grade 9
Girl × Pause	-1.734	-1.186	-0.662	-1.018
	(1.912)	(2.168)	(2.181)	(2.136)
Building FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Girl Pre-Program Mean	85.243	86.121	85.697	87.121
Observations	4,707	4,606	4,623	4,612
Adj. R square	0.448	0.472	0.466	0.466

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
1. This table reports coefficients of program impact on girls' attendance based on estimating equation (6) using data from the DOE attendance database (2008-11 and 2016-17).
2. The base category is boys before program launch.
3. Robust standard errors clustered at the building id level are reported.

Program Impact by District Wealth

If the program does indeed operate via the channel described above, economically disadvantaged students should benefit more from free napkins. Using DLHS-3 (2007-08) data, I rank districts based on the mean wealth of households that lie below the state's median wealth. As explained before, this is likely to capture the households with children in public school. The four districts with the lowest wealth are classified as Poor while the

[39]There are no significant δ coefficients for lower or higher grades either. Therefore, it is unlikely that attendance for grades 6-9 falls due to some other school-level factors.

[40]It does remain possible that attendance drops in response to a sudden withdrawal of the program and would have stabilized if girls had been given more time to adjust to the shock. I cannot test for this with available data since the program resumed in about a year.

remaining five are Rich districts. Table A12 shows results from estimating equation (1) for the two subsamples. While program effects are positive and statistically significant for all grades in Poor districts, they are lower in magnitude and insignificant for Rich districts.[41] This provides suggestive evidence in favour of the proposed mechanism for program impact.

8 Conclusion

Biological events and available institutional support to manage them are critical in determining women's economic participation. Much of the discussion in this space has centred around childbirth and related policies. Puberty is another major event that may be associated with restrictive sociocultural norms in many societies and can determine how adolescent girls engage with the world. Schooling is one of the most important dimensions where effects may manifest.

Given the many benefits of female education, policymakers and researchers focus on enrolment and subsequent school attendance for girls, especially at the secondary level where many diverse factors may start pulling them away from school. In this paper, I evaluate whether gender-specific transfers from governments have a role to play in ensuring school participation for adolescent girls as they transition through puberty. The Delhi government's Kishori Scheme presents an opportunity to study the impact of a free sanitary napkin distribution program on female school attendance. Using a DID specification with boys as a control group for girls, I find that the program significantly benefits girls in grades 6-9. Most girls get their first period in these grades and probably struggle with a new set of constraints at this time. These are likely to be formative years when ensuring engagement in school is critical in determining future economic participation. The result on improved academic performance at grade 10 from cohorts that benefit from the program in pubertal grades points in this direction.

[41] The coefficient of program impact for Grade 8 is significant at 10% for the Rich districts.

While access to napkins seems critical for impact on attendance, it is likely that the program also sets the stage for a more supportive school environment and possibly improved health capital for girls, even if these channels are not strong enough in themselves to sustain higher attendance in the short run. Efforts to encourage more positive behaviour around menstruation might take longer to show effect and should continue nonetheless. Low-cost interventions such as Kishori may provide effective ways to facilitate this process. Regular information sessions for both girls and boys could further help foster support groups and prepare children better for future years. The Delhi government has already taken positive steps in this direction by organizing 'period talks' with girls through NGOs (NDTV, 2017).

As always, context and local realities should determine the precise nature of the intervention. Broadly, I make a case for well-timed interventions that address specific constraints for girls as a way to influence participation in the short run and perhaps even enable longer term changes. I also conjecture that effect sizes may be more pronounced in regions where infrastructure, income and norms are more constrained. This would be worth confirming through formal analysis in rural India or other geographies.

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Appendices

A Additional Figures and Tables

A.1 Figures

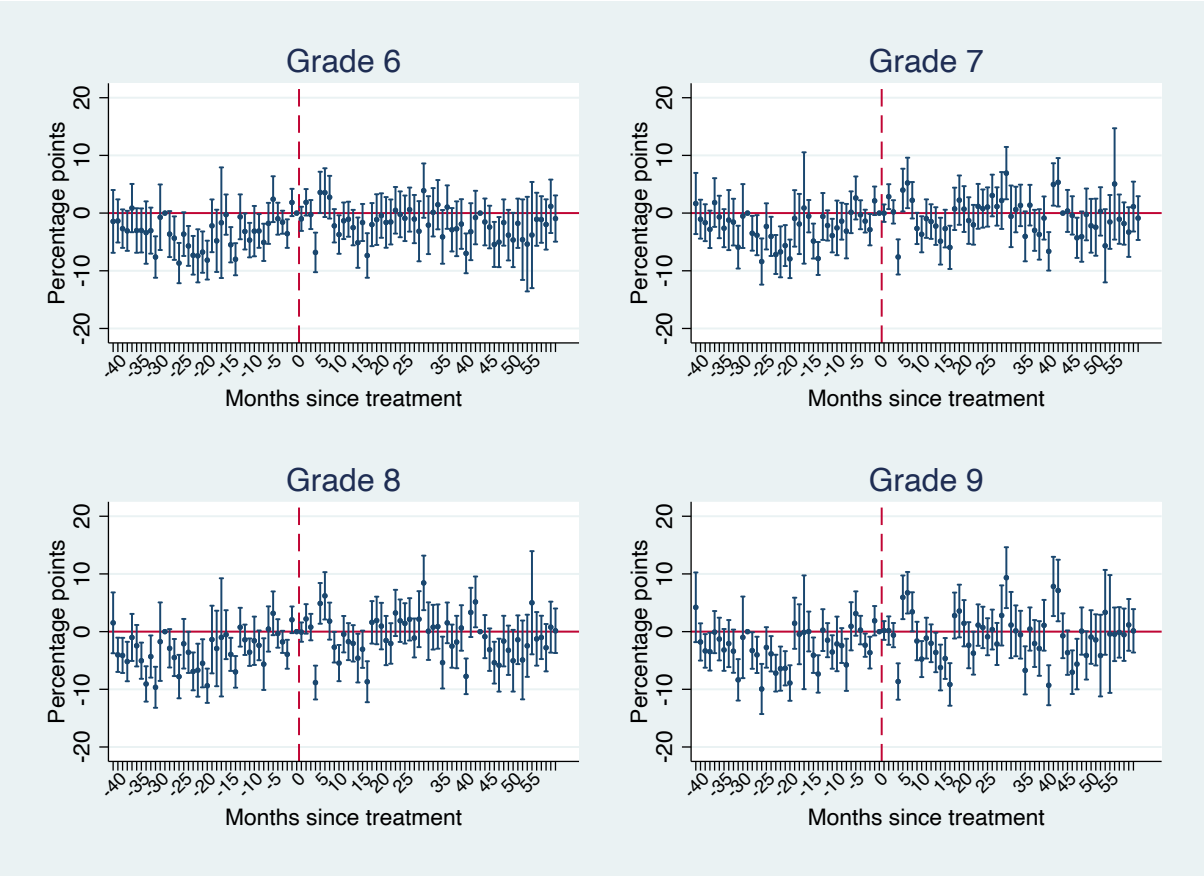


Figure A1: Event Study analysis of Program Impact on Attendance: Grades 6-9

Notes: 1. These figures show the test for pre-program parallel trends in attendance for girls and boys through an event study model using an OLS estimation of equation (4) with the base November, 2011. Point estimates represent the differential attendance for girls compared to boys at each point in time, controlling for the difference in the base period. 2. Building and time fixed effects are included and standard errors are clustered at the building level. 3. 95% confidence intervals are plotted.

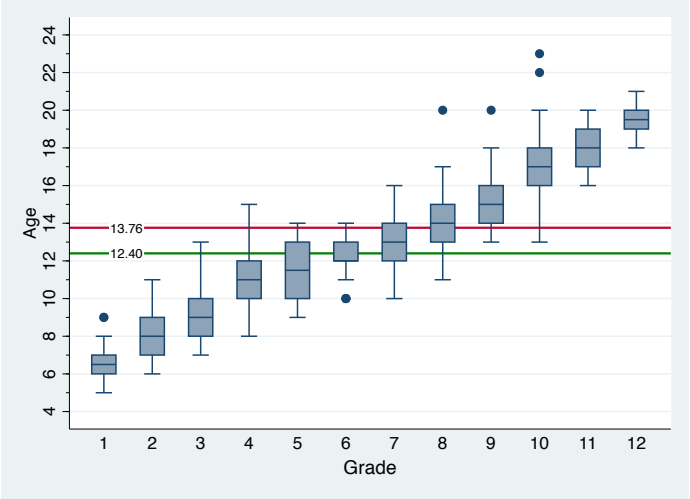


Figure A2: Age distribution for female students in Delhi by grade

Note: 1. This figure shows the age distribution of female students enrolled in government institutions in Delhi based on data from IHDS-II (2011-12). Each box represents the 25^{th}, 50^{th} and 75^{th} percentiles of age for the grade. 2. Lines at 12.40 and 13.76 years represent two estimates of mean menarcheal age for the relevant population (Khadgawat et al., 2016; Pathak et al., 2014).

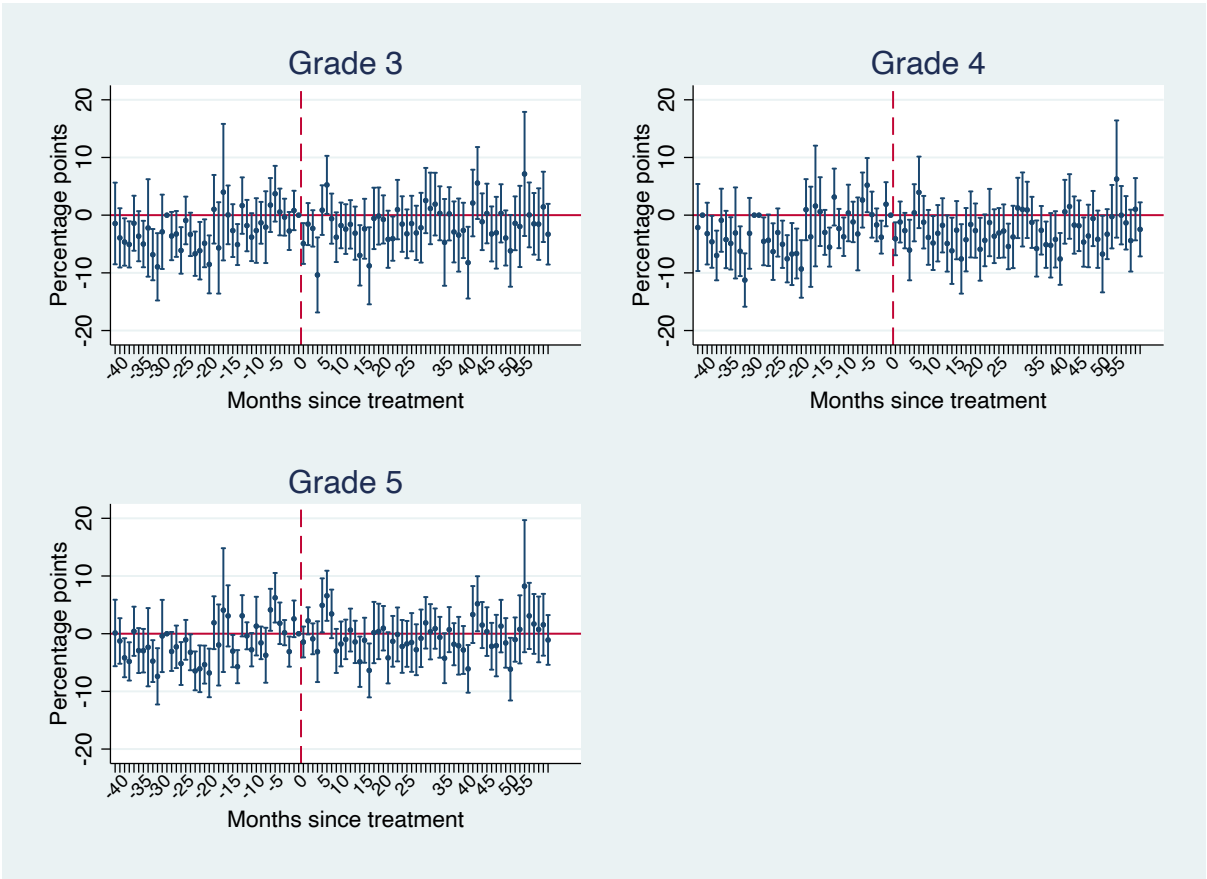


Figure A3: Event Study analysis of Program Impact on Attendance: Grades 3-5

Notes: 1. These figures show the test for pre-program parallel trends in attendance for girls and boys through an event study model using an OLS estimation of equation (4) with the base November, 2011. Point estimates represent the differential attendance for girls compared to boys at each point in time, controlling for the difference in the base period. 2. Building and time fixed effects are included and standard errors are clustered at the building level. 3. 95% confidence intervals are plotted.

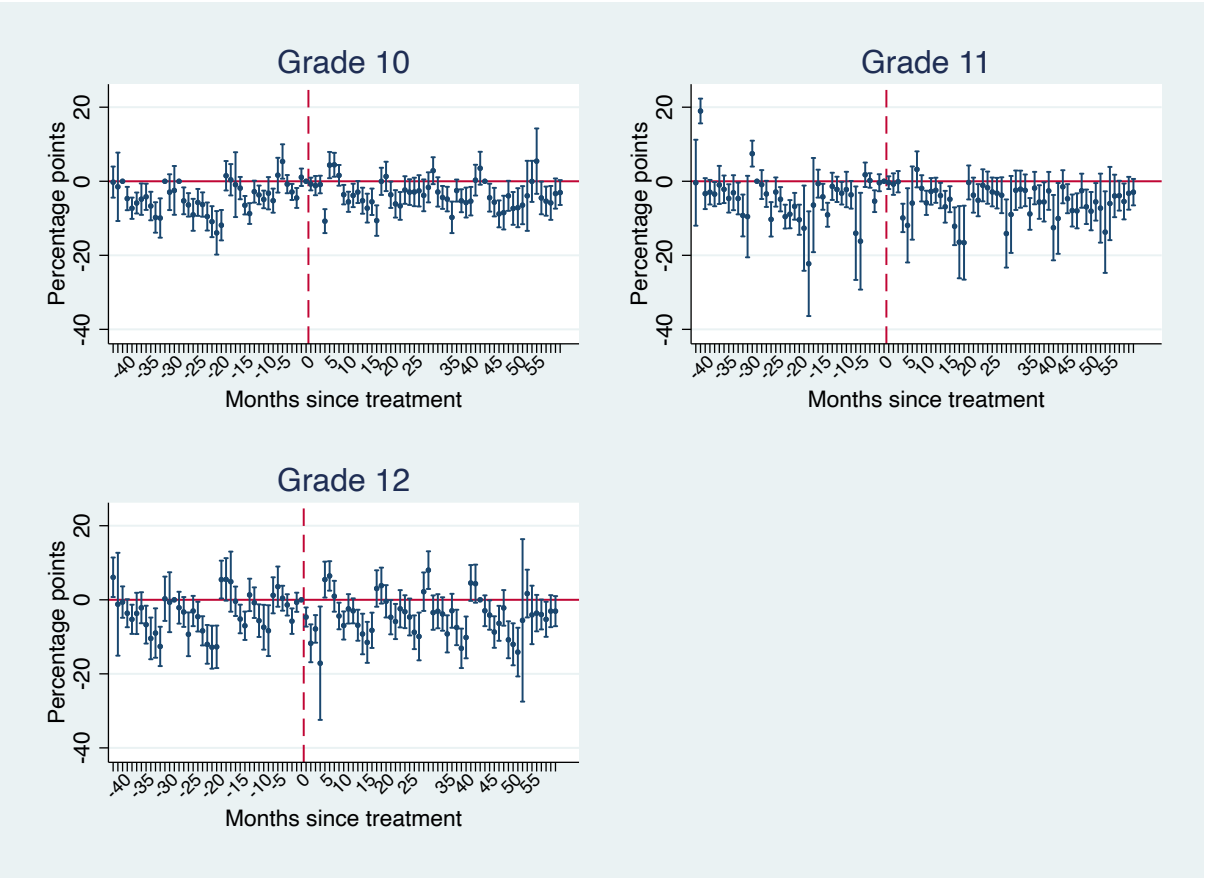


Figure A4: Event Study analysis of Program Impact on Attendance: Grades 10-12

Notes: 1. These figures show the test for pre-program parallel trends in attendance for girls and boys through an event study model using an OLS estimation of equation (4) with the base November, 2011. Point estimates represent the differential attendance for girls compared to boys at each point in time, controlling for the difference in the base period. 2. Building and time fixed effects are included and standard errors are clustered at the building level. 3. 95% confidence intervals are plotted.

A.2 Tables

Table A1: Pre-program School Characteristics

	Boys	Girls	Boys - Girls	p-value
2010				
Classrooms per 100 students	1.44	1.38	0.06	0.56
Classrooms in good condition per 100 students	0.73	0.57	0.16	0.25
Medical checkup	0.43	0.43	0.00	0.97
Boundary wall	0.87	0.92	-0.05	0.41
Toilets (gender-specific)	11.67	13.33	-1.66	0.38
Toilets per 100 students	0.69	0.69	-0.00	0.99
Teachers per 100 students	1.30	1.37	-0.07	0.38
% female teachers	3.44	91.37	-87.94	0.00
% teachers graduate and above	92.52	95.10	-2.57	0.19
% disadvantaged group students	14.40	17.34	-2.93	0.16
Grade 10 pass %	98.64	99.36	-0.71	0.00
2009				
% students failing (grades 1-8)	2.90	3.18	-0.28	0.77
Grade 5 pass %	99.95	99.32	0.63	0.25
Grade 8 pass %	80.52	80.37	0.15	0.96

1. This table reports mean values of baseline school characteristics for 104 sample schools using data from the District Information System for Education (DISE), DOE School Information records and the DOE attendance database, as per data availability.
2. The p-value for an F-test of equality of means for Boys and Girls schools is reported for each characteristic.
3. Disadvantaged groups include scheduled castes (SC), scheduled tribes (ST) and other backward classes (OBC).

Table A2: Mean Enrolment and Present percentage for sample schools

Grade	Enrolment			Present percentage		
	Boys	Girls	All	Boys	Girls	All
3	53	66	60	76	83	80
4	54	66	61	78	84	82
5	56	68	63	80	85	83
6	263	290	277	74	82	78
7	264	290	277	74	82	78
8	263	293	279	74	82	78
9	325	335	330	74	83	79
10	211	245	229	78	85	82
11	266	299	283	73	79	76
12	188	240	215	75	81	78
Lower (3-5)	54	67	61	78	84	81
Middle (6-9)	279	302	291	74	82	78
Higher (10-12)	222	261	242	76	82	79
All	203	223	213	75	83	79
N schools	52	52	104	52	52	104

1. This table reports grade-wise mean enrolment and present percentage for sample schools using data from the DOE attendance database (2008-16).
2. Enrolment is proxied by the total number of students present, absent or on leave. The figure for August of each year is considered to avoid capturing fluctuations associated with the start of the academic year.
3. Present percentage is defined as $\frac{\text{present}}{\text{present + absent}} \times 100$.

Table A3: Program Impact on Attendance: Placebo Treatment

Dependent variable = Present percentage				
	Grade 6	Grade 7	Grade 8	Grade 9
Treat at -32	-0.940	-1.361	1.611	-0.450
	(1.076)	(1.141)	(1.135)	(1.082)
Treat at -31	-1.114	-1.465	1.433	-0.550
	(1.124)	(1.143)	(1.163)	(1.102)
Treat at -30	-1.239	-1.601	1.278	-0.580
	(1.138)	(1.174)	(1.183)	(1.099)
Treat at -29	-1.239	-1.601	1.278	-0.580
	(1.138)	(1.174)	(1.183)	(1.099)
Treat at -28	-1.133	-1.366	1.148	-0.475
	(1.120)	(1.114)	(1.152)	(1.069)
Treat at -27	-0.962	-1.129	1.236	-0.288
	(1.095)	(1.069)	(1.126)	(1.045)
Treat at -26	-0.279	-0.338	1.748	0.625
	(1.079)	(1.068)	(1.150)	(1.028)
Treat at -25	-0.246	-0.353	1.550	0.599
	(1.087)	(1.089)	(1.174)	(1.035)
Treat at -24	0.029	-0.158	1.546	0.709
	(1.098)	(1.095)	(1.183)	(1.045)
Treat at -23	0.488	0.400	1.945	1.218
	(1.117)	(1.108)	(1.214)	(1.077)
Treat at -22	0.915	0.857	2.287*	1.609
	(1.178)	(1.150)	(1.258)	(1.121)
Treat at -21	1.269	1.187	2.502*	1.996*
	(1.225)	(1.208)	(1.346)	(1.164)
Building FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
1. This table reports coefficients of placebo program impact on girls' attendance based on estimating a specification similar to equation (1) using data from the DOE attendance database (2008-11) prior to actual program launch in December, 2011. Placebo treatment timing varies from April, 2009 to March, 2010 i.e. $\tau \in [-32, -21]$. DID coefficients are reported for each model for each grade.
2. The base category for each regression is boys before the start of the placebo treatment.
3. Robust standard errors clustered at the building id level are reported.

Table A4: Program Impact on Attendance: Cluster Bootstrapped standard errors

Dependent variable = Present percentage	Grade 6	Grade 7	Grade 8	Grade 9
Girl × Program	1.539	1.895	2.426	1.877
Building FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Bootstrapped p-value	0.078	0.040	0.018	0.073
Girl Pre-Program Mean	85.243	86.121	85.697	87.121
Observations	8,675	8,597	8,609	8,602
Adj. R square	0.525	0.561	0.553	0.575

1. This table reports coefficients of program impact on girls' attendance based on estimating equation (1) using data from the DOE attendance database (2008-16).
2. The base category is boys before program launch.
3. Standard errors clustered at the building id level.
4. Bootstrapped p-values are reported for the coefficient of Girl × Program based on Cameron et al. (2008).

Table A5: Program Impact on Attendance: Alternative Specification

Dependent variable = Present percentage	Grade 6	Grade 7	Grade 8	Grade 9
Girl × Program	2.738**	2.509*	2.506*	1.792
	(1.263)	(1.267)	(1.291)	(1.186)
Building FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
School-specific linear time trend	Yes	Yes	Yes	Yes
Girl Pre-Program Mean	85.243	86.121	85.697	87.121
Observations	8,675	8,597	8,609	8,602
Adj. R square	0.606	0.645	0.637	0.658

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
1. This table reports coefficients of program impact on girls' attendance based on estimating a specification similar to equation (1) using data from the DOE attendance database (2008-16). Along with building and time fixed effects, a school-specific linear time trend is also incorporated.
2. The base category is boys before program launch.
3. Robust standard errors clustered at the building id level are reported.

Table A6: Program Impact on Academic Performance: By year

Dependent variable = Pass percentage	Grade 10
Girl × 2008	0.335
	(2.324)
Girl × 2009	1.870
	(1.881)
Girl × 2011	0.578
	(0.436)
Girl × 2012	0.234
	(0.463)
Girl × 2013	1.760*
	(0.969)
Girl × 2014	4.368***
	(1.178)
Girl × 2015	5.638*
	(3.062)
Girl × 2016	9.064***
	(1.743)
Building FE	Yes
Year FE	Yes
Girl 2010 Mean	99.352
Observations	861
Adj. R square	0.324

Standard errors in parentheses;
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
1. This table reports coefficients of program impact on girls' academic performance based on estimating equation (3) using data from the DOE School Information Records (2008-16).
2. The base category is boys in year 2010.
3. Robust standard errors clustered at the building id level are reported.

Table A7: Program Impact on Attendance: Heterogeneity by grade

Dependent variable = Present percentage	Lower			Higher		
	Grade 3	Grade 4	Grade 5	Grade 10	Grade 11	Grade 12
Girl × Program	0.871	0.151	1.096	0.884	-0.412	-0.779
	(1.364)	(1.373)	(1.206)	(0.904)	(1.138)	(1.123)
Building FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Girl Pre-Program Mean	88.010	89.116	89.556	87.006	84.063	83.984
Observations	7,388	7,351	7,278	8,537	8,307	8,126
Adj. R square	0.538	0.535	0.544	0.415	0.496	0.399

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
1. This table reports coefficients of program impact on girls' attendance based on estimating equation (1) using data from the DOE attendance database (2008-16).
2. The base category is boys before program launch.
3. Robust standard errors clustered at the building id level are reported.

Table A8: Program Impact on Attendance: Triple Differences

Dependent variable = Present percentage	
Grade 6 × Program × Girl	1.298 (0.973)
Grade 7 × Program × Girl	1.702* (0.946)
Grade 8 × Program × Girl	2.221** (0.976)
Grade 9 × Program × Girl	1.522* (0.885)
Building FE	Yes
Cohort FE	Yes
Time FE	Yes
Observations	56,500
Adj. R square	.475

Standard errors in parentheses;
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
1. This table reports coefficients of program impact on girls' attendance based on estimating equation (5) using data from the DOE attendance database (2008-16). Students in lower grades (3-5) are incorporated as an additional control group.
2. The base category is boys in lower grades (3-5) before program launch.
3. Robust standard errors clustered at the building id level are reported.

Table A9: Program Impact on School Characteristics

	Per 100 students			Percentage		
	Classrooms	Toilets	Teachers	Female Teachers	Teachers who are graduates and above	Students from Disadvantaged groups
	(1)	(2)	(3)	(4)	(5)	(6)
Girl × Program	0.017 (0.065)	-0.106 (0.099)	-0.051 (0.069)	2.232 (1.447)	-1.651 (1.043)	1.152 (1.033)
Building FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Girl Pre-Program Mean	1.469	0.588	1.942	91.941	95.232	16.693
Observations	795	605	795	797	797	797
Adj. R square	0.533	0.597	0.809	0.968	0.223	0.749

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
1. This table reports coefficients of program impact based on estimating equation (2) with school characteristics as outcome variables using data from the DISE database (2008-15). The regression for toilet availability is based on data from 2010-2015 due to data limitations.
2. The base category is boys before program launch.
3. Robust standard errors clustered at the building id level are reported.

Table A10: Program Impact on Attendance: Alternative Present Percentage

Dependent variable = Alternative Present percentage	
Grade 6 × Program × Girl	1.404*
	(0.714)
Grade 7 × Program × Girl	1.590**
	(0.685)
Grade 8 × Program × Girl	2.161***
	(0.714)
Grade 9 × Program × Girl	1.274**
	(0.622)
Building FE	Yes
Cohort FE	Yes
Time FE	Yes
Observations	56,692
Adj. R square	.551

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
1. This table reports coefficients of program impact on girls' attendance based on estimating equation (5) using data from the DOE attendance database (2008-16). The dependent variable uses an alternative measure of enrolment as the base.
2. The base category is boys in lower grades (3-5) before program launch.
3. Robust standard errors clustered at the building id level are reported.

Table A11: Program Impact on Unplanned and Planned Absences

Dependent variable = Percentage of	Unplanned Absence	Planned Absence
Grade 6 × Program × Girl	-1.298	2.517
	(0.973)	(2.153)
Grade 7 × Program × Girl	-1.702*	6.717
	(0.946)	(4.628)
Grade 8 × Program × Girl	-2.221**	3.183
	(0.976)	(2.525)
Grade 9 × Program × Girl	-1.522*	2.706
	(0.885)	(2.296)
Building FE	Yes	Yes
Cohort FE	Yes	Yes
Time FE	Yes	Yes
Observations	56,500	56,500
Adj. R square	.475	.0307

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
1. This table reports coefficients of program impact on girls' attendance based on estimating equation (5) using data from the DOE attendance database (2008-16). The dependent variables capture the daily share of students on planned and unplanned absences based on whether prior applications are submitted by students.
2. The base category is boys in lower grades (3-5) before program launch.
3. Robust standard errors clustered at the building id level are reported.

Table A12: Program Impact on Attendance: By District Wealth

Dependent variable = Present percentage	Grade 6	Grade 7	Grade 8	Grade 9
Poor Districts				
Girl × Program	4.070*	3.549	4.733**	7.330***
	(2.039)	(1.992)	(1.746)	(2.062)
Building FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Girl Pre-Program Mean	79.501	81.489	81.100	83.009
N schools	16	16	16	16
Observations	1,339	1,324	1,324	1,328
Adj. R square	0.555	0.624	0.610	0.616
Rich Districts				
Girl × Program	1.094	1.651	2.087*	0.934
	(1.002)	(1.077)	(1.131)	(1.100)
Building FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Girl Pre-Program Mean	86.277	86.957	86.525	87.861
N schools	88	88	88	88
Observations	7,336	7,273	7,285	7,274
Adj. R square	0.512	0.542	0.534	0.565

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
1. This table reports coefficients of program impact on girls' attendance based on estimating equation (1) using data from the DOE attendance database (2008-16) for subsamples based on district wealth level from DLHS-3.
2. The base category is boys before program launch.
3. Robust standard errors clustered at the building id level are reported.

B Representativeness of Sample Schools

There are 1001 schools in the attendance database. Of these 104 are in the sample i.e. 52 girls and boys schools, respectively. Amongst non-sample schools, there are 355 boys, 375 girls and 167 schools. Thus, a large majority (83%) of schools in the state are single sex. As explained earlier, sample schools have grades 1-12 and operate out of shared buildings in shifts. In general, schools can have a more limited range of grades. Since gender disaggregated attendance data is not available, I focus on single sex schools for analysis.

Table B1 reports mean values of school characteristics for all single sex schools along with relevant comparisons. On most variables, gender-specific differences between sample and non-sample schools are insignificant (Columns 5 and 7). However, sample schools have fewer classrooms per 100 students, fewer toilets per 100 students, fewer teachers who are graduates and are larger. Enrolment may be mechanically larger in sample schools since they have grades 1-12, whereas the others can have fewer grades. This may explain the difference in per capita measures to some extent as well. Therefore, sample schools are representative of the wider set of single sex schools in the state.[42]

[42]Coeducational schools (not shown here) in this context appear significantly better off than sample schools on several measures. While not a concern for the present analysis, it is useful to keep this in mind for future work.

Table B1: Pre-program School Characteristics: All Single Sex Schools

	Sample Schools		Non-Sample Schools		Differences			
	Boys (1)	Girls (2)	Boys (3)	Girls (4)	(1) - (3) (5)	p-value (6)	(2) - (4) (7)	p-value (8)
2010								
Classrooms per 100 students	1.44	1.38	1.59	1.61	-0.15	0.04	-0.23	0.01
Classrooms in good condition per 100 students	0.73	0.57	0.79	0.71	-0.06	0.61	-0.13	0.25
Medical Checkup	0.43	0.43	0.55	0.5	-0.12	0.14	-0.07	0.37
Boundary Wall	0.87	0.92	0.92	0.93	-0.05	0.24	-0.01	0.84
Toilets (gender-specific)	11.67	13.33	10.73	11.83	0.95	0.53	1.5	0.3
Toilets per 100 students	0.69	0.69	0.93	0.93	-0.24	0.07	-0.24	0.07
Teachers per 100 students	1.3	1.37	1.28	1.43	0.02	0.77	-0.06	0.49
% female teachers	3.44	91.37	5.47	88.75	-2.03	0.26	2.62	0.36
% teachers graduate and above	92.52	95.1	97.56	96.8	-5.04	0	-1.7	0.04
% disadvantaged group students	14.4	17.34	14.76	16.25	-0.36	0.84	1.09	0.5
Enrolment	1945.15	2170.76	1410.39	1658.45	534.76	0	512.31	0
Grade 10 pass %	98.64	99.36	98.95	99.09	-0.31	0.14	0.27	0.16
2009								
% students failing grades 1-8	2.9	3.18	3.15	3.25	-0.25	0.73	-0.07	0.89
Grade 5 pass %	99.95	99.32	99.92	98.21	0.03	0.78	1.11	0.48
Grade 8 pass %	80.52	80.37	79.13	81.34	1.4	0.64	-0.97	0.68

1. This table reports mean values of baseline school characteristics for all single sex schools using data from the District Information System for Education (DISE), DOE School Information records and the DOE attendance database, as per data availability.

2. The p-value for an F-test of equality of means for relevant groups is reported for each characteristic.

3. Disadvantaged groups include scheduled castes (SC), scheduled tribes (ST) and other backward classes (OBC).

C Discussion on Identification: Other Concerns

C.1 Collinearity between gender and school shift

Amongst sample schools, girls study in the morning shift and boys in the evening i.e. gender and shift are collinear. There may be a concern that DID estimates of program effects that are attributed to gender are actually explained by shift timing. Perhaps certain types of students choose schools of a particular shift if they have domestic responsibilities or have to go to work at specific hours in the day. This is not likely to be a serious threat to the identification of program impact for a few reasons. First, students are mostly assigned to schools based on residential distance, and do not necessarily choose which school to attend. Further, even if they have some choice, of the entire set of schools under the DOE, girls schools are almost never held in the evening and only 1.3% of boys schools are held in the morning. Hence, concerns around selection into a particular type of school are limited for both genders. Second, both shifts are 5.5 hours long - the morning shift beings at 7:00am while the evening shift begins at 1:00pm. Thus, either shift may allow students to fulfil other part-time responsibilities. Third, as long as differences in student composition across shifts remain the same after program launch, they will get differenced out with the DID design. The only scenario of concern is one where for some reason unrelated to the program, students of the morning shift attend school more and/or students of the evening shift attend less after program implementation. It is difficult to think of a straightforward explanation for this.[43]

C.2 Program effects on enrolment

In estimating program impact through a DID specification on attendance, I make the implicit assumption that the composition of the student body in sample schools does not

[43]Even if this is true, estimates of program impact from a triple differences specification using students in lower grades as an additional control group are almost identical to those from the main specification (Section 6.2). Since younger students also attend schools in the same shift as their older counterparts, any changes in the incentive to attend school would affect both groups of students in similar ways.

change differentially for girls and boys. Suppose girls from low-income private schools shift to public schools to benefit from free napkins, then estimates of program impact may be biased. However, changes in girls' enrolment due to the program seems an unlikely possibility given the monetary value of the subsidy. The estimated annual expense for similar menstrual products purchased from the market may be around USD 4.9-13 while median annual private school fee in Delhi is around USD 230 based on national data from 2014-15 (Kingdon, 2020). For a household that decides to incur the expense of sending their girl to a private school in the first place, the napkin subsidy seems to be too low to cause a shift to public school.[44]

The dataset only provides information on the total number of students in each grade. This precludes a school-level analysis of student entry and exit.[45] However, using annual (net) enrolment data for each academic year, I estimate a DID specification similar to equation (2) to check if there are significant differences in enrolment for girls and boys at any grade, compared to pre-program levels.[46] Table C1 presents results along with pre-program mean enrolment for girls schools by grade. There are no significant impacts of the program on enrolment for grades 6-8.[47]

There is a significant negative effect on grade 9 enrolment of about 7%. This may be explained by the No Detention Policy (NDP) which is effectively implemented in 2011. Under this national policy, children in the public school system are automatically promoted to subsequent grades irrespective of their academic performance on year-end exams until grade 8 (Nath and Deo Bhanj, 2017). This may lead to heightened drop-out at grade 9, most likely driven by the low-performing and possibly economically disadvantaged students who could then also benefit the most from the program. This would make

[44]Similarly, for a household that does not want their girl exposed to the napkin program and information on menstruation, the large additional expense of private school would act as a deterrent for transferring out. Public schools are practically free.

[45]This information is not even available in the DISE, which is a comprehensive national dataset on school characteristics.

[46]As explained earlier, enrolment is proxied by a mid-year value of the total number of students in attendance records to avoid fluctuations due to student transfers that may be more common at the start of the session. Therefore, enrolment is measured based on attendance data from August of each year.

[47]There is no significant change in enrolment for primary grades (3-5) either. Results available upon request.

Table C1: Program Impact on Enrolment

Dependent variable = Enrolment	Grade 6	Grade 7	Grade 8	Grade 9
Girl × Program	15.846	10.791	2.569	-21.322*
	(9.555)	(11.026)	(9.280)	(11.804)
Building FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Girl Pre-Program Mean	276.029	285.316	302.749	297.602
Observations	875	875	875	875
Adj. R square	0.759	0.727	0.705	0.741

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
1. This table reports coefficients of program impact on girls' enrolment based on estimating a specification similar to equation (2) using data from the DOE attendance database (2008-16). The dependent variable is annual enrolment as proxied by a mid-year value of the total number of students in attendance records taken from August of each year, to avoid capturing fluctuations associated with the start of the academic year.
2. The base category is boys before program launch.
3. Robust standard errors clustered at the building id level are reported.

the estimate of program impact at grade 9 a lower bound. It is also comforting to note the positive effect on grade 10 academic performance in program years. This suggests that despite possible drop-out, students who benefit from the program in middle grades are retained in school until grade 10 and go on to show improvements in pass percentage.

C.3 Confounding effects of other programs

I now discuss the other major public programs on secondary education and girls schooling that are operational alongside the Kishori Scheme and explain why these are unlikely to confound my results. The Delhi government's Ladli Scheme and the Central government's Rashtriya Madhyamik Shiksha Abhiyaan (RMSA) are launched prior to the Kishori program, in 2008 and 2009, respectively. The former incentivizes the birth and educational attainment of girls in economically disadvantaged families while the latter targets access to secondary education by providing schools at reasonable distances and improving the quality of education (Department of Women and Child Development, Government of NCT of Delhi, 2022; Ministry of Human Resource Development, Government of India, 2022). The DID strategy should account for any pre-program changes in girls' school attendance on account of these programs. Moreover there is only a small 4% change in the number of public schools in Delhi during the study period.

Other policy changes start late into the study period and are unlikely to drive results.

In 2015, the Central Government launched the Beti Bachao Beti Padhao program to target the low child sex ratio in the country and improve education and participation of girls through media campaigns, gender trainings and sensitization initiatives (Ministry of Women and Child Development, Government of India, 2022). This program primarily focuses on the initial life stage while Kishori targets adolescent girls. Additionally, in 2015 the Aam Aadmi Party comes to power in Delhi and explicitly focuses on public schooling (Sahoo and Mahajan, 2020). Most education-related initiatives of this government take shape in 2016, and thus, form a very small part of the program period.