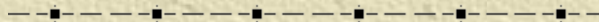


Cycling to School: Increasing High School Girl's Enrollment in Bihar (Very Preliminary)

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Motivation

- ✦ Increasing female school attainment is one of the MDG's
- ✦ Improving female education directly contributes to the 'inclusive growth' agenda of the Government
 - ◆ Growth – by increasing human capital of the labor force
 - ◆ Inclusive – by allowing more people to participate in the growth process
- ✦ Large gender gap in Bihar in school attendance (grows with age)
- ✦ Girls/boys enrollment ratio (2007-08):
 - ◆ 93% in Class 1
 - ◆ 80% in Class 5
 - ◆ 69% in Class 8
 - ◆ 62% in Class 9

Policy Intervention

- ✦ In 2006, GoB initiated a program to provide bicycles to all girls studying in classes 9 and 10
 - ✦ Personal initiative of the Chief Minister
 - ✦ Program was called the “Mukhyamantri Balika Cycle Yojana (MBCY)”

- ✦ An allocation of Rs. 2000/student was made (now Rs. 2500)

- ✦ No direct provision of bicycles – cash was made available to eligible students through the schools, and receipts for purchase of cycles were collected

- ✦ This was effectively a CCT (or CKT) program and was India’s first scaled up CT program for girl’s secondary education
 - ✦ What was the impact of the program?

The Program in Action (1)



Picture Credits: Abhinav Nayar

The Program in Action (2)



Picture Credits: Abhinav Nayar

This Paper

- ✦ Aims to evaluate the impact of the MBCY on:
 - ✦ Girl's Enrolment
 - ✦ Girl's Educational Attainment

- ✦ Relevant not just for Bihar but across India

- ✦ Two main challenges in the empirical analysis:
 - ✦ Implemented state-wide and so difficult to find a control group
 - ✦ Boys
 - ✦ Jharkhand/UP

- ✦ Degrees of freedom for econometric estimation (fundamentally you have 1 treatment and 1-2 controls)

Data

- ✦ Two main variables of interest are enrollment and attainment

- ✦ No systematic enrollment data for class 9 and 10
 - ◆ DISE/EMIS provides great data up to class 8
 - ◆ SEMIS is only starting to systematize this for class 9-10 (RMSA)

- ✦ Undertook a substantial data collection exercise collecting school level enrollment histories by gender in 38 districts of Bihar, 10 districts of Jharkhand, and 6 districts in UP
 - ◆ Currently have data for 34 districts in BH, 10 in JK, 0 in UP
 - ◆ Data gaps (BH data does not include private-aided schools)

- ✦ Also obtained 10th standard board exam records from the State Exam authority in Bihar and Jharkhand
 - ◆ Dependent variable of interest is not passing percentage (biased) but the absolute number of girls who pass the 10th board exams

Estimation Strategy

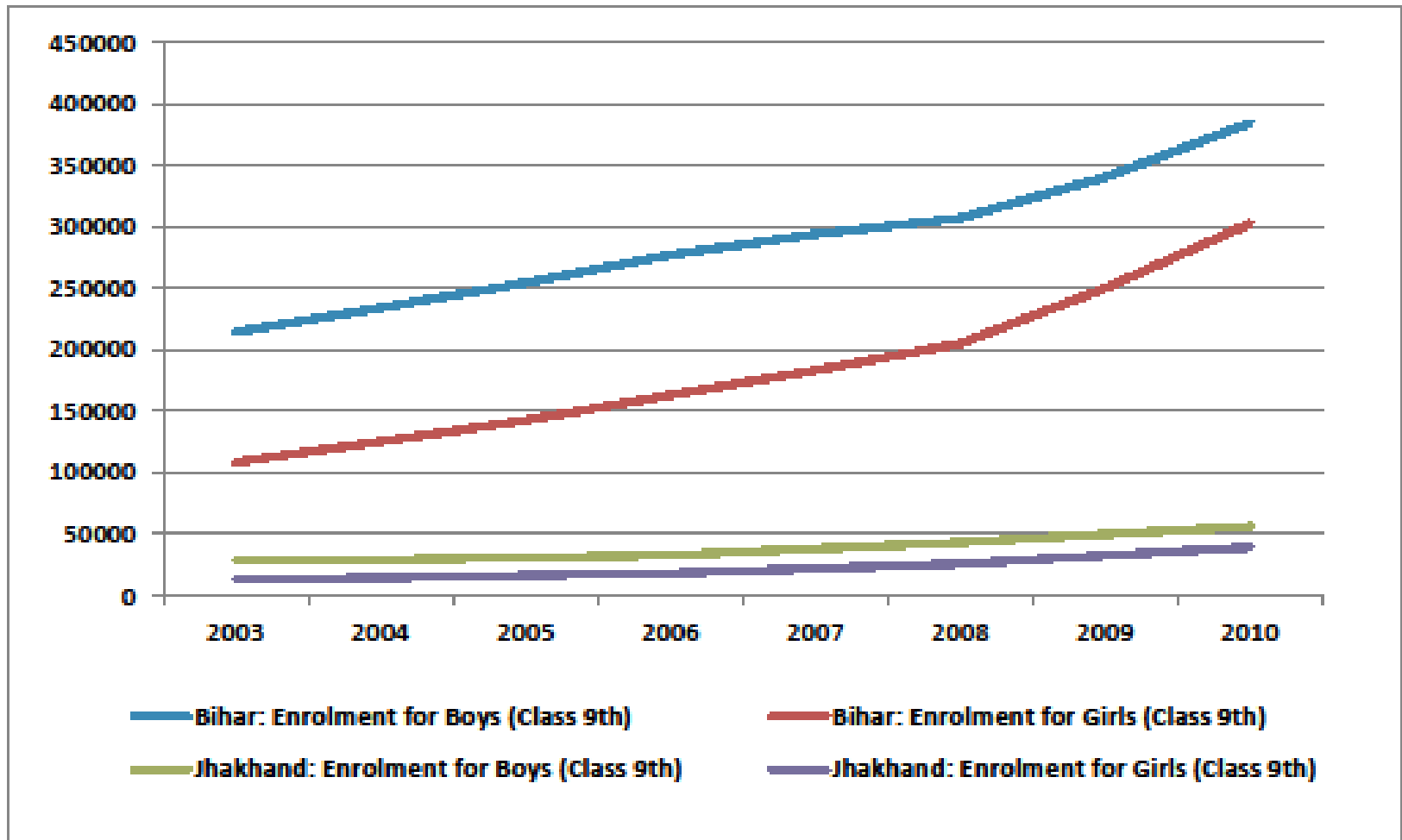
▶ Difference in Difference Approach:

- ▶ Single Difference = $[(Enroll)_{Post}^{Girls} - (Enroll)_{Pre}^{Girls}]$
- ▶ D-D Bihar = A = $[(Enroll)_{Post}^{Girls} - (Enroll)_{Pre}^{Girls}] - [(Enroll)_{Post}^{Boys} - (Enroll)_{Pre}^{Boys}]$
- ▶ This will control for changes in income, tastes and government policies that was targeted towards school going children

▶ Triple Difference Approach:

- ▶ D-D Jharkhand = B = $[(Enroll)_{Post}^{Girls} - (Enroll)_{Pre}^{Girls}] - [(Enroll)_{Post}^{Boys} - (Enroll)_{Pre}^{Boys}]$
- ▶ D-D-D = [A - B]
- ▶ This will control for remaining bias from differential time trend
 - ▶ Jharkhand is particularly compelling as it was part of Bihar till 2000
 - ▶ Border districts share similar socio-economic conditions

Visual Representation of Estimation Strategy



Enrollment Impact on Girls – Double Difference (wrt Time, Boys in Bihar)

VARIABLES	Dependent Variable: Enrollment					
	(1)	(2)	(3)	(4)	(5)	(6)
	Class 9			Class 10		
	School Level	Block Level	District Level	School Level	Block Level	District Level
Female Dummy* Post	5.141**	37.30*	360.2	-0.958	12.25	-60.50
	(2.461)	(20.82)	(1,418)	(1.676)	(21.71)	(1,260)
Post	12.64***	65.14**	879.7	16.93***	69.82***	1,171
	(2.664)	(27.52)	(1,122)	(1.789)	(17.44)	(998.2)
Female Dummy	-49.63***	-258.9***	-3,358***	-44.01***	-219.8***	-2,976***
	(5.610)	(31.55)	(956.2)	(5.228)	(31.08)	(819.2)
Constant	119.2***	601.5***	8,150***	103.9***	523.8***	7,099***
	(5.817)	(39.41)	(767.8)	(5.053)	(36.75)	(658.3)
Observations	9,340	1,847	136	9,331	1,847	136
R-squared	0.045	0.056	0.145	0.055	0.062	0.165
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Enrollment Impact on Girls – Triple Difference (wrt Time, Boys, and Jharkhand)

VARIABLES	Dependent Variable: Enrollment					
	(1)	(2)	(3)	(4)	(5)	(6)
	School Level	Class 9 Block Level	District Level	School Level	Class 10 Block Level	District Level
Bihar Dummy*Female*Post	11.35*** (3.110)	112.4** (49.56)	638.4 (1,552)	3.293 (2.392)	105.6 (82.19)	129.4 (1,361)
Post	23.24*** (2.719)	97.41*** (14.70)	1,041** (481.2)	18.75*** (2.762)	152.7* (80.71)	830.2** (416.5)
Female	-32.77*** (6.638)	-86.78 (52.56)	-1,468*** (328.7)	-29.48*** (5.596)	-121.8*** (10.35)	-1,314*** (275.4)
Bihar Dummy	45.63*** (10.80)	295.1*** (44.04)	4,852*** (817.2)	42.07*** (9.539)	266.5*** (39.13)	4,333*** (705.8)
Bihar*Post	-10.60*** (3.800)	-32.27 (31.14)	-161.4 (1,229)	-1.821 (3.288)	-82.84 (82.56)	340.4 (1,089)
Female*Post	-6.210*** (1.912)	-75.13 (45.01)	-278.2 (605.0)	-4.251** (1.712)	-93.32 (79.29)	-189.9 (488.1)
Female*Bihar Dummy	-16.86* (8.679)	-172.1*** (61.26)	-1,889* (1,019)	-14.53* (7.647)	-97.98*** (32.68)	-1,661* (870.8)
Constant	73.60*** (9.118)	306.4*** (19.87)	3,297*** (261.8)	61.87*** (8.101)	257.3***1 (13.70)	2,766*** (240.0)
Observations	11,132	2,268	176	11,118	2,268	176
R-squared	0.056	0.081	0.284	0.069	0.087	0.308
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Enrollment Impact on Girls – Triple Difference (wrt Time, Boys, and Jharkhand) – Border Dist. only

VARIABLES	Dependent Variable: Enrollment					
	(1)	(2)	(3)	(4)	(5)	(6)
	School Level	Class 9 Block Level	District Level	School Level	Class 10 Block Level	District Level
Bihar Dummy*Female*Post	14.12*** (3.198)	116.6** (47.95)	859.2 (3,686)	5.305 (4.763)	99.43 (84.05)	275.3 (3,357)
Post	23.24*** (2.772)	97.41*** (15.02)	1,041** (500.5)	18.75*** (2.816)	152.7* (82.47)	830.2* (433.2)
Female	-32.77*** (6.768)	-86.78 (53.71)	-1,468*** (341.9)	-29.48*** (5.706)	-121.8*** (10.58)	-1,314*** (286.5)
Bihar Dummy	49.08*** (13.06)	307.0*** (95.74)	5,290** (2,065)	44.09*** (12.35)	272.5*** (86.46)	4,652** (1,822)
Bihar*Post	-11.13* (5.820)	-36.86 (30.21)	-193.4 (3,028)	-1.394 (5.719)	-65.86 (86.69)	384.9 (2,786)
Female*Post	-6.210*** (1.949)	-75.13 (45.99)	-278.2 (629.2)	-4.251** (1.746)	-93.32 (81.02)	-189.9 (507.7)
Female*Bihar Dummy	-15.41* (7.343)	-154.1** (63.98)	-1,905 (2,501)	-13.28* (6.784)	-92.01** (36.56)	-1,679 (2,150)
Constant	73.60*** (9.296)	306.4*** (20.30)	3,297*** (272.3)	61.87*** (8.260)	257.3*** (13.99)	2,766*** (249.6)
Border District	YES	YES	YES	YES	YES	YES
Observations	3,754	812	68	3,748	812	68
R-squared	0.065	0.170	0.419	0.073	0.182	0.426
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Outcome Impact: No. of Girls who Passed 10th: Double and Triple Differences

Dependent Variable: Average No of students who passed Class 10			
	(1)	(2)	
	Class 10	Class 10	
VARIABLES	No. Who Passed	No. Who Passed	
Bihar Dummy*Post*Female		818.7	
		(3,022)	
Post	1,036	2,054	
	(1,190)	(1,901)	
Female	-4,154***	-2,320	
	(949.5)	(1,901)	
Bihar Dummy		3,651**	
		(1,511)	
Bihar Dummy* Post		-1,018	
		(2,137)	
Female* Post	451.8	-366.9	
	(1,453)	(2,689)	
Female*Bihar Dummy		-1,834	
		(2,137)	
Constant	8,470***	4,819***	
	(804.1)	(1,345)	
Observations	152	192	
R-squared	0.179	0.219	
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Next Steps

- ✦ Match blocks across the state borders to create strata of “border pairs” and then re-estimate with border-pair fixed effects with treatments/controls within each stratum
- ✦ Assign school/block codes to the testing data to allow us to carry out the testing analysis at a corresponding granular level
- ✦ Continue chasing up data from UP (and perhaps West Bengal?)
- ✦ Continue chasing up DEO’s in Bihar for complete enrollment data (filling gaps in private-aided school data)

Bihar/Jharkhand Border Districts/Blocks



Conclusion and Policy Implications

- ✦ The point estimates suggest that the program did have a meaningful positive impact on both enrolment and attainment
 - ✦ Estimates suggest a bridging of 10-20% of the gender gap in enrollment
 - ✦ Similar bridging of the attainment gap
- ✦ But, we (as of now) do not have enough statistical power to say that these effects are robustly statistically significant
 - ✦ This may improve as we get more granular and match blocks across the border and include 'block-pair' fixed effects
 - ✦ But there is no guarantee that the results will be significant even then
- ✦ Highlights another reason for experimental studies of high priority policy initiative before scaling up such as Pratham's remedial and reading programs (statistical precision!)
- ✦ Also, highlights the importance of high quality administrative data – and making it easily available to researchers/students
 - ✦ Substantially reduces the marginal cost of policy-relevant research