Do Public Colleges Increase Private School Enrollment? Evidence from India

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Abstract

We study the impact of 'elite' public colleges on schooling in India. Using an event study framework, we find that new public colleges increase the probability of enrollment in private schools by 4% in the year of entry, and by over 10% in the longer term. In addition, we find a decrease in enrollment in public schools. Overall, this translates into higher educational attainment, concentrated at the middle school level. We explore both the demand- and supply-side mechanisms, and find that our result is driven by an increase in supply of private schools. We provide evidence that suggests that 'elite' public colleges attract investment in public infrastructure, including access to electricity, which can reduce costs for private schools, facilitating their entry. We do not find evidence for an increase in demand for private schooling; there is no change in wages, consumption expenditure, population or migration in areas that got a new public college. We also find no evidence of support of higher aspirations to complete school and attend college.

JEL: I20, I28, O53

Keywords: Education, Enrollment, Private Schools, India

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Recent studies have documented large economic impacts of universities to geographically close neighboring regions through increases in the supply of human capital (Valero and Van Reenen (2016)). And while a large literature has documented the impact of college proximity to college enrollment, the impacts on other levels of education remains an unaddressed question (Card (1993); Currie and Moretti (2003)). In this paper, we present the first estimates of the impact of public colleges on school enrollment in India. To measure the causal effect of colleges, we exploit the opening of certain 'elite' public colleges in India between 2004-2014 in an event study and difference-in-differences framework.

India's higher education system is the third largest in the world, next to United States and China[1]. As of 2011, India has 42 central universities, 275 state universities, 130 deemed universities, 90 private universities, and 93 Institutes of National Importance[2]. Amongst these are certain federally funded 'elite' colleges and universities offering, undergraduate education or prost-graduate education or both, in fields of Medicine, Information Technology, Sciences, Engineering, Architecture and Business. We exploit the staggered placement of these colleges between 2004-2014 to evaluate the causal impact on school enrollment and educational attainment for children. We find that public colleges increase the probability of enrollment in private schools by over 4% in year of treatment, and by over 10% by year two. We also find a substantial decrease in enrollment in public schools. Overall, there is an increase in educational attainment of 0.2 years, concentrated in the completion of middle school.

We examine both the supply- and demand- side mechanisms of impact, and find that our result is driven by an increase in supply of private schools. 'Elite' public colleges increase the number of private schools in the area by over 15% in the year of 'treatment'. We hypothesize that this entry is driven by an increase in access to public infrastructure; for instance, villages in districts that get a public college are 23 percentage points more likely to have access to electricity for agricultural use, and 5 percentage points more likely to have access to roads. Relatedly, we find a large increase in the density of satellite-measured night-time lights in areas closest to the public college. We find that villages located within 10 km from the new college saw an increase of over 15% in nighttime lights brightness. Although, we can't rule it out completely,

[1]India Country Summary of Higher Education. World Bank
[2]Universities Grant Commission, India

we do not find evidence for an increase in demand of private schooling; we find that entry of an 'elite' public college does not increase wages, consumption expenditure, population or migration. We also find no evidence of support of higher aspirations to complete school and attend college.

Although 'elite' public colleges have been set-up since 1947, locations of new such colleges has been a function of addressing regional imbalance caused by locations of older such institutions. An emphasis on correcting historical regional imbalances means that such colleges are not placed randomly. However, it likely also means that locations are unlikely to have been a function of primary or secondary education indicators for a given district. Moreover, student admissions into these institutions are determined by extremely competitive nation-wide entrance tests. Therefore, there is little reason to believe that location is driven by anticipated changes in local schooling markets. Regardless, we test both assumptions explicitly. Further, with the inclusion of district fixed effects, any fixed difference across districts will be adjusted for.

Educational attainment has long been linked to economic development, both as a driver of economic growth and a means to reduce income inequality (Barro (2001)). This could not be more important for developing countries where 60% of the population are under 24 years old. India with the world's highest number of 10-24 year-olds (United Nations (2014)) is a case in point. And although primary school enrollment in India is over 90%, post-secondary enrollment is only around 20%, with only 10% of the students having access to colleges in the country[3][4]. Cognizant of this, successive recent governments have pushed for a drastic and immediate increase in supply of public colleges and universities[5]. For instance, almost 50% of the elite public colleges, who are the primary subject of discussion for this paper, were built in the last two decades.

In addition, the primary and secondary education market in India is changing rapidly; there is an increased preference for private schools, as opposed to the free public school system, which are perceived to be of inferior quality. There has also been a concurrent, and rapid growth of for-profit private schools in India (ASER, 2014). The Government of India, perhaps

[3]Gross enrollment ratio by level of education. UNESCO Institute for Statistics

[4]http://timesofindia.indiatimes.com/home/education/news/Only-10%-of-students-have-access-to-higher-education-in-country/articleshow/28420175.cms

[5]http://www.telegraph.co.uk/education/expateducation/7634544/1000-new-universities-for-India.html

acknowledging this shift in preferences, and mindful of the expansion of private schools in the country, has pushed for private sector participation in educating India's poor through the Right to Education Act. Enacted in 2009, the Act requires all private schools in the country to reserve 25 percent of seats for the poor. However, till 2003, only 28% of rural India had access to private schools (Muralidharan and Kremer (2008)).

In this context, it is crucial to understand the dynamics of school enrollment in India as a function of large scale investments in the local education sector, like the establishment of public colleges, and that is the primary contribution of this paper. This paper also contributes to three related strands of research; first, it contributes towards the understanding of the determinants of private schools in developing countries (Muralidharan and Kremer (2008); Pal (2010); Andrabi et al. (2013)). We find an increase in the number of private schools, an increase in night-time lights, and an increase in availability of public infrastructure is areas that get a public college. This suggests that public colleges crowd-in public investment in infrastructure like electricity, roads and water that decrease costs for private schools to enter the market. For instance, Pal (2010) shows that access to village infrastructural facilities is associated with a higher likelihood of having a private school in the community. Public schools are less likely to respond to such costs since public school locations are decided by the state or central government in ways that doesnt depend on how good infrastructure is, but rather how much the school may be needed. In fact, Muralidharan and Kremer (2008), show that public schools are more likely to be in places where there are fewer private schools. So public schools would end up in needy places, where infrastructure may be bad, and costs of setting up may be high.

Second, we speak to the literature on the externalities of large-scale governmental interventions (Duflo and Pande (2007); Donaldson and Hornbeck (2016)). Public sector investments, could conceivably either crowd-out or crowd-in the private sector. Since we find that private sector entry increases with investments in public sector higher education, the benefits from such investments should incorporate these spillovers as well. Our estimates help quantify how important these spillovers are.

Third, it relates to the larger literature on school enrollment in the developing world (e.g. Duflo (2001); Burde and Linden (2009); Oster and Steinberg (2013)) as well as the literature on school choice amongst low-income households (Alderman et al. (2001)). On the entry of a public college, we find a small but imprecise increase in overall enrollment. More importantly, we find that one, parents move their children from public to private schools and two, an increase in number of private schools, in response to public college entry in the area. This suggests that private school enrollment is inversely related to household distance to such schools. Alderman et al. (2001) find a similar result in Pakistan, lowering distance raises private school enrollments, partly by transfers from public schools and partly from enrollments of children who otherwise would not have gone to school.

While we see a response in the supply of education from private schools, we fail to find evidence for an increase in demand for private schools. For instance, public colleges may create jobs, which could incentivize immigration into these regions. This could mean other jobs in the college itself, jobs working for college employees or newly created jobs in existing firms/industries that enjoy synergies with these academic institutions. If people migrate into these areas for these jobs, this could result in population changes, increasing demand for private schooling. However, we do not find any increase in population or migration in response to public college entry. Further, we also find no change in wages or consumption expenditure in areas that get a public college.

Another possibility is that public colleges affect aspirations of children in the area. These colleges are considered extremely prestigious, and close proximity might make them even more salient, or increasing salience of colleges in general, thus increasing educational aspirations of children in the region. We do not find an increase in probability of finishing high school, or college. We do find a small increase in educational attainment due to an increase in likelihood of finishing middle-school, which is consistent with our enrollment results; however, given that these colleges grant graduate or post-graduate degrees, if children in the region were becoming more aspirational, we would have seen an increase in the likelihood of finishing high school or college. Further, we also do not find an increase in math or reading test scores in areas that got a new public college.

However, we can't completely rule out the possibility that our result is also driven by an increase in demand for private schooling. For instance, it is possible that private schools provide better education, and thus much more likely to get admitted into such 'elite' public colleges, which are much more salient now, thus increasing demand for private schools in areas that get a new public college. Additionally, entry of public colleges might alter local perceptions about returns to schooling causing an increase in demand for schooling, and if public schools are unable to meet this increased demand, private schools enter the region. Although we can't be certain, we do not believe that these explanations are driving our result; first, there is no conclusive evidence for learning outcomes in favor of private schools (Muralidharan and Sundararaman (2015)). Second, public colleges are most salient for children in secondary school, hence it is likely that any increase in demand for private schooling due to entry of public colleges would have been largely driven by older children. However, we do not find any differential increase in private school enrollment between younger children (5-10) and older children (11-16).

References

Alderman, H., Orazem, P. F., and Paterno, E. M. (2001). School quality, school cost, and the public/private school choices of lowincome households in pakistan. *Journal of Human Resources.*

Andrabi, T., Das, J., and Khwaja, I. A. (2013). Students today, teachers tomorrow: Identifying constraints on the provision of education. *Journal of Public Economics*, 100:1–14.

Arellano, M. (1987). Computing Robust Standard Errors for Within-Groups Estimators. *Oxford Bulletin of Economics and Statistics*, 49(4):431–34.

Barro, R. J. (2001). Human capital and growth. *American Economic Review*, 91(2):12–17.

Burde, D. and Linden, L. L. (2009). The effect of proximate schools: A randomized controlled trial in afghanistan. *Mimeo, Columbia University.*

Cameron, A., Gelbach, J., and Miller, D. (2008). Bootstrap-based improvements for inference with clustered errors. *The Review of Economics and Statistics*, 90(3):414–427.

Card, D. (1993). Using geographic variation in college proximity to estimate returns to schooling. *NBER Working Paper # 4483, NBER Cambridge.*

Currie, J. and Moretti, E. (2003). Mother's education and the intergenerational transmission of human capital: Evidence from college openings. *The Quarterly Journal of Economics*, 118(4):1495–1532.

Donaldson, D. and Hornbeck, R. (2016). Railroads and american economic growth: a market access approach. *The Quarterly Journal of Economics*, 131(2):799–858.

Duflo, E. (2001). Schooling and labor market consequences of school construction in indonesia: Evidence from an unusual policy experiment. *American Economic Review*, 91(4).

Duflo, E. and Pande, R. (2007). Dams. *The Quarterly Journal of Economics*, 122(2):601–646.

Henderson, J. V., Storeygard, A., and Weil, D. N. (2012). Measuring Economic Growth from Outer Space. *American Economic Review*, 102(2):994–1028.

Michalopoulos, S. and Papaioannou, E. (2013). Pre-colonial Ethnic Institutions and Contemporary African Development. *Econometrica*, 81(1):113–152.

Muralidharan, K. and Kremer, M. (2008). Public and Private Schools in Rural India. School Choice International. *School Choice International, edited by Paul Peterson and Rajashri Chakrabarti, MIT Press.*

Muralidharan, K. and Sundararaman, V. (2015). The Aggregate Effect of School Choice: Evidence from a Two-Stage Experiment in India. *Quarterly Journal of Economics*, 130(3):1011–1066.

Oster, E. and Steinberg, B. (2013). Do IT centers promote school enrollment? Evidence from India: Evidence from India. *Journal of Development Economics*, 104:123–135.

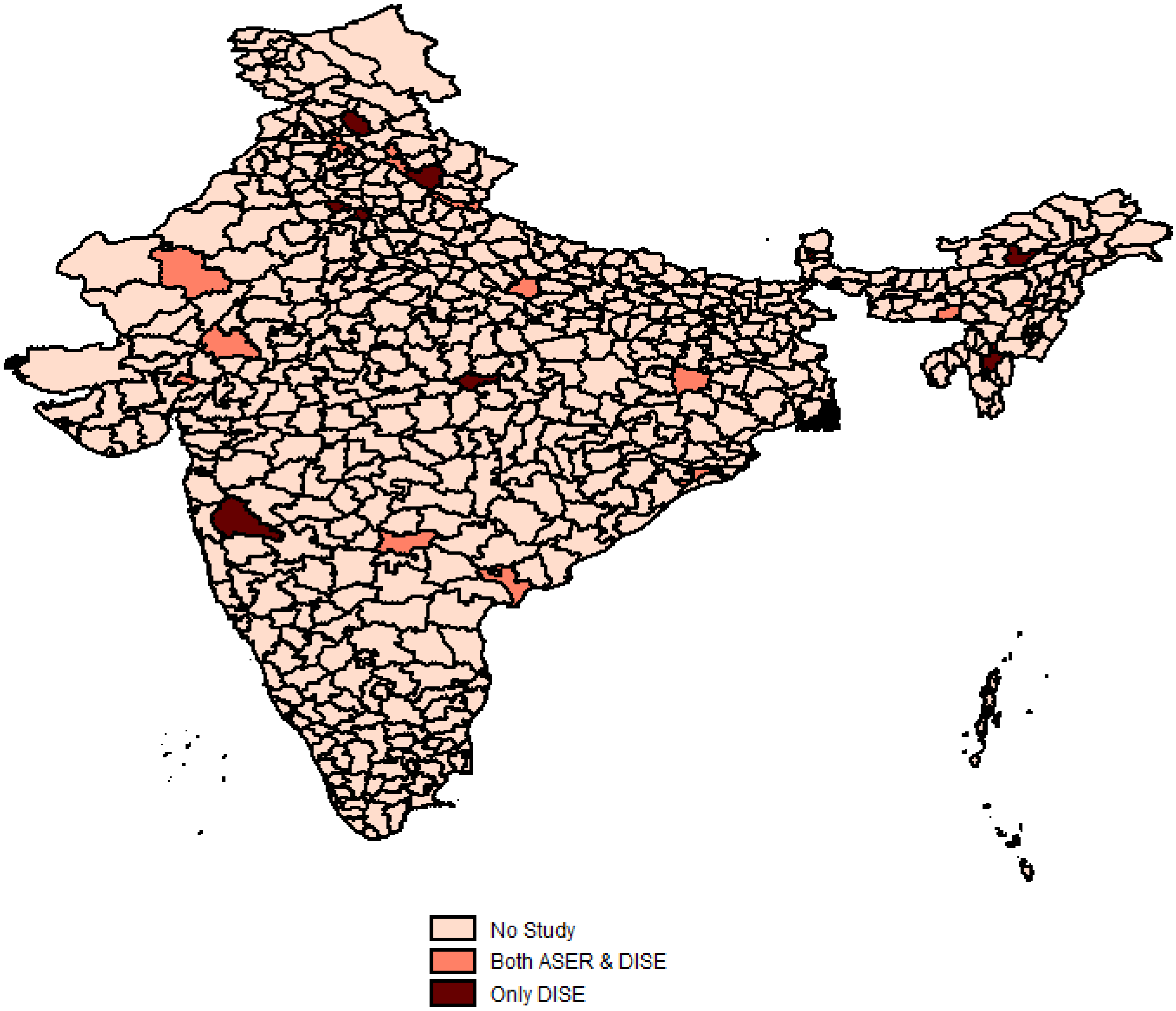
Pal, S. (2010). Public infrastructure, location of private schools and primary school attainment in an emerging economy. *Economics of Education Review*, 29:783–794.

United Nations, P. F. (2014). The Power of 1.8 Billion. *The State of World Population 2014*.

Valero, A. and Van Reenen, J. (2016). Economic impact of universities: evidence from aacross the globe. *NBER Working Paper # 22501, NBER Cambridge.*

Tables and Figures

Figure 1: Treatment Districts



ASER

Table 1: Summary Statistics: Private vs. Public School Enrollment (%) (2006-2009)

	All	2006	2007	2008	2009
Pub. School Enroll	0.57 (0.49)	0.61 (0.49)	0.61 (0.49)	0.60 (0.49)	0.61 (0.49)
Pvt. School Enroll	0.32 (0.47)	0.25 (0.43)	0.29 (0.45)	0.30 (0.46)	0.27 (0.45)
Ov. Enroll	0.90 (0.30)	0.87 (0.34)	0.91 (0.28)	0.90 (0.30)	0.89 (0.31)
Observations	120915	15774	15705	14371	13750

Notes: Sample includes 14 districts over 9 years. Standard deviations in parentheses.

Table 2: Summary Statistics: Private vs. Public School Enrollment (%) (2010-2014)

	2010	2011	2012	2013	2014
Pub. School Enroll	0.57	0.55	0.53	0.51	0.50
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Pvt. School Enroll	0.33	0.35	0.36	0.39	0.40
	(0.47)	(0.48)	(0.48)	(0.49)	(0.49)
Ov. Enroll	0.91	0.92	0.91	0.91	0.90
	(0.29)	(0.28)	(0.29)	(0.29)	(0.30)
Observations	13955	13145	12161	11346	10708

Notes: Sample includes 14 districts over 9 years. Standard deviations in parentheses.

Table 3: Event Study: Impact of Public Colleges on Enrollment (Linear Probability Model)

	(1) Pub. School Enroll β / SE	(2) Pvt. School Enroll β / SE	(3) Ov. Enroll β / SE
T = -4	0.000	-0.031	-0.027**
	(0.025)	(0.028)	(0.011)
T = -3	-0.020	0.021	0.005
	(0.033)	(0.038)	(0.012)
T = -2	0.008	0.010	0.022*
	(0.033)	(0.027)	(0.011)
T = 0	-0.045**	0.045**	0.005
	(0.020)	(0.017)	(0.011)
T = 1	-0.092***	0.081**	-0.007
	(0.030)	(0.030)	(0.010)
T = 2	-0.093***	0.102***	0.011
	(0.024)	(0.022)	(0.010)
T = 3	-0.075***	0.079***	0.007
	(0.022)	(0.026)	(0.013)
T = 4	-0.127***	0.131***	0.012
	(0.019)	(0.019)	(0.007)
T = 5	-0.077***	0.092**	0.014
	(0.024)	(0.031)	(0.012)
T = 6	-0.073**	0.095**	0.027*
	(0.027)	(0.032)	(0.013)
Observations	120915	120915	120915
R^2	0.125	0.108	0.132

Notes: Includes district FE and year FE. Sample includes 14 districts over 9 years. Standard errors are in parentheses, clustered by district.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Figure 2: Event Study: Impact of Public Colleges on Public School Enrollment (Specification 1)

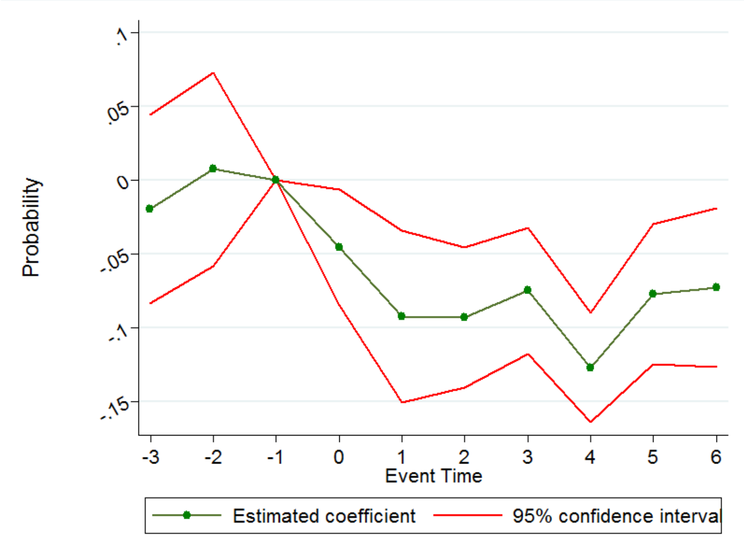


Figure 3: Event Study: Impact of Public Colleges on Private School Enrollment (Specification 2)

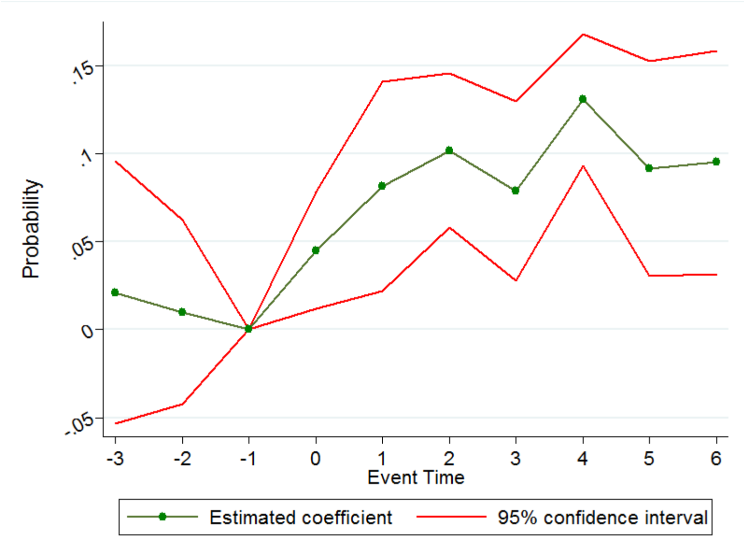


Figure 4: Event Study: Impact of Public Colleges on Overall School Enrollment (Specification 3)

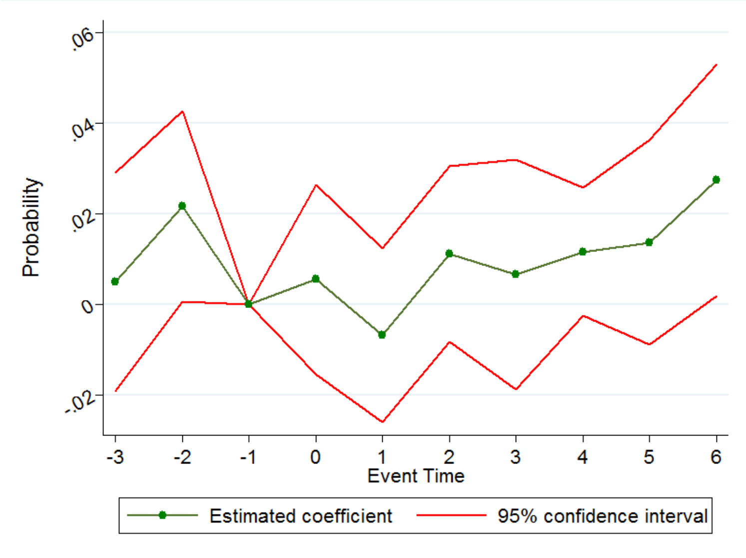


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Table 4: Summary Statistics: #of Schools(2004-2008)

	All	2004	2005	2006	2007	2008
Total Pvt. Schools (00s)	5.41	3.49	3.84	4.48	5.04	5.36
	(4.95)	(3.55)	(4.06)	(4.47)	(4.78)	(5.11)
Total Pub. Schools (00s)	16.91	15.55	16.52	16.82	17.06	16.77
	(13.30)	(12.72)	(13.61)	(14.47)	(14.11)	(13.56)
Total Rural Pvt. Schools (00s)	3.31	2.21	2.37	2.80	3.19	3.36
	(3.33)	(2.56)	(2.88)	(3.34)	(3.50)	(3.76)
Total Rural Pub. Schools (00s)	15.30	14.05	14.98	15.24	15.55	15.19
	(12.58)	(12.02)	(12.81)	(13.49)	(13.28)	(12.74)
Observations	253	23	23	23	23	23

Notes: Sample includes 23 districts over 11 years. Standard deviations in parentheses.

Table 5: Summary Statistics: #of Schools (2009-2014)

	2009	2010	2011	2012	2013	2014
Total Pvt. Schools (00s)	5.69	5.72	5.97	6.33	6.67	6.93
	(5.41)	(4.90)	(4.93)	(5.24)	(5.62)	(5.78)
Total Pub. Schools (00s)	16.86	17.16	17.16	17.47	17.54	17.12
	(13.63)	(13.37)	(13.25)	(13.38)	(13.94)	(13.10)
Total Rural Pvt. Schools (00s)	3.53	3.45	3.62	3.75	3.97	4.12
	(3.95)	(3.00)	(3.17)	(3.27)	(3.51)	(3.56)
Total Rural Pub. Schools (00s)	15.24	15.57	15.48	15.69	15.86	15.45
	(12.79)	(12.64)	(12.54)	(12.77)	(13.36)	(12.61)
Observations	23	23	23	23	23	23

Notes: Sample includes 23 districts over 11 years. Standard deviations in parentheses.

Table 6: Event Study: Impact of Public Colleges on Log # of Private Schools

	(1) Log Pvt. Schools β / SE	(2) Log Rural Pvt. Schools β / SE
T = -4	-0.289**	-0.226
	(0.119)	(0.140)
T = -3	-0.029	0.016
	(0.118)	(0.145)
T = -2	-0.072	-0.009
	(0.105)	(0.126)
T = 0	0.186**	0.227**
	(0.090)	(0.107)
T = 1	0.205**	0.199*
	(0.088)	(0.108)
T = 2	0.258***	0.208
	(0.093)	(0.128)
T = 3	0.277***	0.236*
	(0.098)	(0.125)
T = 4	0.337***	0.356**
	(0.102)	(0.139)
Observations	253	253
R^2	0.893	0.874

Notes: Includes district FE and year FE. Sample includes 23 districts over 11 years. Standard errors are in parentheses, clustered by district.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Figure 5: Event Study: Impact of Public Colleges on Log # of all Private Schools (Specification 1)

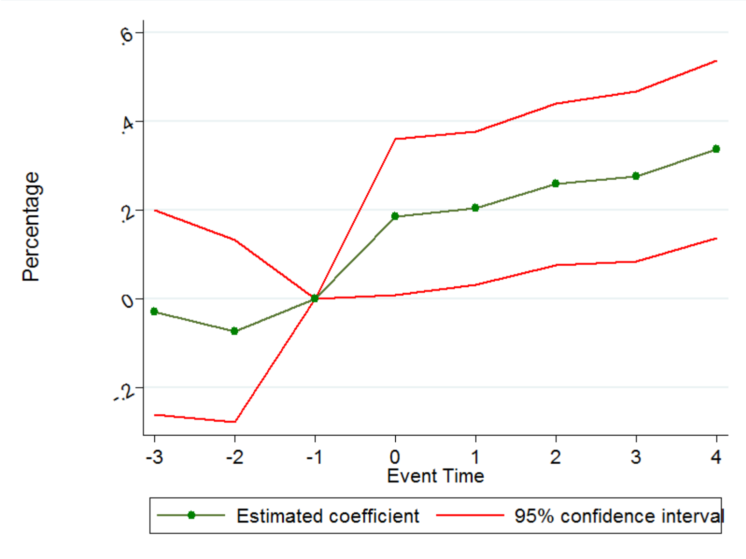
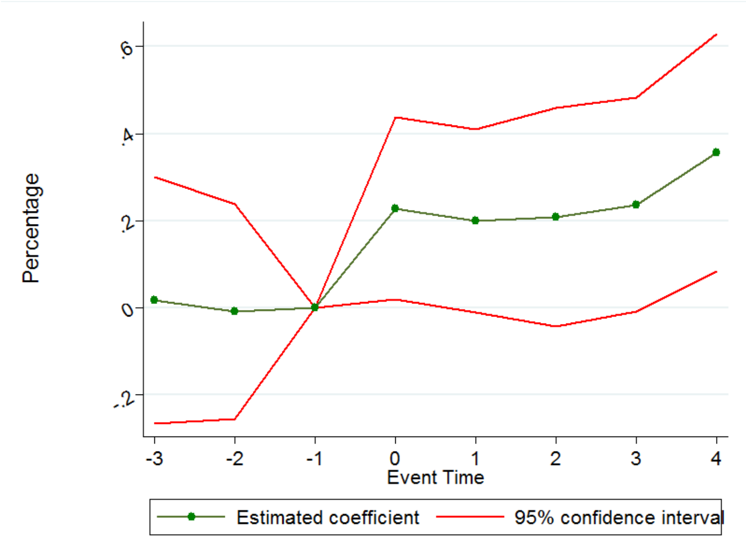


Figure 6: Event Study: Impact of Public Colleges on Log # of Rural Private Schools (Specification 2)



Village Night Lights

Table 7: Summary Statistics: Mean Village Night Lights and Minimum Distance from Public College (2004-2007)

	All	2004	2005	2006	2007
Mean Night Lights	5.03	3.33	3.43	3.55	3.59
	(6.59)	(4.58)	(4.69)	(4.96)	(4.94)
Minimum Distance	115.11	130.46	128.72	125.68	125.06
	(74.85)	(84.87)	(84.51)	(81.49)	(81.85)
Dist. $<$ 10km	0.01	0.01	0.01	0.01	0.01
	(0.09)	(0.08)	(0.08)	(0.08)	(0.09)
10km $<$ Dist. $<$ 20km	0.03	0.02	0.02	0.03	0.03
	(0.17)	(0.15)	(0.15)	(0.16)	(0.16)
20km $<$ Dist. $<$ 30km	0.04	0.04	0.04	0.04	0.04
	(0.21)	(0.19)	(0.19)	(0.19)	(0.20)
30km $<$ Dist. $<$ 40km	0.05	0.05	0.05	0.05	0.05
	(0.23)	(0.21)	(0.21)	(0.21)	(0.22)
40km $<$ Dist. $<$ 50km	0.06	0.05	0.06	0.06	0.06
	(0.24)	(0.23)	(0.23)	(0.23)	(0.23)
50km $<$ Dist. $<$ 60km	0.06	0.06	0.06	0.06	0.06
	(0.24)	(0.23)	(0.24)	(0.24)	(0.24)
60km $<$ Dist. $<$ 70km	0.06	0.06	0.06	0.06	0.06
	(0.24)	(0.23)	(0.23)	(0.23)	(0.23)
70km $<$ Dist. $<$ 80km	0.06	0.05	0.06	0.06	0.05
	(0.24)	(0.23)	(0.23)	(0.23)	(0.23)
80km $<$ Dist. $<$ 90km	0.06	0.05	0.05	0.05	0.05
	(0.23)	(0.22)	(0.22)	(0.22)	(0.22)
90km $<$ Dist. $<$ 100km	0.05	0.05	0.05	0.05	0.05
	(0.23)	(0.22)	(0.22)	(0.22)	(0.22)
100km $<$ Dist. $<$ 110km	0.05	0.05	0.05	0.05	0.05
	(0.23)	(0.22)	(0.22)	(0.22)	(0.22)
110km $<$ Dist. $<$ 120km	0.05	0.05	0.05	0.05	0.05
	(0.22)	(0.22)	(0.22)	(0.22)	(0.22)
120km $<$ Dist. $<$ 130km	0.05	0.05	0.05	0.05	0.05
	(0.22)	(0.21)	(0.21)	(0.21)	(0.21)
130km $<$ Dist. $<$ 140km	0.04	0.04	0.04	0.04	0.04
	(0.21)	(0.20)	(0.20)	(0.20)	(0.20)
140km $<$ Dist. $<$ 150km	0.04	0.04	0.04	0.04	0.04
	(0.20)	(0.19)	(0.19)	(0.19)	(0.19)
Observations	4085289	453921	453921	453921	453921

Notes: Sample includes 23 districts over 11 years. Standard deviations in parentheses.

Table 8: Summary Statistics: Mean Village Night Lights and Minimum Distance from Public College (2008-2012)

	2008	2009	2010	2011	2012
Mean Night Lights	5.19	4.86	7.67	6.48	7.20
	(6.21)	(6.60)	(8.13)	(7.54)	(8.41)
Minimum Distance	112.23	111.95	103.13	99.61	99.19
	(70.97)	(70.96)	(62.43)	(61.13)	(61.22)
Dist. < 10km	0.01	0.01	0.01	0.01	0.01
	(0.09)	(0.10)	(0.11)	(0.11)	(0.11)
10km < Dist. < 20km	0.03	0.03	0.04	0.04	0.04
	(0.17)	(0.17)	(0.19)	(0.19)	(0.19)
20km < Dist. < 30km	0.04	0.05	0.05	0.05	0.05
	(0.21)	(0.21)	(0.22)	(0.22)	(0.22)
30km < Dist. < 40km	0.06	0.06	0.06	0.06	0.06
	(0.23)	(0.23)	(0.24)	(0.24)	(0.24)
40km < Dist. < 50km	0.06	0.06	0.07	0.07	0.07
	(0.24)	(0.24)	(0.25)	(0.26)	(0.26)
50km < Dist. < 60km	0.06	0.06	0.07	0.07	0.07
	(0.24)	(0.24)	(0.25)	(0.26)	(0.26)
60km < Dist. < 70km	0.06	0.06	0.06	0.07	0.07
	(0.24)	(0.24)	(0.25)	(0.25)	(0.25)
70km < Dist. < 80km	0.06	0.06	0.06	0.07	0.07
	(0.24)	(0.24)	(0.24)	(0.25)	(0.25)
80km < Dist. < 90km	0.06	0.06	0.06	0.06	0.06
	(0.23)	(0.23)	(0.23)	(0.24)	(0.24)
90km < Dist. < 100km	0.06	0.06	0.06	0.06	0.06
	(0.23)	(0.23)	(0.23)	(0.24)	(0.24)
100km < Dist. < 110km	0.05	0.05	0.06	0.06	0.06
	(0.23)	(0.23)	(0.23)	(0.23)	(0.23)
110km < Dist. < 120km	0.05	0.05	0.06	0.06	0.06
	(0.23)	(0.23)	(0.23)	(0.23)	(0.23)
120km < Dist. < 130km	0.05	0.05	0.05	0.05	0.05
	(0.22)	(0.22)	(0.22)	(0.22)	(0.22)
130km < Dist. < 140km	0.05	0.05	0.05	0.05	0.05
	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)
140km < Dist. < 150km	0.04	0.04	0.04	0.04	0.04
	(0.20)	(0.20)	(0.20)	(0.20)	(0.19)
Observations	453921	453921	453921	453921	453921

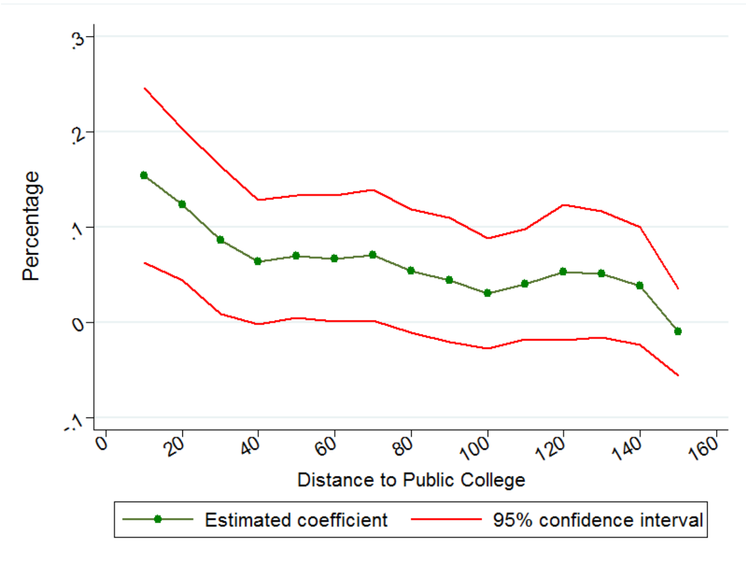
Notes: Sample includes 23 districts over 11 years.

Table 9: Difference-in-Difference: Impact of Public Colleges on Log Village Mean Night Lights

	(1) Log Night Lights β / SE	(2) Log Night Lights β / SE
Log Min. Dist.	-0.048*** (0.015)	
Dist. < 10km		0.154*** (0.047)
10km < Dist. < 20km		0.124*** (0.041)
20km < Dist. < 30km		0.087** (0.039)
30km < Dist. < 40km		0.063* (0.033)
40km < Dist. < 50km		0.069** (0.033)
50km < Dist. < 60km		0.067** (0.034)
60km < Dist. < 70km		0.070** (0.035)
70km < Dist. < 80km		0.054 (0.033)
80km < Dist. < 90km		0.044 (0.033)
90km < Dist. < 100km		0.030 (0.030)
100km < Dist. < 110km		0.040 (0.030)
110km < Dist. < 120km		0.053 (0.036)
120km < Dist. < 130km		0.051 (0.034)
130km < Dist. < 140km		0.038 (0.031)
140km < Dist. < 150km		-0.010 (0.023)
Observations	4085289	4085289
R^2	0.814	0.814

Notes: Specifications Includes village FE and year FE. Sample includes 453921 villages in 571 districts over 9 years. Standard errors are in parentheses, clustered by district.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Figure 7: Difference-in-Difference: Impact of Public Colleges on Log Village Mean Night Lights (Specification 2)



Census Village Directories

Table 10: Summary Statistics: Village-level Census 2001 and 2011

	All	2001	2011
Pop.	1251.15	1164.29	1338.00
	(1523.64)	(1435.64)	(1602.13)
Road	0.86	0.87	0.84
	(0.35)	(0.34)	(0.36)
Dom. Elec.	0.53	0.29	0.76
	(0.50)	(0.46)	(0.43)
Agr. Elec.	0.32	0.10	0.54
	(0.47)	(0.30)	(0.50)
Access to Tap Water	0.32	0.34	0.30
	(0.47)	(0.47)	(0.46)
Comm. Bank	0.05	0.05	0.05
	(0.22)	(0.22)	(0.23)
Observations	1056384	528192	528192

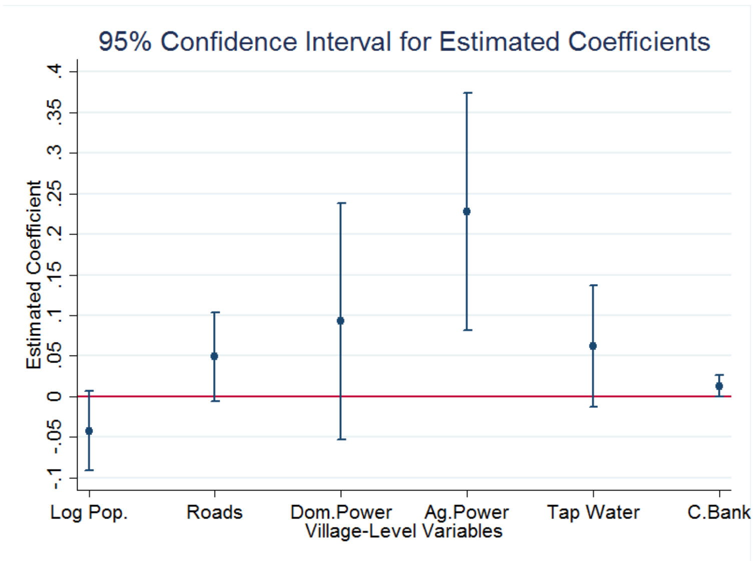
Notes: Sample includes 528,192 villages in 493 districts in two census waves 2001 and 2011. Standard deviations are in parentheses

Table 11: Difference-in-Difference: Impact of Public Colleges on Village Infrastructure

	(1) Log of Pop. β / SE	(2) Road β / SE	(3) Dom. Elec. β / SE	(4) Agr. Elec. β / SE	(5) Access to Tap Water β / SE	(6) Comm. Bank β / SE
Public College*2011	-0.043*	0.049*	0.093	0.228***	0.062	0.013*
	(0.025)	(0.028)	(0.074)	(0.075)	(0.038)	(0.007)
Observations	1056384	1056384	1056384	1056384	1056384	1056384
R^2	0.001	0.001	0.217	0.226	0.007	0.000

Notes: Sample includes 528,192 villages in 493 districts in two census waves 2001 and 2011. Standard errors are in parentheses, clustered by district.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Figure 8: Difference-in-Difference: Impact of Public Colleges on Village Infrastructure



NSS and IHDS Household Surveys

Table 12: Difference-in-Difference: Educational Attainment

	Ages 5 to 20			
	Years of Ed	Finished Middle	Finished High School	College
Treated	0.233**	0.0448***	0.00772	-0.000836
	(0.103)	(0.0135)	(0.0121)	(0.00578)
Observations	50,051	50,079	50,079	50,079
R-squared	0.123	0.080	0.044	0.033
	Ages 21 to 35			
	Years of Ed	Finished Middle	Finished High School	College
	0.0156	-0.00499	-0.00854	-0.00108
Treated	(0.234)	(0.0194)	(0.0264)	(0.0192)
Observations	40,406	40,889	40,889	40,889
R-squared	0.126	0.119	0.077	0.061

Notes: All specifications include district and year FE. Sample includes treated districts in 4 NSS waves between 2004-2014. Standard errors are clustered at the district-level.

Table 13: Difference-in-Difference: Consumption Expenditure, Earnings, Probability of Being a College Teacher and Migration

	Log Expenditure	Log Wages	Probability College Teacher	Years in Current Location
Treated	0.000620	0.0555	0.00001	-2.649
	(0.0304)	(0.0504)	(0.001)	(2.039)
Observations	176,225	30,495	176,225	79,992
R-squared	0.002	0.294	0.002	0.218

Notes: All NSS specifications include include district and year FE. Sample includes treated districts in 4 NSS waves between 2004-2014. 'Years in Current Location' is from IHDS survey-rounds for households in all districts in 2005 and 2011. Standard errors are clustered at the district-level.

Appendix

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Table 14: Adding District-Specific Linear Trends: Impact of Public Colleges on Enrollment (Linear Probability Model)

	(1) Pub. School Enroll β / SE	(2) Pvt. School Enroll β / SE	(3) Ov. Enroll β / SE
T = -4	-0.001	0.009	-0.010
	(0.032)	(0.028)	(0.015)
T = -3	-0.022	0.036	0.010
	(0.027)	(0.032)	(0.017)
T = -2	0.010	0.015	0.028**
	(0.034)	(0.024)	(0.011)
T = 0	-0.043**	0.054***	0.012
	(0.019)	(0.017)	(0.011)
T = 1	-0.087***	0.112***	0.012
	(0.029)	(0.032)	(0.012)
T = 2	-0.082***	0.163***	0.049***
	(0.021)	(0.023)	(0.012)
T = 3	-0.057***	0.180***	0.068***
	(0.016)	(0.020)	(0.011)
T = 4	-0.105***	0.289***	0.104***
	(0.029)	(0.036)	(0.025)
T = 5	-0.050	0.314***	0.140***
	(0.040)	(0.047)	(0.035)
T = 6	-0.032	0.395***	0.201***
	(0.054)	(0.057)	(0.036)
Observations	120915	120915	120915
R^2	0.127	0.111	0.134

Notes: Includes district FE, year FE and district-specific linear trends. Sample includes 14 districts over 9 years. Standard errors are in parentheses, clustered by district.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Figure 9: Adding District-Specific Linear Trends: Impact of Public Colleges on Public School Enrollment (Specification 1)

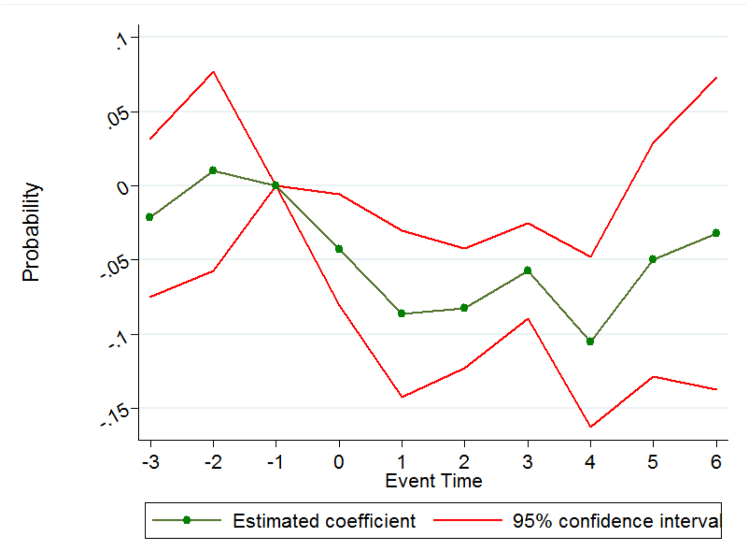


Figure 10: Adding District-Specific Linear Trends: Impact of Public Colleges on Private School Enrollment (Specification 2)

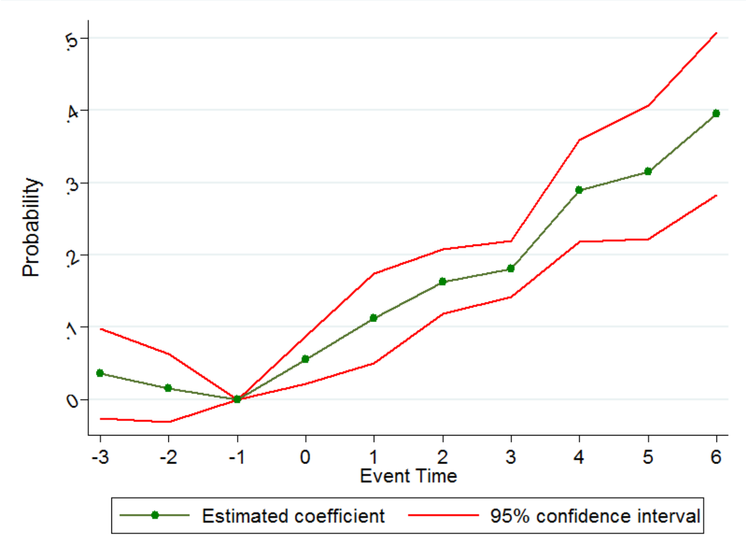


Figure 11: Adding District-Specific Linear Trends: Impact of Public Colleges on Overall School Enrollment (Specification 3)

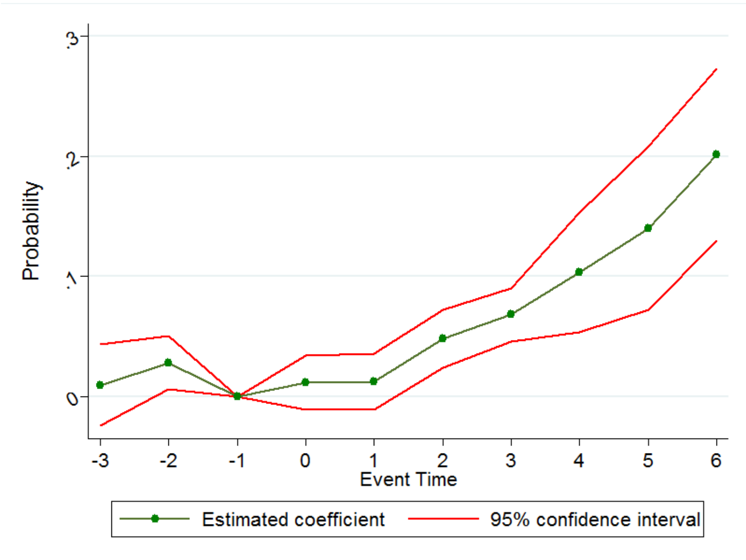


Table 15: Heterogeneous Impacts of Public Colleges on Enrollment, by Age (Linear Probability Model)

	(1) Pub. School Enroll β / SE	(2) Pub. School Enroll β / SE	(3) Pvt. School Enroll β / SE	(4) Pvt. School Enroll β / SE	(5) Ov. Enroll β / SE	(6) Ov. Enroll β / SE
T = -4	0.001	0.011	-0.033	-0.042	-0.027	-0.030
	(0.041)	(0.033)	(0.034)	(0.032)	(0.016)	(0.019)
T = -3	-0.008	-0.036	0.010	0.037	0.004	0.005
	(0.028)	(0.042)	(0.030)	(0.048)	(0.016)	(0.013)
T = -2	0.005	0.010	0.016	0.004	0.027*	0.016
	(0.041)	(0.025)	(0.032)	(0.021)	(0.015)	(0.012)
T = 0	-0.049*	-0.041**	0.052*	0.037**	0.011	-0.001
	(0.026)	(0.019)	(0.026)	(0.016)	(0.013)	(0.012)
T = 1	-0.090**	-0.094***	0.080*	0.082***	-0.003	-0.012
	(0.037)	(0.025)	(0.040)	(0.023)	(0.014)	(0.011)
T = 2	-0.092**	-0.090***	0.090**	0.111***	0.002	0.021**
	(0.032)	(0.022)	(0.030)	(0.019)	(0.017)	(0.008)
T = 3	-0.075**	-0.075***	0.070**	0.089***	-0.000	0.013
	(0.026)	(0.021)	(0.030)	(0.026)	(0.017)	(0.011)
T = 4	-0.114***	-0.139***	0.135***	0.124***	0.028*	-0.006
	(0.018)	(0.027)	(0.018)	(0.028)	(0.015)	(0.011)
T = 5	-0.054	-0.098***	0.061	0.123***	0.005	0.025*
	(0.034)	(0.020)	(0.037)	(0.027)	(0.017)	(0.013)
T = 6	-0.060	-0.081***	0.079*	0.109***	0.028	0.029**
	(0.036)	(0.025)	(0.043)	(0.024)	(0.023)	(0.010)
Observations	63931	56984	63931	56984	63931	56984
R^2	0.139	0.125	0.107	0.129	0.189	0.078

Notes: All specifications include district FE and year FE. Specifications 1, 3 and 5 look at ages 5-10 while specifications 2, 4 and 6 look at ages 11-16. Sample includes 14 districts over 9 years. Standard errors are in parentheses, clustered by district.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Figure 12: Heterogeneous Impacts of Public Colleges on Public School Enrollment (Specification 1 and 2)

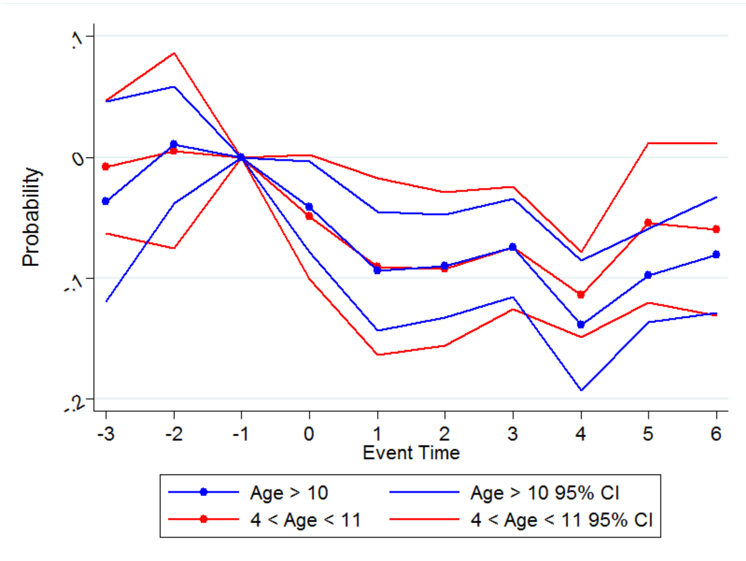


Figure 13: Heterogeneous Impacts of Public Colleges on Private School Enrollment (Specification 3 and 4)

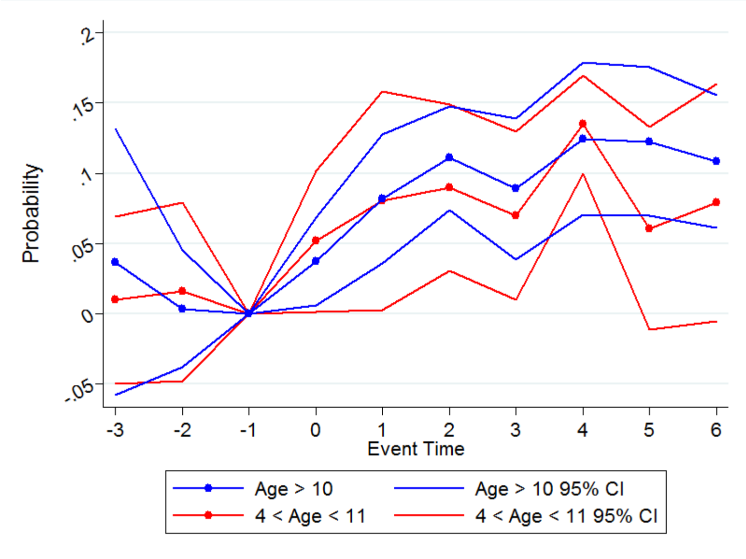


Figure 14: Heterogeneous Impacts of Public Colleges on Overall School Enrollment (Specification 5 and 6)

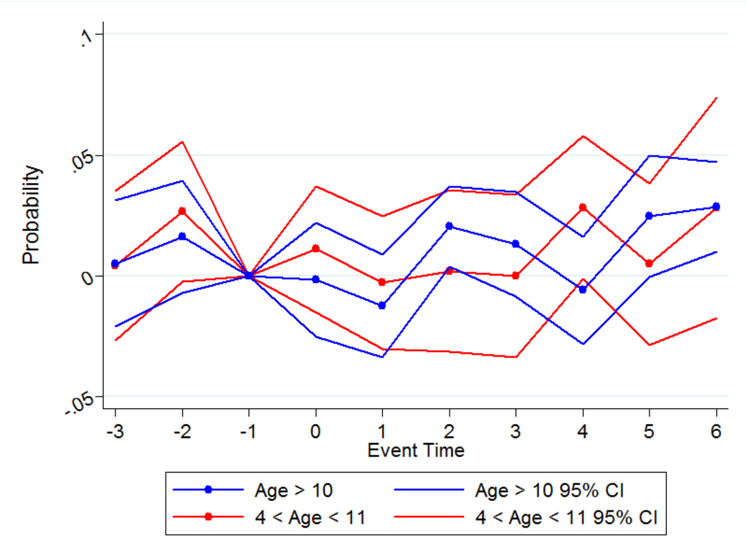


Table 16: Heterogeneous Impacts of Public Colleges on Enrollment, by Gender (Linear Probability Model)

	(1) Pub. School Enroll β / SE	(2) Pub. School Enroll β / SE	(3) Pvt. School Enroll β / SE	(4) Pvt. School Enroll β / SE	(5) Ov. Enroll β / SE	(6) Ov. Enroll β / SE
T = -4	-0.020	0.020	-0.016	-0.045	-0.030**	-0.023**
	(0.026)	(0.027)	(0.030)	(0.030)	(0.012)	(0.011)
T = -3	-0.028	-0.008	0.031	0.011	0.010	0.004
	(0.034)	(0.035)	(0.037)	(0.041)	(0.015)	(0.012)
T = -2	0.009	0.008	0.009	0.009	0.021	0.022*
	(0.036)	(0.032)	(0.032)	(0.024)	(0.015)	(0.010)
T = 0	-0.028	-0.063**	0.032*	0.059**	0.007	0.004
	(0.019)	(0.024)	(0.017)	(0.020)	(0.012)	(0.011)
T = 1	-0.075**	-0.107***	0.068**	0.093**	-0.003	-0.010
	(0.030)	(0.031)	(0.031)	(0.031)	(0.011)	(0.010)
T = 2	-0.064**	-0.116***	0.082***	0.117***	0.018*	0.005
	(0.026)	(0.023)	(0.026)	(0.021)	(0.010)	(0.012)
T = 3	-0.054**	-0.092***	0.066**	0.090***	0.013	0.001
	(0.020)	(0.025)	(0.029)	(0.025)	(0.014)	(0.013)
T = 4	-0.097***	-0.154***	0.114***	0.145***	0.025**	-0.001
	(0.019)	(0.023)	(0.017)	(0.024)	(0.009)	(0.009)
T = 5	-0.034	-0.114***	0.062*	0.118***	0.022	0.008
	(0.026)	(0.026)	(0.034)	(0.030)	(0.015)	(0.012)
T = 6	-0.026	-0.115***	0.054	0.135***	0.030*	0.027**
	(0.030)	(0.026)	(0.040)	(0.027)	(0.017)	(0.011)
Observations	56359	63625	56359	63625	56359	63625
R^2	0.129	0.126	0.118	0.106	0.132	0.139

Notes: Includes district FE and year FE. Specifications 1, 3 and 5 look at girls while specifications 2, 4 and 6 look at boys. Sample includes 14 districts over 9 years. Standard errors are in parentheses, clustered by district.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Figure 15: Heterogeneous Impacts of Public Colleges on Public School Enrollment (Specification 1 and 2)

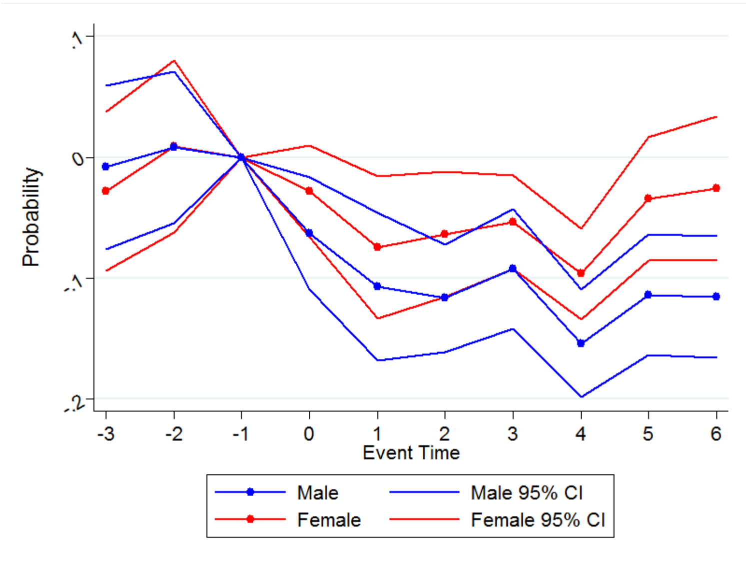


Figure 16: Heterogeneous Impacts of Public Colleges on Private School Enrollment (Specification 3 and 4)

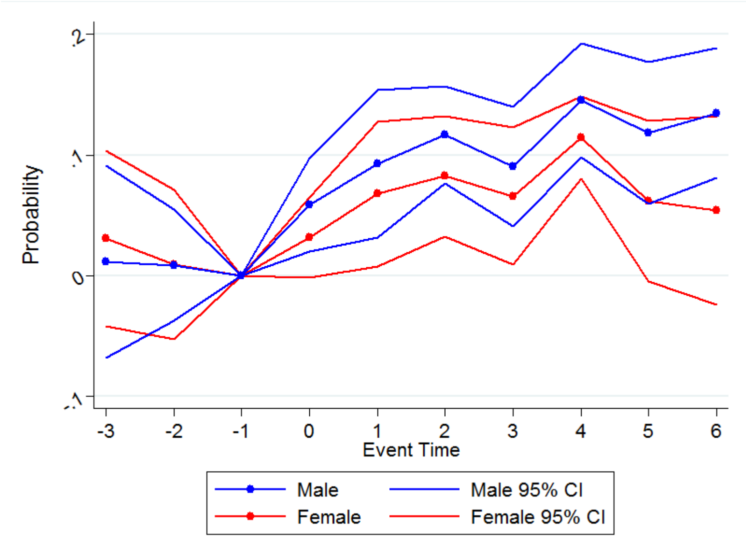


Figure 17: Heterogeneous Impacts of Public Colleges on Overall School Enrollment (Specification 5 and 6)

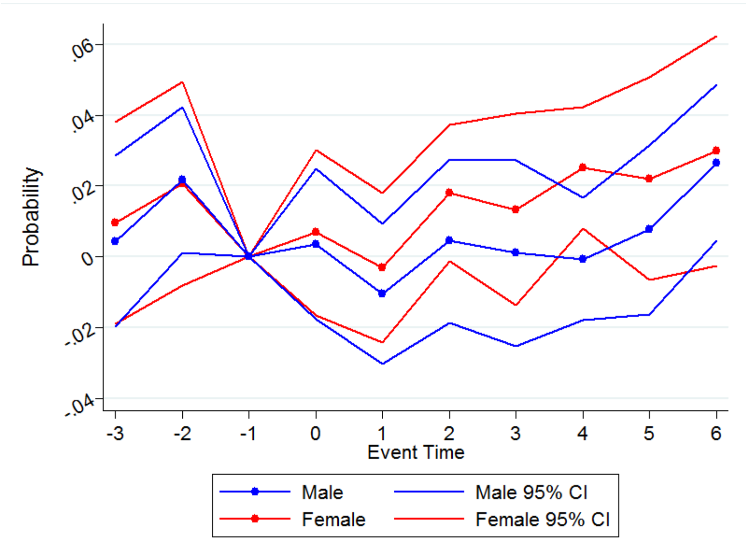


Table 17: Event Study: Impact of Public Colleges on Math and Reading Scores (Normalized)

	(1) Math(Norm.) β / SE	(2) Read(Norm.) β / SE
T = -4	0.002	0.030
	(0.092)	(0.052)
T = -3	0.067	0.071
	(0.095)	(0.068)
T = -2	0.049	0.052
	(0.063)	(0.042)
T = 0	0.043	0.031
	(0.044)	(0.033)
T = 1	-0.122*	-0.075
	(0.060)	(0.058)
T = 2	-0.043	-0.058
	(0.055)	(0.056)
T = 3	-0.070	-0.056
	(0.059)	(0.053)
T = 4	-0.056	-0.058
	(0.082)	(0.055)
T = 5	-0.029	-0.010
	(0.071)	(0.044)
T = 6	-0.006	-0.019
	(0.078)	(0.047)
Observations	78468	78853
R^2	0.102	0.073

Notes: Specifications 1 and 4 include district FE and year FE; specifications 2 and 5 also include district-specific linear trends, while specifications 3 and 6 include quadratic trends. Sample includes only on-track children in 14 districts over 9 years. Standard errors are in parentheses, clustered by district.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Figure 18: Event Study: Impact of Public Colleges on Math Scores (Specification 1)

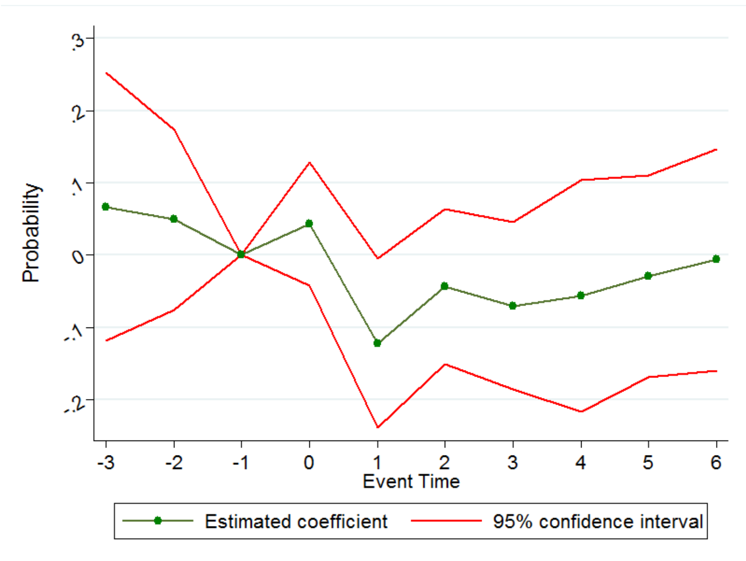


Figure 19: Event Study: Impact of Public Colleges on Reading Scores (Specification 2)

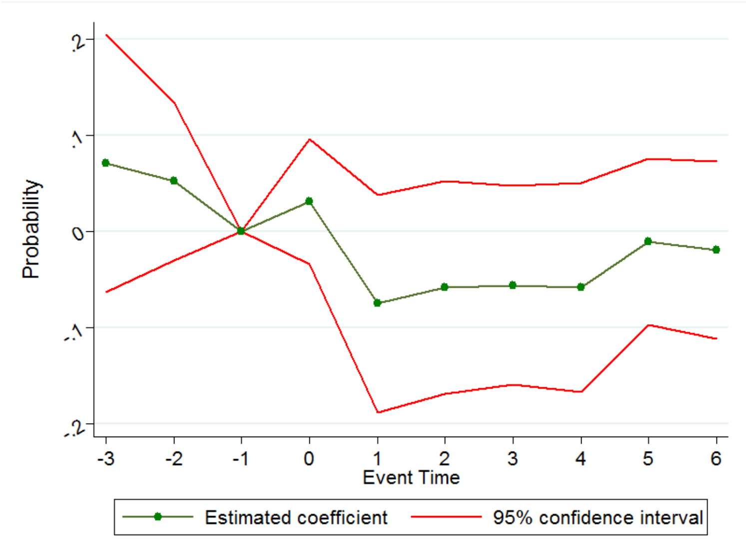
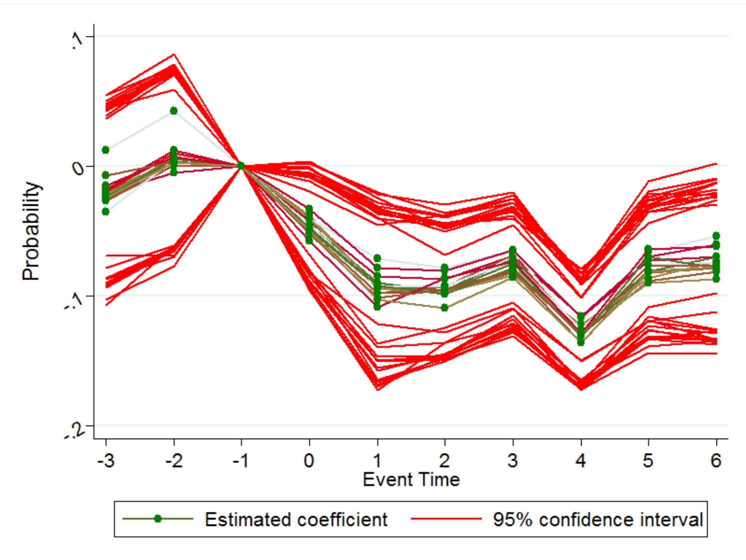
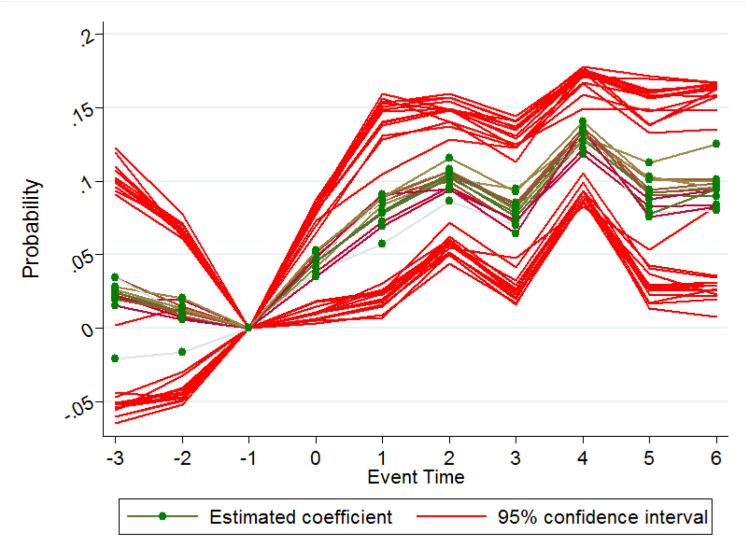


Figure 20: Robustness Check: Impact of Public Colleges on Public School Enrollment After Dropping a District (Linear Probability Model)



Notes: Specification include district FE and year FE. Sample includes children in 14 districts over 9 years. Standard errors are in parentheses, clustered by district.

Figure 21: Robustness Check: Impact of Public Colleges on Private School Enrollment After Dropping a District (Linear Probability Model)



Notes: Specification include district FE and year FE. Sample includes children in 14 districts over 9 years. Standard errors are in parentheses, clustered by district.

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Table 18: Adding District-specific Linear Trends: Impact of Public Colleges on Log # of Private Schools

	(1) Log Pvt. Schools β / SE	(2) Log Rural Pvt. Schools β / SE
T = -4	-0.092	-0.183
	(0.180)	(0.185)
T = -3	0.070	0.027
	(0.151)	(0.157)
T = -2	-0.017	0.009
	(0.094)	(0.103)
T = 0	0.151**	0.215**
	(0.076)	(0.091)
T = 1	0.141*	0.162*
	(0.078)	(0.095)
T = 2	0.174**	0.143
	(0.077)	(0.097)
T = 3	0.173**	0.119
	(0.078)	(0.093)
T = 4	0.202*	0.198
	(0.106)	(0.126)
Observations	253	253
R^2	0.934	0.923

Notes: Includes district FE, year FE and district-specific linear trends. Sample includes 23 districts over 11 years. Standard errors are in parentheses, clustered by district.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Figure 22: Adding District-specific Linear Trends: Impact of Public Colleges on Log # of all Private Schools (Specification 1)

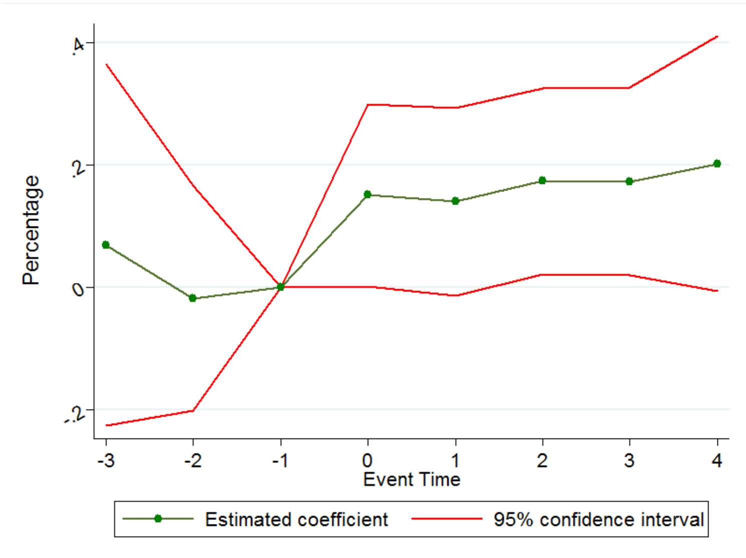


Figure 23: Adding District-specific Linear Trends: Impact of Public Colleges on Log # of Rural Private Schools (Specification 2)

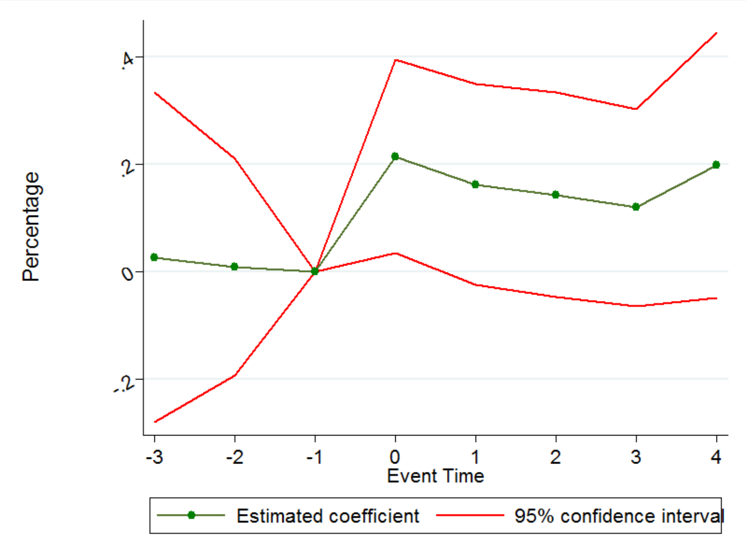


Table 19: Event Study: Impact of Public Colleges on Log # of Public Schools

	(1) Log Pub. Schools β / SE	(2) Log Rural Pub. Schools β / SE
T = -4	0.058	0.108
	(0.075)	(0.082)
T = -3	0.066	0.101
	(0.058)	(0.064)
T = -2	0.010	0.025
	(0.070)	(0.074)
T = 0	-0.011	-0.026
	(0.061)	(0.066)
T = 1	0.005	-0.020
	(0.061)	(0.065)
T = 2	-0.007	-0.067
	(0.076)	(0.086)
T = 3	0.051	-0.003
	(0.070)	(0.079)
T = 4	0.074	0.024
	(0.071)	(0.088)
Observations	253	253
R^2	0.971	0.967

Notes: All specifications include district FE and year FE. Sample includes 23 districts over 11 years. Standard errors are in parentheses, clustered by district.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Figure 24: Event Study: Impact of Public Colleges on Log # of all Public Schools (Specification 1)

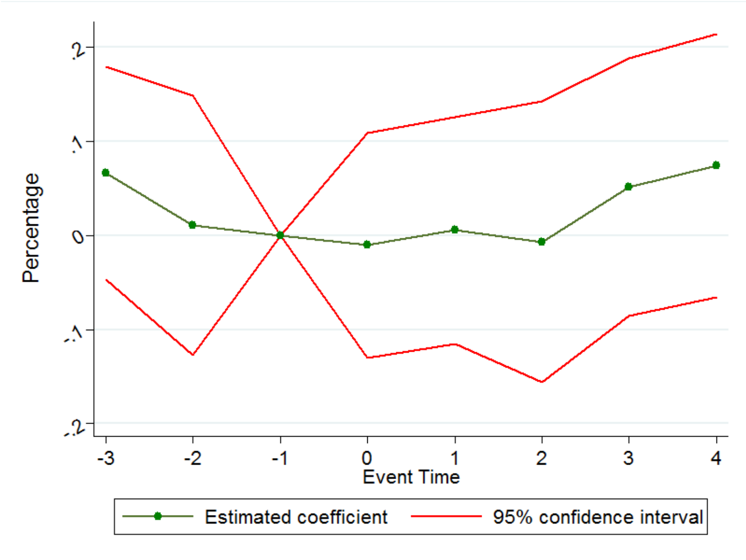
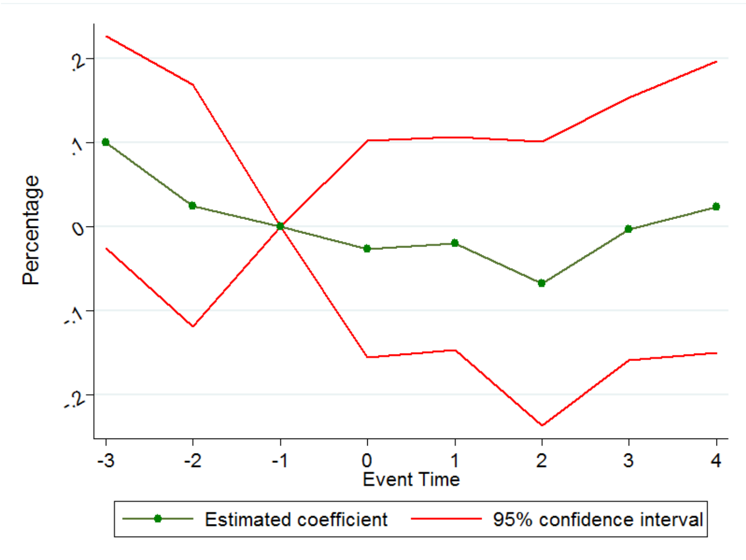


Figure 25: Event Study: Impact of Public Colleges on Log # of Rural Public Schools (Specification 2)



Census Population

Table 20: Summary Statistics: District-level Population Census 2001 and 2011

	All	2001	2011
Pop.	1755826.10	1639165.69	1872486.52
	(1309999.31)	(1190685.58)	(1410807.67)
Rural Pop.	1300831.28	1242816.03	1358846.54
	(944353.57)	(880541.55)	(1001580.96)
Urban Pop.	454994.82	396349.66	513639.99
	(662581.57)	(567534.12)	(741523.39)
Pop 1 to 10	435362.63	443380.50	427344.76
	(324267.10)	(321795.46)	(326821.45)
Rural Pop. 1 to 10	341041.53	353456.88	328626.19
	(268975.24)	(268566.30)	(269059.24)
Urban Pop. 1 to 10	94321.10	89923.62	98718.57
	(126893.29)	(118929.72)	(134352.75)
Pop 21 to 30	305461.64	282421.16	328502.13
	(241448.02)	(217013.39)	(261808.98)
Rural Pop. 21 to 30	217839.83	206352.29	229327.37
	(158107.46)	(146596.81)	(168188.21)
Urban Pop. 21 to 30	87621.81	76068.87	99174.75
	(137311.82)	(118883.61)	(152785.15)
Pop 31 to 40	243116.91	222817.44	263416.38
	(191752.31)	(170815.06)	(208812.50)
Rural Pop. 31 to 40	173678.05	163505.06	183851.05
	(125974.37)	(116484.61)	(134136.12)
Urban Pop. 31 to 40	69438.86	59312.38	79565.33
	(108351.25)	(90659.67)	(122788.92)
Pop 41 to 50	172171.62	148630.49	195712.75
	(138609.13)	(114375.52)	(155783.32)
Rural Pop. 41 to 50	122586.56	109497.02	135676.09
	(89665.90)	(78694.20)	(97769.01)
Urban Pop. 41 to 50	49585.06	39133.47	60036.66
	(77339.25)	(59287.64)	(90773.98)
Observations	1080	540	540

Notes: Sample includes 540 districts. Standard deviations are in parentheses

Table 21: Difference-in-Difference: Impact of Public Colleges on Log of Population

	(1)	(2)	(3)
	Pop.	Rural Pop.	Urban Pop.
	β / SE	β / SE	β / SE
Public College*2011	0.005	-0.030	0.086
	(0.295)	(0.307)	(0.365)
Observations	1080	1070	1067
R^2	0.004	0.005	0.016

Notes: Sample includes 540 districts in two census waves 2001 and 2011. Homoskedastic standard errors are in parentheses.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Table 22: Difference-in-Difference: Impact of Public Colleges on Log of Population

	(1) Pop 1 to 10 β / SE	(2) Rural Pop. 1 to 10 β / SE	(3) Urban Pop. 1 to 10 β / SE
Public College*2011	-0.008	-0.038	0.085
	(0.301)	(0.318)	(0.361)
Observations	1080	1070	1067
R^2	0.001	0.009	0.006

Notes: Sample includes 540 districts in two census waves 2001 and 2011. Homoskedastic standard errors are in parentheses.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Table 23: Difference-in-Difference: Impact of Public Colleges on Log of Population

	(1) Pop 11 to 20 β / SE	(2) Rural Pop. 11 to 20 β / SE	(3) Urban Pop. 11 to 20 β / SE
Public College*2011	-0.042	-0.071	0.054
	(0.293)	(0.308)	(0.360)
Observations	1080	1070	1067
R^2	0.002	0.004	0.011

Notes: Sample includes 540 districts in two census waves 2001 and 2011. Homoskedastic standard errors are in parentheses.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Table 24: Difference-in-Difference: Impact of Public Colleges on Log of Population

	(1) Pop 21 to 30 β / SE	(2) Rural Pop. 21 to 30 β / SE	(3) Urban Pop. 21 to 30 β / SE
Public College*2011	-0.004	-0.034	0.061
	(0.291)	(0.299)	(0.365)
Observations	1080	1070	1067
R^2	0.006	0.005	0.020

Notes: Sample includes 540 districts in two census waves 2001 and 2011. Homoskedastic standard errors are in parentheses.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Table 25: Difference-in-Difference: Impact of Public Colleges on Log of Population

	(1) Pop 31 to 40 β / SE	(2) Rural Pop. 31 to 40 β / SE	(3) Urban Pop. 31 to 40 β / SE
Public College*2011	0.024	-0.014	0.093
	(0.296)	(0.305)	(0.365)
Observations	1080	1070	1067
R^2	0.007	0.006	0.020

Notes: Sample includes 540 districts in two census waves 2001 and 2011. Homoskedastic standard errors are in parentheses.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Table 26: Difference-in-Difference: Impact of Public Colleges on Log of Population

	(1) Pop 41 to 50 β / SE	(2) Rural Pop. 41 to 50 β / SE	(3) Urban Pop. 41 to 50 β / SE
Public College*2011	0.038	-0.001	0.096
	(0.299)	(0.310)	(0.375)
Observations	1080	1070	1067
R^2	0.018	0.012	0.033

Notes: Sample includes 540 districts in two census waves 2001 and 2011. Homoskedastic standard errors are in parentheses.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.