

Online Appendix

Appendix Table 1: Descriptive statistics comparing excluded and included cases

Variable	Included Cases--OLS Reading Model, Grade 3					Excluded Cases--OLS Reading Model, Grade 3					Difference in means
	Obs	Mean	SD	Min	Max	Obs	Mean	SD	Min	Max	
Reading score (std)	172,826	-0.01	1.00	-3.44	2.15	32,289	-0.02	1.02	-3.44	2.15	-0.01
Math score (std)	172,657	0.01	0.99	-3.05	2.43	34,547	-0.08	1.02	-3.03	2.43	-0.09
Gifted Identification	172,826	0.08		0.00	1.00	32,441	0.07		0.00	1.00	-0.01
Disability Identification	172,826	0.12		0.00	1.00	32,441	0.19		0.00	1.00	0.06
Forced Redshirt	172,826	0.07		0.00	1.00	8,076	0.05		0.00	1.00	-0.02
Forced Redshirt (ITT)	172,826	0.07		0.00	1.00	8,076	0.05		0.00	1.00	-0.02
Months Younger Than Cutoff	172,826	5.92	3.45	0.00	12.13	36,349	6.10	3.43	0.00	12.13	0.18
Months Younger Than Cutoff Sq.	172,826	46.97	42.40	0.00	147.22	36,349	49.02	43.15	0.00	147.22	2.05
Male	172,826	0.51		0.00	1.00	36,762	0.52		0.00	1.00	0.02
Black	172,826	0.24		0.00	1.00	36,759	0.26		0.00	1.00	0.02
Hispanic	172,826	0.16		0.00	1.00	36,759	0.19		0.00	1.00	0.03
Asian	172,826	0.03		0.00	1.00	36,759	0.05		0.00	1.00	0.02
Am. Indian	172,826	0.01		0.00	1.00	36,759	0.01		0.00	1.00	0.00
Multiracial	172,826	0.04		0.00	1.00	36,759	0.04		0.00	1.00	0.00
Moved Within Year	172,826	0.06		0.00	1.00	36,762	0.17		0.00	1.00	0.00
Moved Within Year Missing	172,826	0.00		0.00	0.00	36,762	0.12		0.00	1.00	0.00
Moved Prior Year	172,826	0.00		0.00	1.00	36,762	0.01		0.00	1.00	-0.01
Days Absent	172,826	5.80	5.28	0.00	85.00	31,030	5.94	5.57	0.00	84.00	0.15
Free Lunch Eligible	172,826	0.51		0.00	1.00	36,762	0.41		0.00	1.00	-0.10
Reduced Priced Lunch Eligible	172,826	0.06		0.00	1.00	36,762	0.05		0.00	1.00	-0.01
English Language Learner (ELL)	172,826	0.10		0.00	1.00	36,762	0.12		0.00	1.00	0.01
ELL (Former)	172,826	0.01		0.00	1.00	36,762	0.00		0.00	1.00	0.00
Year 2013	172,826	0.48		0.00	1.00	36,762	0.47		0.00	1.00	-0.01
Year 2014	172,826	0.52		0.00	1.00	36,762	0.53		0.00	1.00	0.01
Redshirt (Voluntary)	172,826	0.02		0.00	1.00	8,076	0.03		0.00	1.00	0.01

Note: See text for explanation of excluded cases.

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Appendix Table 2: Descriptive statistics for Forced Redshirts and the “next 45 days” of students in the RD estimation comparison sample

Variable	<b>Forced Redshirts</b>	<b>Comparison</b>	Difference
	Born 9/1/04-10/15/04	Born 10/16/04-11/30/04	
Reading Score (std)	0.12	0.17	-0.05
Math Score (std)	0.13	0.17	-0.05
Gifted Identification	0.07	0.06	0.00
Disability Identification	0.10	0.09	0.01
Forced Redshirt (Intent-to-treat)	0.00	1.00	-1.00
Distance from 10/15/04 cutoff	21.84	-22.67	44.51
Redshirt	0.00	0.00	0.00
Male	0.50	0.51	-0.01
Black	0.26	0.24	0.02
Hispanic	0.15	0.16	0.00
Asian	0.03	0.03	0.00
Am. Indian	0.01	0.01	0.00
Multiracial	0.04	0.04	0.00
Moved Within Year	0.07	0.08	-0.01
Moved Within Year Missing	0.00	0.00	0.00
Moved Prior Year	0.00	0.00	0.00
Days Absent	4.86	4.97	-0.11
Free Lunch Eligible	0.51	0.50	0.01
Reduced Price Lunch Eligible	0.06	0.06	0.00
English Language Learner	0.09	0.09	0.00
English Language Learner (Former)	0.01	0.01	0.00
N	10,061	11,617	

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Appendix Table 3: Treatment effect estimates on class size

Grade level	Class size
3	0.034 (0.035)
4	0.114** (0.043)
5	0.162** (0.047)

Note: Estimates come from OLS ITT model sample.

\*\*  $p < 0.01$ , \*  $p < 0.05$ , +  $p < 0.10$

Appendix Table 4: Local polynomial RD results

Grade level	(1) OLS RD estimates without school FE	(2) Local polynomial regression estimates
<b>A. Reading achievement</b>		
3	0.024 (0.024)	-0.046+ (0.026)
4	0.024 (0.024)	-0.004 (0.025)
5	0.006 (0.023)	0.017 (0.025)
N	21678	
<b>B. Math achievement</b>		
3	0.023 (0.024)	-0.039 (0.026)
4	0.029 (0.024)	-0.013 (0.026)
5	0.008 (0.024)	0.019 (0.026)
N	21811	
<b>C. Gifted Identification</b>		
3	-0.011+ (0.006)	0.007 (0.007)
4	-0.011 (0.009)	0.017+ (0.010)
5	-0.007 (0.010)	0.013 (0.011)
N	22139	
<b>D. Disability Identification</b>		
3	0.010 (0.008)	-0.005 (0.009)
4	0.008 (0.009)	-0.004 (0.010)
5	0.009 (0.009)	-0.011 (0.010)
N	22139	

Notes: Local polynomial regression estimates include all student characteristics but cannot include fixed effects for school. The OLS RD estimates shown in column 1 are from an analogous OLS specification that do not include school fixed effects and shown for comparison only. Observation counts are from 3<sup>rd</sup> grade models. \*\* p<0.01, \* p<0.05, + p<0.10

Appendix Table 5: Results from analyses adjusting for compliance

Grade level	(1) 2SLS	(2) Single cohort OLS estimates that omit non-compliers
<b>A. Reading achievement</b>		
3	0.114** (0.016)	0.054** (0.014)
4	0.083** (0.017)	0.073** (0.014)
5	0.043* (0.018)	0.070** (0.014)
N	172826	90088
<b>B. Math achievement</b>		
3	0.065** (0.016)	0.047** (0.014)
4	0.026 (0.017)	0.071** (0.014)
5	-0.010 (0.018)	0.069** (0.014)
N	174006	90791
<b>C. Gifted Identification</b>		
3	0.007 (0.006)	-0.007+ (0.004)
4	0.013+ (0.007)	-0.003 (0.005)
5	0.019** (0.007)	0.007 (0.006)
N	176102	92778
<b>D. Disability Identification</b>		
3	0.061** (0.007)	-0.029** (0.005)
4	0.054** (0.007)	-0.032** (0.006)
5	0.062** (0.007)	-0.035** (0.006)
N	176102	92778

Notes: Reading and math achievement are in standard deviation units, and gifted and disability identification are in percentage point units. All models include school fixed effects, and the set of covariates described in the text and shown in Table 1. Robust standard errors (in parentheses) are clustered at the school level. Observation counts are from 3<sup>rd</sup> grade models. \*\* p<0.01, \* p<0.05, + p<0.10

Appendix Table 6: Regression discontinuity results comparing forced redshirts with the youngest students in the prior cohort who just missed the new birthdate cutoff

	(1) OLS RD estimates with school FE	(2) OLS RD estimates without school FE	(3) Local polynomial regression estimates
Grade level			
<b>A. Reading achievement</b>			
3	0.278** (0.024)	0.282** (0.024)	0.220** (0.025)
4	0.254** (0.023)	0.256** (0.023)	0.209** (0.024)
5	0.238** (0.023)	0.242** (0.023)	0.212** (0.024)
N	23713	23713	23713
<b>B. Math achievement</b>			
3	0.206** (0.023)	0.211** (0.023)	0.176** (0.025)
4	0.228** (0.023)	0.230** (0.023)	0.208** (0.024)
5	0.221** (0.023)	0.226** (0.023)	0.178** (0.025)
N	23894	23876	23876
<b>C. Gifted Identification</b>			
3	-0.008 (0.008)	-0.007 (0.008)	-0.026** (0.008)
4	0.041** (0.009)	0.042** (0.009)	0.019+ (0.010)
5	0.049** (0.010)	0.050** (0.010)	0.025* (0.010)
N	24220	24220	24220
<b>D. Disability Identification</b>			
3	-0.064** (0.009)	-0.064** (0.009)	-0.057** (0.009)
4	-0.064** (0.009)	-0.064** (0.009)	-0.067** (0.010)
5	-0.069** (0.009)	-0.070** (0.009)	-0.064** (0.010)
N	23918	24220	24220

Notes: Local polynomial regression estimates include all student characteristics but cannot include fixed effects for school. The OLS RD estimates shown in column 2 are from an analogous OLS specification that do not include school fixed effects and shown for comparison only. Observation counts are from 3<sup>rd</sup> grade models. \*\* p<0.01, \* p<0.05, + p<0.10