

Online Appendix

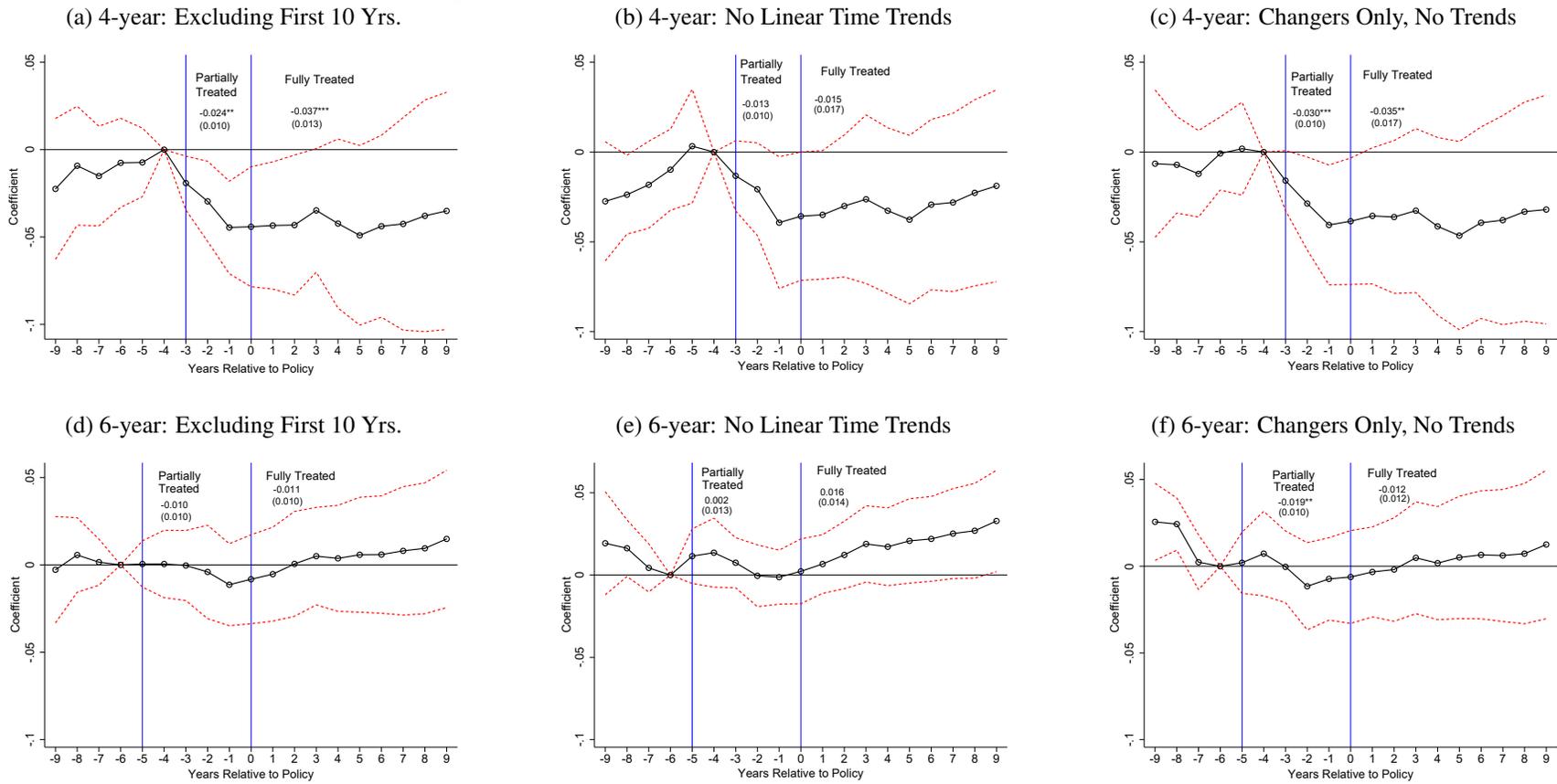
Semesters or Quarters? The Effect of the Academic Calendar on Postsecondary Student Outcomes

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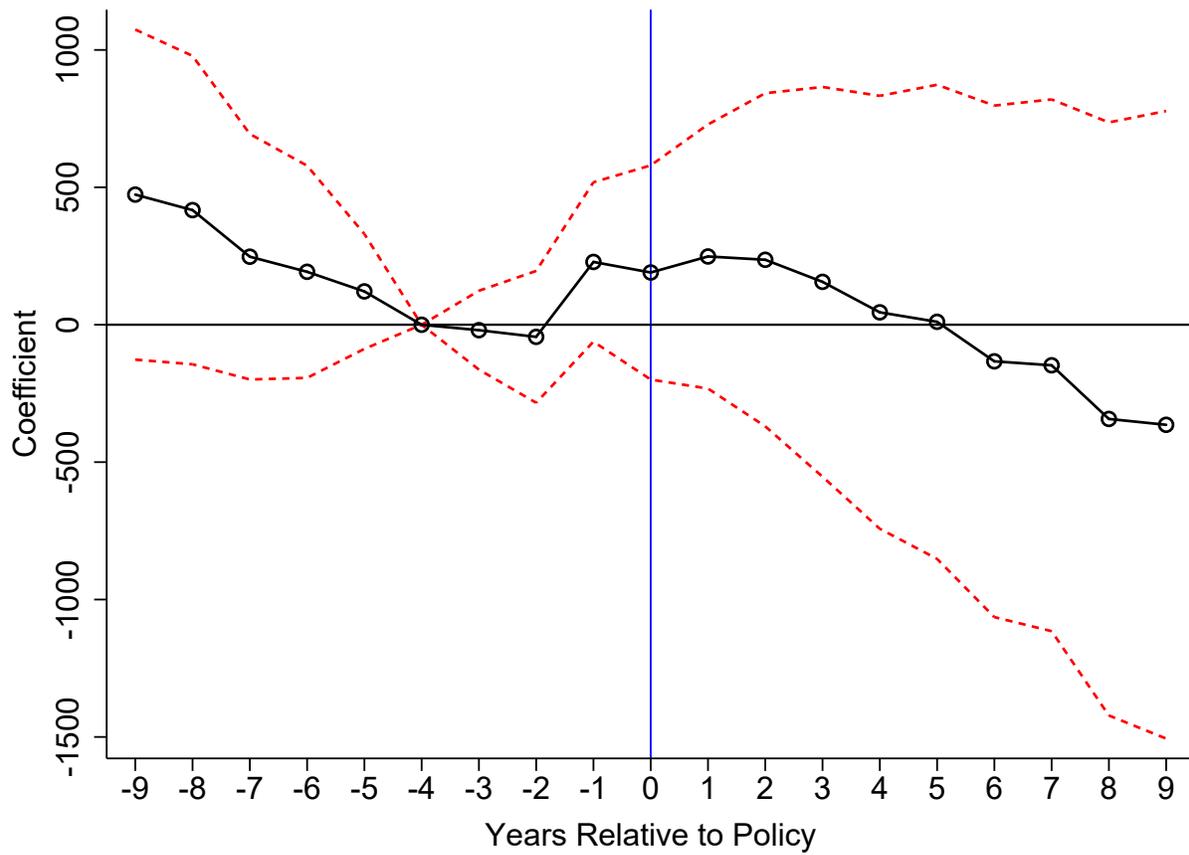
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Figure A1: Institution-Level Event Study Robustness Checks



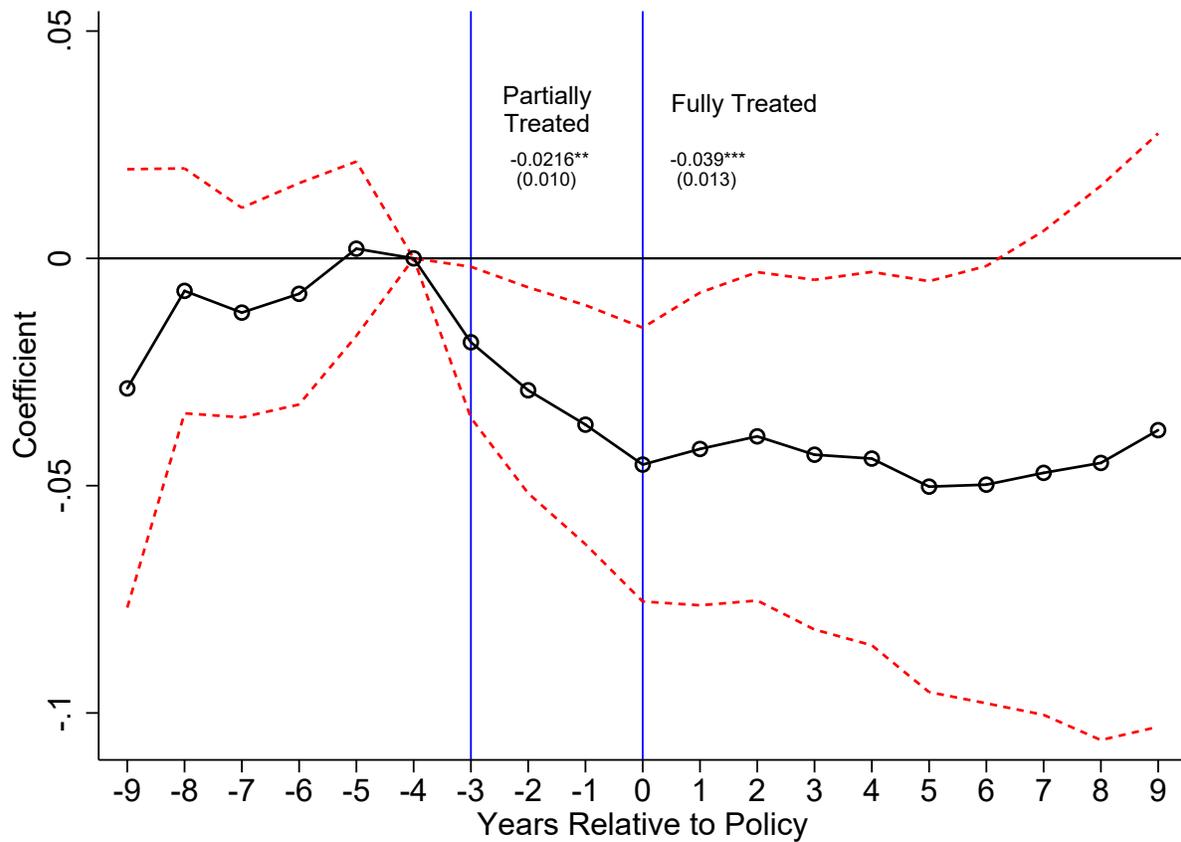
Data Source: IPEDS. Notes: The sample includes 13,889 observations for (a) and (d), 13,836 observations for (b) and (e), and 1,501 observations for (c) and (f). This figure plots θ_k , and 95% confidence intervals in dashed lines, from estimating Eq. (1). Year and institution fixed effects, institution-specific linear time trends, and time varying controls are included unless otherwise noted. Standard errors are clustered at the institution level.

Figure A2: Event Study: In-State Tuition—Institution-Level Analysis



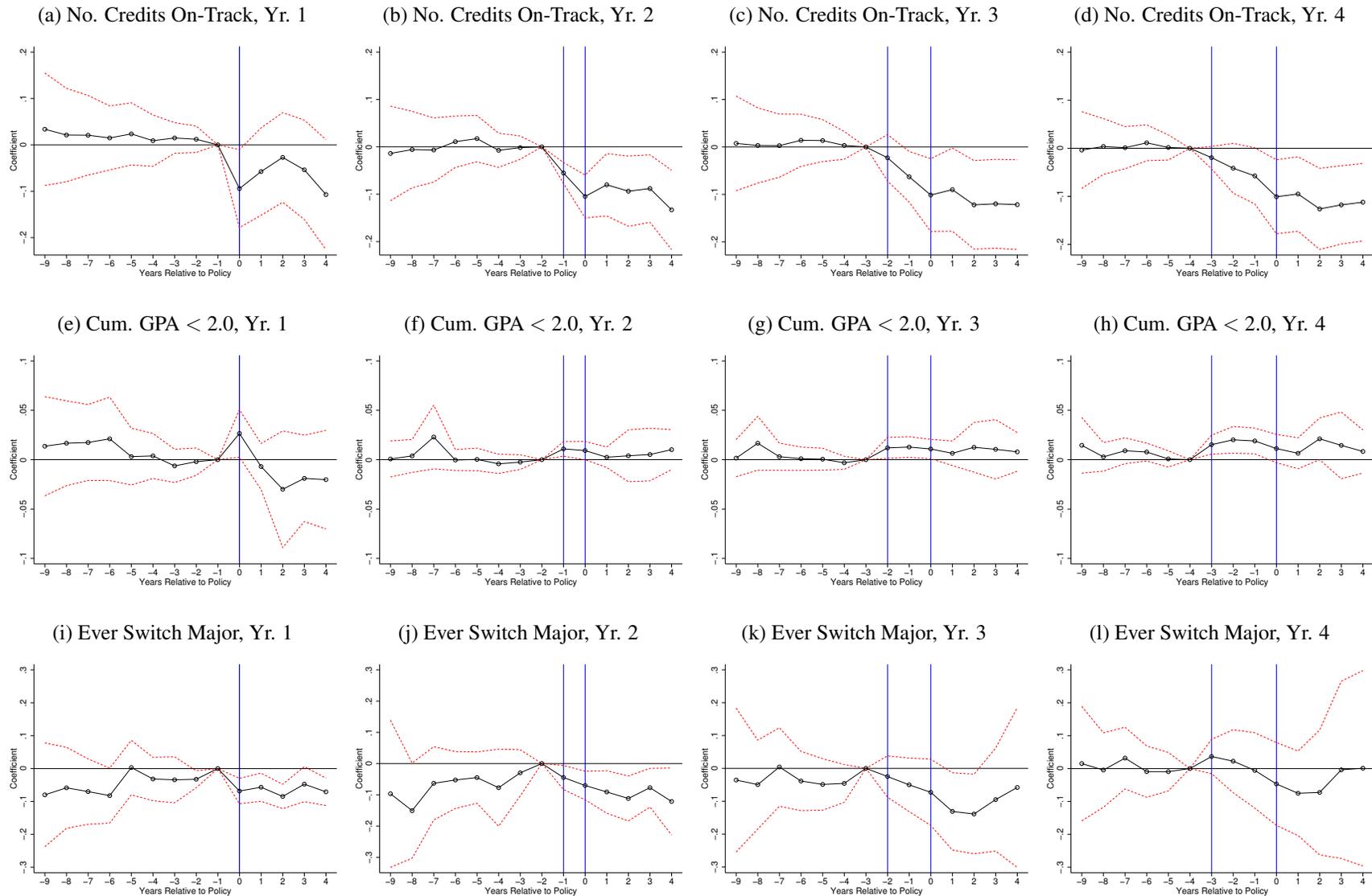
Data Source: IPEDS. The sample includes 731 institutions for 19 years (13,889). Notes: This figure plots θ_k , and 95% confidence intervals in dashed lines, from estimating Eq. (1). Year and institution fixed effects and institution-specific linear time trends are included. Standard errors are clustered at the institution level.

Figure A3: Event Study: 4-Year Graduation Rates for Institutions with State-Level Mandates to Adopt a Semester Calendar



Data Source: IPEDS. Notes: This figure plots θ_k , and 95% confidence intervals in dashed lines, from estimating Eq. (1). The sample includes 2,071 observations from 109 institutions. Year and institution fixed effects and institution-specific linear time trends are included. Standard errors are clustered at the institution level.

Figure A4: Event Study: Mechanism Analysis—Effect of Switching to Semesters on Cumulative Outcomes by Year in School



Data Source: OLDA. Notes: Sample includes first-time freshmen in the F1999-F2013 cohorts who remain enrolled for 4+ years (341,646 obs). This figure plots θ_k , and 95% confidence intervals in dashed lines, from estimating Eq. (3). Year and institution fixed effects, institution linear time trends, and student-level controls are included. The vertical line at $t = 0$ indicates the first fully treated cohort, that is students who first enroll at a university in the year of semester calendar adoption. The additional vertical line indicates the first partially treated cohort; e.g., in Figure A4f, the line at $t = -1$ indicates students who enrolled 1 year before the switch to semesters. Standard errors are estimated using multiway clustering.

Table A1: Effect of Switching to Semesters on Graduation Rates (Unbalanced Panel)—Institution-Level Analysis

	All (1)	All (2)	All (3)	All (4)	Women (5)	Men (6)	URM (7)	Non-URM (8)	Public (9)	Private (10)
<u>Panel A: Effect on 4-year Grad. Rates</u>										
G1 - partially treated	0.004 (0.014)	-0.003 (0.010)	-0.006 (0.011)	-0.008 (0.011)	-0.006 (0.012)	-0.009 (0.011)	-0.006 (0.011)	-0.007 (0.012)	-0.004 (0.013)	-0.017* (0.010)
G2 - fully treated	-0.013 (0.016)	-0.015 (0.013)	-0.020* (0.011)	-0.021* (0.011)	-0.019 (0.012)	-0.022** (0.011)	-0.014 (0.014)	-0.024** (0.012)	-0.016 (0.013)	-0.021 (0.013)
<u>Panel B: Effect on 6-year Grad. Rates</u>										
G1 - partially treated	0.019 (0.016)	0.012 (0.012)	0.001 (0.010)	-0.001 (0.009)	-0.002 (0.010)	0.001 (0.009)	-0.006 (0.015)	-0.000 (0.009)	0.001 (0.011)	-0.003 (0.008)
G2 - fully treated	0.028* (0.015)	0.024* (0.012)	0.006 (0.011)	0.006 (0.011)	0.005 (0.012)	0.010 (0.011)	-0.004 (0.020)	0.005 (0.011)	0.010 (0.013)	-0.004 (0.012)
Observations	22,089	22,089	22,089	22,089	22,010	21,489	22,074	21,528	8,845	13,244
School, Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Institution-Specific Time Trends	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Data Source: IPEDS. Notes: The sample includes 1,253 institutions over 19 years. Not all institutions are observed in each year. All regressions are weighted by average cohort size. Within each panel and column, point estimates come from the same regression. The left out category comprises the pre-treatment years, and is defined as ($k \leq -4$) for the four-year graduation outcome and ($k \leq -6$) for the six-year graduation outcome. Standard errors are clustered at the institution level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A2: Effect of Switching to Semesters on Graduation Rates (Unweighted)—Institution-Level Analysis

	All (1)	Women (2)	Men (3)	URM (4)	Non-URM (5)	Public (6)	Private (7)
<u>Panel A: Effect on 4-year Grad. Rates</u>							
G1 - partially treated	-0.019*** (0.008)	-0.016 (0.011)	-0.023*** (0.008)	-0.021** (0.011)	-0.017* (0.010)	-0.017* (0.009)	-0.013 (0.016)
G2 - fully treated	-0.031*** (0.010)	-0.029** (0.014)	-0.033*** (0.010)	-0.035** (0.014)	-0.030** (0.012)	-0.023** (0.011)	-0.035* (0.021)
<u>Panel B: Effect on 6-year Grad. Rates</u>							
G1 - partially treated	-0.011 (0.008)	-0.009 (0.009)	-0.012 (0.009)	-0.025* (0.013)	0.000 (0.011)	-0.011 (0.011)	-0.005 (0.011)
G2 - fully treated	-0.005 (0.011)	-0.004 (0.013)	-0.003 (0.013)	-0.028* (0.017)	0.004 (0.020)	-0.000 (0.014)	-0.009 (0.014)
Observations	13,889	13,865	13,824	13,883	13,799	6,365	7,524
School, Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Institution-Specific Time Trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Data Source: IPEDS. Notes: The sample includes 731 institutions for 19 years. Within each panel and column, point estimates come from the same regression. The left out category comprises the pre-treatment years, and is defined as ($k \leq -4$) for the four-year graduation outcome and ($k \leq -6$) for the six-year graduation outcome. Standard errors are clustered at the institution level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A3: Timing of Calendar Switch for Ohio Campuses

Institution	Year of Switch to Semesters	Total # Obs	% of Obs on Semesters
Kent State University - Ashtabula Campus	1979	3,584	100%
Kent State University - East Liverpool Campus	1979	1,468	100%
Kent State University - Geauga Campus	1979	2,545	100%
Kent State University - Main Campus	1979	56,134	100%
Kent State University - Salem Campus	1979	3,117	100%
Kent State University - Stark Campus	1979	9,727	100%
Kent State University - Trumbull Campus	1979	5,126	100%
Kent State University - Tuscarawas Campus	1979	4,957	100%
Bowling Green State University - Firelands Campus	1982	4,463	100%
Bowling Green State University - Main Campus	1982	51,081	100%
Miami University - Hamilton Campus	Before 1987	9,732	100%
Miami University - Main Campus	Before 1987	48,914	100%
Miami University - Middletown Campus	Before 1987	6,025	100%
University of Akron - Main Campus	Before 1987	53,784	100%
University of Akron - Wayne Campus	Before 1987	4,830	100%
University of Toledo	1997	50,344	100%
Cleveland State University	1999	18,180	100%
Youngstown State University	2000	32,925	95%
Central State University	2005	7,926	71%
Shawnee State University	2007	13,738	61%
Ohio State University - Agricultural Technical Institute	2012	5,126	24%
Ohio State University - Lima Campus	2012	6,067	25%
Ohio State University - Main Campus	2012	94,822	24%
Ohio State University - Mansfield Campus	2012	6,977	28%
Ohio State University - Marion Campus	2012	6,410	25%
Ohio State University - Newark Campus	2012	14,673	31%
Ohio University - Chillicothe Campus	2012	4,471	28%
Ohio University - Eastern Campus	2012	1,793	22%
Ohio University - Lancaster Campus	2012	5,338	27%
Ohio University - Main Campus	2012	54,890	23%
Ohio University - Southern Campus	2012	3,978	22%
Ohio University - Zanesville Campus	2012	4,111	20%
University of Cincinnati - Clermont Campus	2012	8,216	26%
University of Cincinnati - Main Campus	2012	54,972	23%
University of Cincinnati - Raymond Walters Campus	2012	10,729	36%
Wright State University - Lake Campus	2012	2,640	31%
Wright State University - Main Campus	2012	35,591	23%
Total		709,404	64%

Data Source: OLDA. Notes: Sample includes all students enrolling as first-time freshmen at a bachelor's degree-granting public Ohio institution in the Fall terms of 1999-2015.

Table A4: Effect of Switching to Semesters on First-Year Outcomes with Limited Cohorts

	Drop Out (1)	Transfer Out (2)	On-Track Course Taking (3)	Cum. GPA <2.0 (4)	Switch Major (5)
Semester	0.005	-0.010	-0.063	0.027	-0.060
SE clustered by campus	(0.005)	(0.007)	(0.040)	(0.006)***	(0.009)***
Wild cluster bootstrap p-value	[0.39]	[0.17]	[0.16]	[0.01]**	[0.00]***
Observations	47,372	47,372	47,372	47,372	47,372

Data Source: OLDA. Notes: This is a companion table to Table 6 but instead of the full sample, there are only two cohorts in this subsample: those that enter the year before the calendar switch and those that enter the year of the calendar switch. *Semester* is an indicator variable that takes the value of 1 if institution *s* operates on a semester calendar in year *t*, and 0 if it operates on a quarter calendar. All regressions include age, age-squared, sex, a foreign-born indicator, indicators for race/ethnicity and campus and year fixed-effects. There are no campus-specific linear time trends included because there are only two cohorts per campus. Multiway clustering is equivalent to campus clustering when there are only two cohorts per institution. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A5: Effect of Switching to Semesters on Student-Level Cumulative Outcomes by Year in School (Full Sample)

	Year 1 (1)	Year 2 (2)	Year 3 (3)	Year 4 (4)
Panel A: Outcome - Cumulative # of Credits is On-Track				
G1 - partially treated		-0.052	-0.044	-0.051
SE multi-way clustered		(0.017)***	(0.022)**	(0.018)***
SE clustered by campus		(0.017)***	(0.026)*	(0.023)**
Wild cluster bootstrap p-value		[0.02]**	[0.31]	[0.15]
G2 - fully treated	-0.068	-0.103	-0.106	-0.115
SE multi-way clustered	(0.036)*	(0.029)***	(0.031)***	(0.026)***
SE clustered by campus	(0.044)	(0.040)**	(0.043)**	(0.040)***
Wild cluster bootstrap p-value	[0.23]	[0.02]**	[0.06]*	[0.03]**
Mean of Outcome	0.54	0.57	0.59	0.62
Panel B: Outcome - Cum. GPA < 2.0				
G1 - partially treated		0.034	0.023	0.018
SE multi-way clustered		(0.009)***	(0.006)***	(0.005)***
SE clustered by campus		(0.009)***	(0.007)***	(0.006)***
Wild cluster bootstrap p-value		[0.01]***	[0.02]**	[0.02]**
G2 - fully treated	0.049	0.038	0.026	0.012
SE multi-way clustered	(0.010)***	(0.012)***	(0.007)***	(0.005)**
SE clustered by campus	(0.013)***	(0.016)**	(0.010)**	(0.006)*
Wild cluster bootstrap p-value	[0.01]***	[0.10]*	[0.08]*	[0.14]
Mean of Outcome	0.24	0.12	0.06	0.04
Panel C: Outcome - Has Ever Switched Major				
G1 - partially treated		-0.032	-0.000	0.040
SE multi-way clustered		(0.026)	(0.033)	(0.028)
SE clustered by campus		(0.029)	(0.039)	(0.034)
Wild cluster bootstrap p-value		[0.36]	[1.00]	[0.35]
G2 - fully treated	-0.071	-0.107	-0.070	-0.022
SE clustered by campus	(0.007)***	(0.023)***	(0.034)**	(0.033)
SE clustered by campus	(0.009)***	(0.030)***	(0.044)	(0.041)
Wild cluster bootstrap p-value	[0.00]***	[0.00]***	[0.16]	[0.62]
Mean of Outcome	0.11	0.38	0.54	0.61
Obs	709,404	515,629	405,488	341,646

Data Source: OLDA. Note: Sample includes first-time freshmen in the F2000-F2015 cohorts and is conditional on continued enrollment through the year in which the outcome variable is measured. The partially treated group is defined separately for each year/column. In column (2), G1 includes students who enrolled 1 year before the switch to semesters. In columns (3) and (4), G1 also includes student who enroll 2 and 3 years before the calendar switch, respectively. In all specifications, the fully treated group, G2, includes all students who first enroll at a university that is on a semester calendar. All regressions include age, age-squared, sex, a foreign-born indicator, indicators for race/ethnicity, campus and year fixed-effects, and campus-specific linear time trends. ***p<0.01, **p<0.05, *p<0.10.

Table A6: Effect of Switching to Semesters on Student-Level Cumulative Outcomes with Individual Fixed Effects

	Cum. # of Credits is On-Track (1)	Cum. GPA <2.0 (2)	Has Ever Switched Major (3)
Semester	-0.066	0.024	-0.014
SE multi-way clustered	(0.023)***	(0.006)***	(0.029)
SE clustered by campus	(0.019)***	(0.006)***	(0.028)
Wild cluster bootstrap p-value	[0.02]**	[0.00]***	[0.65]
Observations	1,854,364	1,854,364	1,854,364

Data Source: OLDA. Note: Sample includes first-time freshmen in the F2000-F2012 cohorts.

Notes: Point estimates come from estimating the following equation:

$$Y_{ist} = \beta \text{Semesters}_{st} + D_t + D_i + \text{Status}_{it} + u_{ist}$$

Where i is an individual, s is an institution, and t is the year. *Semester* is an indicator variable that takes the value of 1 if institution s operates on a semester calendar in year t , and 0 if it operates on a quarter calendar. Status_{it} are indicator variables for the student's current year in school ($\in [1, 5]$).

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A7: Effect of Switching to Semesters on Summer Employment (Full Sample)

	Share of Summers Employed	Employed Summer After:		
		1st Year	2nd Year	3rd Year
	(1)	(2)	(3)	(4)
Panel A: Excluding Retail and Food Service Employment				
G2 - fully treated	0.024	0.016	0.021	0.015
SE multi-way clustered	(0.009)**	(0.005)***	(0.009)**	(0.012)
SE clustered by campus	(0.013)*	(0.007)**	(0.011)*	(0.016)
Wild cluster bootstrap p-value	[0.14]	[0.05]**	[0.10]	[0.49]
Mean of Outcome	0.52	0.52	0.53	0.52
Observations	351,643	619,491	446,569	351,643
Panel B: Retail and Food Service Employment Only				
G2 - fully treated	-0.018	-0.007	-0.023	-0.023
SE multi-way clustered	(0.009)*	(0.007)	(0.009)**	(0.010)**
SE clustered by campus	(0.012)	(0.009)	(0.012)*	(0.013)
Wild cluster bootstrap p-value	[0.31]	[0.51]	[0.15]	[0.24]
Mean of Outcome	0.23	0.27	0.25	0.22
Observations	351,643	619,491	446,569	351,643

Data Source: OLDA linked to ODJFS Unemployment Insurance Quarterly Wage data. Notes: Sample includes first-time freshmen in the F2000-F2015 cohorts and is conditional on continued enrollment through the year in which the outcome variable is measured, and can be linked to ODJFS employment data. The partially treated group (not reported) is defined separately for each year/column and always includes the short summer preceding the calendar switch. In column 2, G1 includes students who enrolled 1 year before the switch to semesters. In column 2 it includes student enrolled 1 and 2 years before, and in column 3 (and column 1) it includes those enrolled 1-3 years before. In all specifications, the fully treated group, G2, includes all students who first enroll at a university that is on a semester calendar. All regressions include age, age-squared, sex, a foreign-born indicator, indicators for race/ethnicity, and campus and year fixed-effects. ***p<0.01, **p<0.05, *p<0.10.

Table A8: Effect of Switching to Semesters on School-Year Employment (Full Sample)

	Share of School-Years Employed	Employed During:			
		1st Year	2nd Year	3rd Year	4th Year
	(1)	(2)	(3)	(4)	(5)
Panel A: Excluding Retail and Food Service Employment					
G2 - fully treated	-0.032	-0.042	-0.031	-0.023	-0.037
SE multi-way clustered	(0.015)**	(0.012)***	(0.016)*	(0.010)**	(0.023)
SE clustered by campus	(0.019)	(0.015)***	(0.021)	(0.016)	(0.028)
Wild cluster bootstrap p-value	[0.15]	[0.05]***	[0.23]	[0.21]	[0.20]
Mean of Outcome	0.38	0.34	0.39	0.41	0.43
Observations	296,452	619,491	446,569	351,643	296,452
Panel B: Retail and Food Service Employment Only					
G2 - fully treated	-0.048	-0.037	-0.048	-0.049	-0.040
SE multi-way clustered	(0.010)***	(0.008)***	(0.010)***	(0.010)***	(0.011)***
SE clustered by campus	(0.012)***	(0.011)***	(0.013)***	(0.013)***	(0.013)***
Wild cluster bootstrap p-value	[0.01]**	[0.02]**	[0.01]**	[0.00]***	[0.04]**
Mean of Outcome	0.21	0.24	0.24	0.22	0.21
Observations	296,452	619,491	446,569	351,643	296,452

Data Source: OLDA linked to ODJFS Unemployment Insurance Quarterly Wage data. Notes: Sample includes first-time freshmen in the F2000-F2015 cohorts and is conditional on continued enrollment through the year in which the outcome variable is measured. The partially treated group (not reported) is defined separately for each year/column. In column (3), G1 includes students who enrolled 1 year before the switch to semesters. In columns (4) and (5), G1 also includes student who enroll 2 and 3 years before the calendar switch, respectively. In column (1), G1 includes student who enrolled 1-3 years before the calendar switch. In all specifications, the fully treated group, G2, includes all students who first enroll at a university that is on a semester calendar. All regressions include age, age-squared, sex, a foreign-born indicator, indicators for race/ethnicity, and campus and year fixed-effects. ***p<0.01, **p<0.05, *p<0.10.