

# Appendix

For Online Publication

Table A1: State Issuance Schedules, by State

State	Letter Groups	Issuance Days	Require SAT?	Require ACT?	Require PSAT?
Arizona	A-B, C-D, E-F, G-H, I-J, K-L, M-N, O-P Q-R, S-T, U-V, W-X, Y-Z	1-13 1-13	No	No	No
DC	A-B, C, D-F, G-H, I-K, L-M, N-Q, R-S, T-V, W-Z	1-10	Yes (as of 2014)	No	No
Indiana	A-B, C-D, E-G, H-I, J-L, M-N, O-R, S, T-V, W-Z	1-10	No	No	No
Iowa	A-B, C-D, E-G, H-I, J-L, M-O, P-R, S, T-V, W-Z	1-10	No	No	No
Kansas	A-B, C-D, E-G, H-J, K-L, M, N-R, S, T-V, W-Z	1-10	No	No	No
Maryland	A-B, C-D, E-G, H-I, J-L, M-O, P-R, S, T-V, W-Z	6-15	No	No	No
Utah	A-G, H-O, P-Z	5, 11, 15	No	Yes	No
West Virginia	B & X-Z, C & F, H & N & V, I & M & O & U, Q & S & A & W, J-K & P, D-E & R, G & L & T	1-9	No	No	No

Notes: Data on SNAP issuance schedules is from the USDA. Data on ACT and SAT requirements is from Education Commission of the States. See <https://www.ecs.org/state-information-request-use-of-act-sat-and-psat-for-high-school-testing-as-required-by-essa/> for more information.

Table A2: Effects of SNAP Timing on Math and Verbal SAT Scores

	SAT Math			SAT Verbal		
<b>Scarcity Indicator</b>						
≥ 15 days since SNAP * Income < 60k	-4.6913*** (0.9867)	-2.7722*** (0.8051)	-2.3038*** (0.6426)	-6.1212*** (1.1130)	-4.2227*** (0.9070)	-3.4572*** (0.7065)
≥ 15 days since SNAP	-1.8300** (0.8380)	-1.3638* (0.6962)	-0.8203 (0.6023)	-0.4815 (0.7722)	-0.0960 (0.6693)	0.2506 (0.5790)
Income < 60k	-32.8900*** (0.8354)	-21.1358*** (0.6656)	-13.3045*** (0.5350)	-31.1066*** (1.0094)	-21.6874*** (0.7884)	-13.3471*** (0.6239)
Black		-75.4233*** (0.9000)	-62.5138*** (0.5770)		-66.1329*** (0.7466)	-56.5637*** (0.5996)
Hispanic		-30.4508*** (0.6982)	-29.2666*** (0.6158)		-31.2397*** (0.7788)	-30.0227*** (0.6150)
Asian		40.1073*** (1.8252)	27.8270*** (1.3465)		-4.8284*** (1.2651)	-14.9030*** (0.9559)
Native		-27.4003*** (1.8188)	-22.9394*** (1.7477)		-28.1512*** (2.0661)	-22.2755*** (1.9211)
Male		33.4130*** (0.4063)	32.8011*** (0.3975)		4.7383*** (0.4710)	4.1577*** (0.4532)
<b>Days Since SNAP</b>						
Days since SNAP * Income < 60k	-0.1518*** (0.0431)	-0.0881** (0.0361)	-0.0822*** (0.0296)	-0.2031*** (0.0487)	-0.1429*** (0.0401)	-0.1250*** (0.0319)
Days since SNAP	-0.0518* (0.0302)	-0.0357 (0.0268)	-0.0092 (0.0232)	-0.0033 (0.0288)	0.0130 (0.0258)	0.0343 (0.0223)
Income < 60k	-33.2248*** (0.9580)	-21.3549*** (0.7688)	-13.3387*** (0.6221)	-31.4584*** (1.1333)	-21.8790*** (0.8863)	-13.3693*** (0.7022)
Black		-75.4619*** (0.9012)	-62.5276*** (0.5775)		-66.1808*** (0.7470)	-56.5823*** (0.6002)
Hispanic		-30.4566*** (0.6967)	-29.2711*** (0.6156)		-31.2456*** (0.7774)	-30.0286*** (0.6148)
Asian		40.0918*** (1.8256)	27.8167*** (1.3465)		-4.8542*** (1.2643)	-14.9216*** (0.9557)
Native		-27.3974*** (1.8176)	-22.9386*** (1.7471)		-28.1513*** (2.0644)	-22.2784*** (1.9203)
Male		33.4119*** (0.4063)	32.7985*** (0.3976)		4.7376*** (0.4710)	4.1550*** (0.4534)
Observations	420,881	420,881	420,881	420,881	420,881	420,881
State-by-DOM Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Cohort Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Test Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	Yes	No	No	Yes
School Fixed Effects	No	Yes	Yes	No	Yes	Yes

Notes: Estimates are based on data from The College Board on SAT scores from 2009–2014 cohorts. We estimate Equation (2) with controls including indicator variables for race, ethnicity, and gender. Standard errors are clustered on the state-by-disbursement day-of-month-by-cohort level.

\*, \*\*, and \*\*\* indicate statistical significance at the ten, five, and one percent levels, respectively.

Table A3: Summary Statistics By Income Level

	<u>All Students</u>		<u>Low Income</u>	<u>Not Low Income</u>	Difference
	Mean	St.Dev.	Mean	Mean	
<b>Student Characteristics</b>					
SAT Score	994.6	192.4	929.9	1034.3	104.4***
SAT Math	499.9	105.4	466.1	520.7	54.6***
SAT Verbal	494.7	102.8	463.8	513.6	49.9***
Took >1 SAT	0.47	0.50	0.36	0.53	0.17***
Black	0.15	0.36	0.23	0.10	-0.13***
Hispanic	0.089	0.29	0.14	0.056	-0.088***
Asian	0.051	0.22	0.057	0.048	-0.0094***
Male	0.47	0.50	0.43	0.50	0.072***
<b>College Outcomes</b>					
No College	0.13	0.33	0.18	0.098	-0.079***
Attend 2 Yr College	0.21	0.41	0.25	0.18	-0.072***
Attend 4 Yr College	0.66	0.47	0.57	0.72	0.15***
<b>College Characteristics</b>					
Barrons Top 4	0.58	0.49	0.47	0.65	0.18***
Flagship	0.15	0.36	0.11	0.17	0.061***
College 6 Yr. Grad Rate	57.2	18.6	51.6	59.8	8.27***
College Avg. SAT	1090.6	123.3	1055.0	1107.6	52.6***
Observations	420,881		160,089	260,792	

Notes: Data span 2009–2014 cohorts and include the following states: Arizona, District of Columbia, Indiana, Iowa, Kansas, Maryland, Utah, and West Virginia. Data on SAT scores are from The College Board. Data on college attendance are from the National Student Clearinghouse. Data on college characteristics are from IPEDS and are only reported for students who attend college, so the number of observations reported is not accurate for those measures in this table. Students are considered low-income if they report that their family income is below \$60,000 on the SAT survey.

Table A4: Alternative Specifications: Effects of SNAP Timing on SAT Scores and College Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>SAT Score</b>							
≥ 15 days since SNAP * Income < 60k	-5.7611*** (1.2327)	-6.7948*** (1.3813)	-5.2406*** (1.2427)	-6.4389*** (1.3897)	-4.9208*** (1.1813)	-5.7611*** (1.6897)	-5.7611** (2.1072)
<b>No College</b>							
≥ 15 days since SNAP * Income < 60k	-0.0017 (0.0025)	0.0002 (0.0025)	0.0007 (0.0027)	0.0030 (0.0027)	-0.0024 (0.0025)	-0.0017 (0.0029)	-0.0017 (0.0020)
<b>Start 2-Year</b>							
≥ 15 days since SNAP * Income < 60k	0.0089*** (0.0031)	0.0112*** (0.0033)	0.0045 (0.0031)	0.0069** (0.0033)	0.0073** (0.0030)	0.0089** (0.0034)	0.0089** (0.0038)
<b>Start 4-Year</b>							
≥ 15 days since SNAP * Income < 60k	-0.0072** (0.0033)	-0.0114*** (0.0035)	-0.0053 (0.0034)	-0.0100*** (0.0035)	-0.0049 (0.0033)	-0.0072* (0.0041)	-0.0072** (0.0029)
<b>College Graduation Rate</b>							
≥ 15 days since SNAP * Income < 60k	-0.3527*** (0.1161)	-0.4237*** (0.1249)	-0.2058 (0.1281)	-0.2823** (0.1401)	-0.2736** (0.1131)	-0.3527** (0.1357)	-0.3527*** (0.0878)
<b>College Average SAT</b>							
≥ 15 days since SNAP * Income < 60k	-2.8144*** (0.7088)	-3.1083*** (0.7739)	-1.3324* (0.7907)	-1.5726* (0.8830)	-2.3410*** (0.6762)	-2.8144*** (1.0438)	-2.8144** (0.9763)
<b>Selective</b>							
≥ 15 days since SNAP * Income < 60k	-0.0093*** (0.0035)	-0.0120*** (0.0037)	-0.0071** (0.0035)	-0.0101*** (0.0038)	-0.0067* (0.0035)	-0.0093** (0.0039)	-0.0093*** (0.0018)
<b>Flagship</b>							
≥ 15 days since SNAP * Income < 60k	-0.0051** (0.0022)	-0.0053** (0.0022)	-0.0033 (0.0022)	-0.0034 (0.0023)	-0.0036* (0.0021)	-0.0051** (0.0025)	-0.0051*** (0.0009)
Observations	420,881	420,537	388,422	388,076	420,881	420,881	420,881
Controls	Yes						
State-by-DOM Fixed Effects	Yes						
Cohort Fixed Effects	Yes						
School Fixed Effects	Yes	No	Yes	No	Yes	Yes	Yes
Zip Fixed Effects	No	Yes	No	Yes	No	No	No
Test Fixed Effects	Yes	Yes	No	No	Yes	Yes	Yes
Opportunity Fixed Effects	No	No	Yes	Yes	No	No	No
Income Bin Controls	No	No	No	No	Yes	No	No
Cluster	SDC	SDC	SDC	SDC	SDC	SC	S

Notes: Estimates are based on data from The College Board on SAT scores and National Student Clearinghouse data on college attendance from 2009–2014. We estimate Equation (2) with controls including indicator variables for race, ethnicity, and gender. Income bin controls include indicator variables for household income bins as reported on the SAT survey by students. Standard errors are clustered on either the state-by-disbursement day-by-cohort level (SDC), state-by-cohort (SC) or state (S) level as indicated.

\*, \*\*, and \*\*\* indicate statistical significance at the ten, five, and one percent levels, respectively.

Table A5: Effects of SNAP Timing on SAT Score by Different Income Measures

	Inc < 60k	Inc < 40k	Waiver	Low-Inc Sch
<b>Scarcity Indicator</b>				
≥ 15 days since SNAP * Measure(s)	-5.7611*** (1.2327)	-5.2159*** (1.3407)	-3.3175** (1.5573)	-8.5738*** (2.2612)
≥ 15 days since SNAP	-0.5697 (1.0952)	-1.6217 (1.0289)	-2.3132** (1.0481)	-2.1243* (1.2045)
<b>Days Since SNAP</b>				
Days since SNAP * Measure(s)	-0.2072*** (0.0555)	-0.1827*** (0.0599)	-0.0883 (0.0674)	-0.2982*** (0.0975)
Days since SNAP	0.0251 (0.0414)	-0.0164 (0.0374)	-0.0445 (0.0387)	-0.0407 (0.0446)
Observations	420,881	420,881	420,881	420,881
Treated Observations	160,089	95,940	70,525	99,827
State-by-DOM Fixed Effects	Yes	Yes	Yes	Yes
Cohort Fixed Effects	Yes	Yes	Yes	Yes
Test Fixed Effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes	No

Notes: Estimates are based on data from The College Board on SAT scores from 2009–2014 cohorts. We estimate Equation (2) with controls including indicator variables for race, ethnicity, and gender. Each column corresponds to a different measure of low-income status that is interacted with the scarcity indicator. “Low-Income Schools” includes schools with a majority of students reporting a household income lower than \$60,000. The outcome variable is composite SAT score. Standard errors are clustered on the state-by-disbursement day-of-month-by-cohort level.

\*, \*\*, and \*\*\* indicate statistical significance at the ten, five, and one percent levels, respectively.

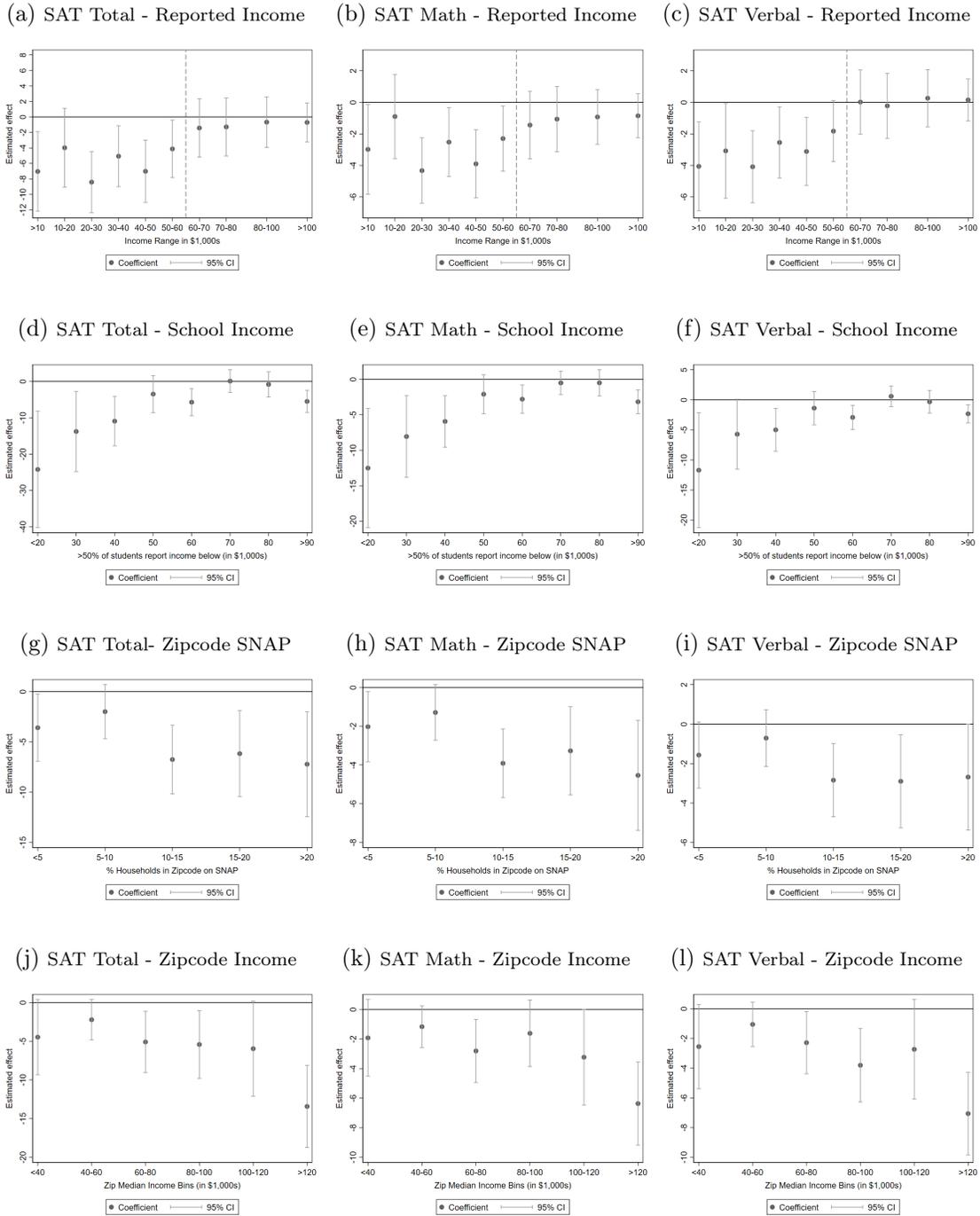
Table A6: Effects of SNAP Timing on SAT Scores and College Attendance, by Demographic Subgroups

	SAT Score	No College	Start 2-Year	Start 4-Year
<b>Interacting Race with Treatment</b>				
Low Inc.*Scarce*White	-1.0190 (1.4444)	-0.0045 (0.0029)	0.0128*** (0.0036)	-0.0082** (0.0038)
Low Inc.*Scarce*Black	-3.4598 (2.1327)	0.0058 (0.0055)	-0.0244*** (0.0062)	0.0186*** (0.0067)
Low Inc.*Scarce*Hispanic	-7.8358*** (2.7475)	0.0016 (0.0066)	0.0197*** (0.0076)	-0.0213** (0.0088)
Low Inc.*Scarce*Asian	-23.3729*** (4.8490)	-0.0035 (0.0083)	0.0494*** (0.0104)	-0.0458*** (0.0113)
Low Inc.*Scarce*Native				
Observations	404,420	404,420	404,420	404,420
<b>Interacting Gender with Treatment</b>				
Low Inc.*Scarce*Male	-8.6613*** (1.7294)	-0.0003 (0.0035)	0.0095** (0.0041)	-0.0092** (0.0044)
Low Inc.*Scarce*Female	-3.6186*** (1.3619)	-0.0028 (0.0030)	0.0085** (0.0036)	-0.0057 (0.0040)
Observations	420,881	420,881	420,881	420,881
Controls	Yes	Yes	Yes	Yes
State-by-DOM Fixed Effects	Yes	Yes	Yes	Yes
Cohort Fixed Effects	Yes	Yes	Yes	Yes
Test Fixed Effects	Yes	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes	Yes

Notes: Estimates are based on data from The College Board on SAT scores and National Student Clearinghouse data on college attendance from 2009–2014 cohorts. We estimate an extension of Equation (2) that includes interactions of race/gender with the variable of interest ( $low - income * SNAPscarce$ ) as well as the “low-income” indicator. For each subgroup, we report the coefficient for the treatment effect for that group (e.g. “female\*low-income\*SNAP scarce”). We estimate 2 regressions per outcome: one for race and one for gender. In the race regressions, we only include students who indicated that they are white, black, Hispanic, or Asian. Standard errors are clustered on the state-by-disbursement day-of-month-by-cohort level.

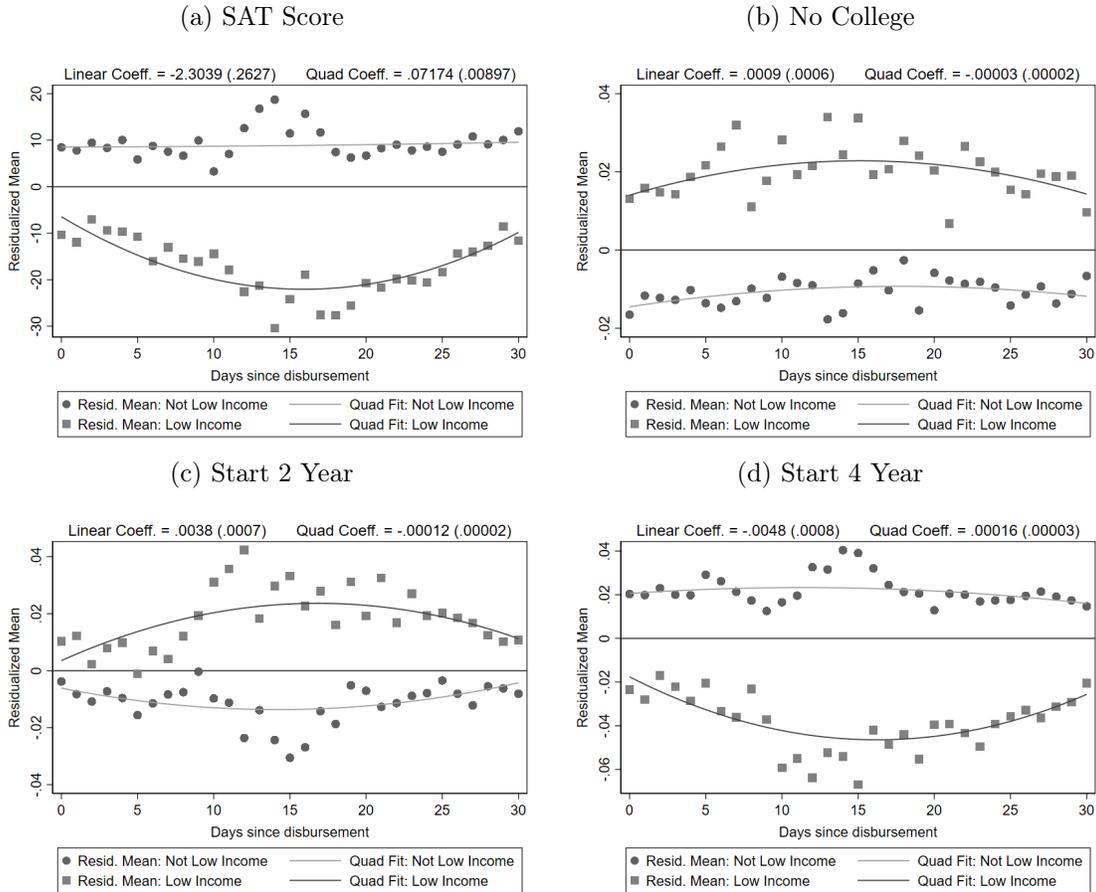
\*, \*\*, and \*\*\* indicate statistical significance at the ten, five, and one percent levels, respectively.

Figure A1: Effects of SNAP Timing on SAT Scores, by Various Poverty Measures



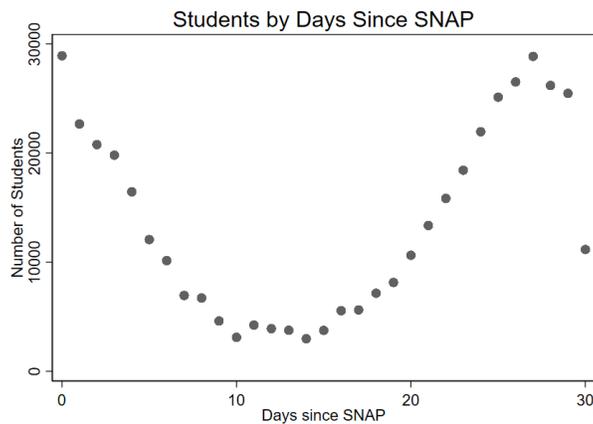
Notes: Data on SAT scores are from The College Board, and Zipcode attributes are from the American Community Survey. Coefficients and 95% confidence intervals are generated by estimating Equation (2), interacting whether a student is “SNAP scarce,” with income measure bins. The top row corresponds to reported income. Each bin in the second row indicates that at least half of the students report an income below a given threshold, but less than half indicate income below a previous threshold. The third row pertains to SNAP usage by families in the student’s home zip code, and the last row is by median family income. Standard errors are clustered at the state-by-disbursement day-of-month-by-cohort level.

Figure A2: Effects of SNAP Timing by Days Since Disbursement



Notes: Figures are based on data from The College Board on SAT scores and National Student Clearinghouse data on college attendance from 2009–2014 cohorts. Each figure plots day-level means of residuals for days over the SNAP benefit month (after differencing out state-by-day-of-month, cohort, test, and school fixed effects and race and gender effects) with quadratic fits of each of the outcomes listed. Means for low-income students are represented by squares, while means for other students are represented by circles. We present both the linear coefficient and quadratic coefficient and their corresponding standard errors in parenthesis from a quadratic analogue of Equation 2.

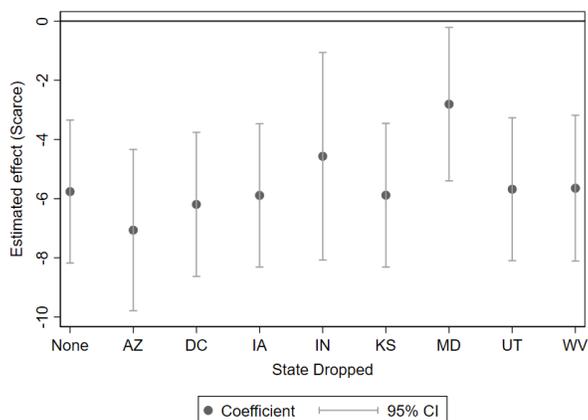
Figure A3: Number of Students by Days Since SAT



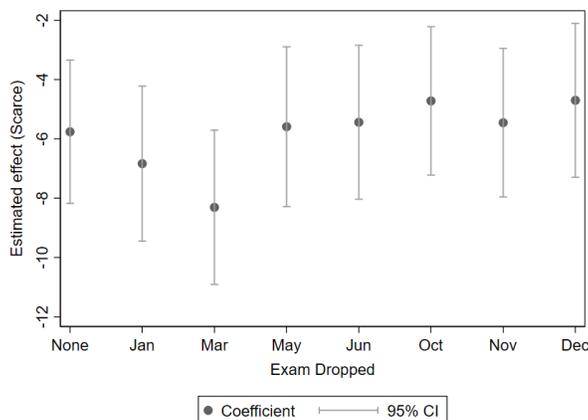
Notes: Figures are based on data from The College Board on SAT scores from 2009–2014 cohorts. We calculate the “Days Since SNAP” for all students taking into account their test date and state schedule. The figure plots the raw number of students for each number of days since possible disbursement.

Figure A4: Effects of SNAP Timing on SAT Scores, Dropping Each State and Exam

(a) Dropping Each State

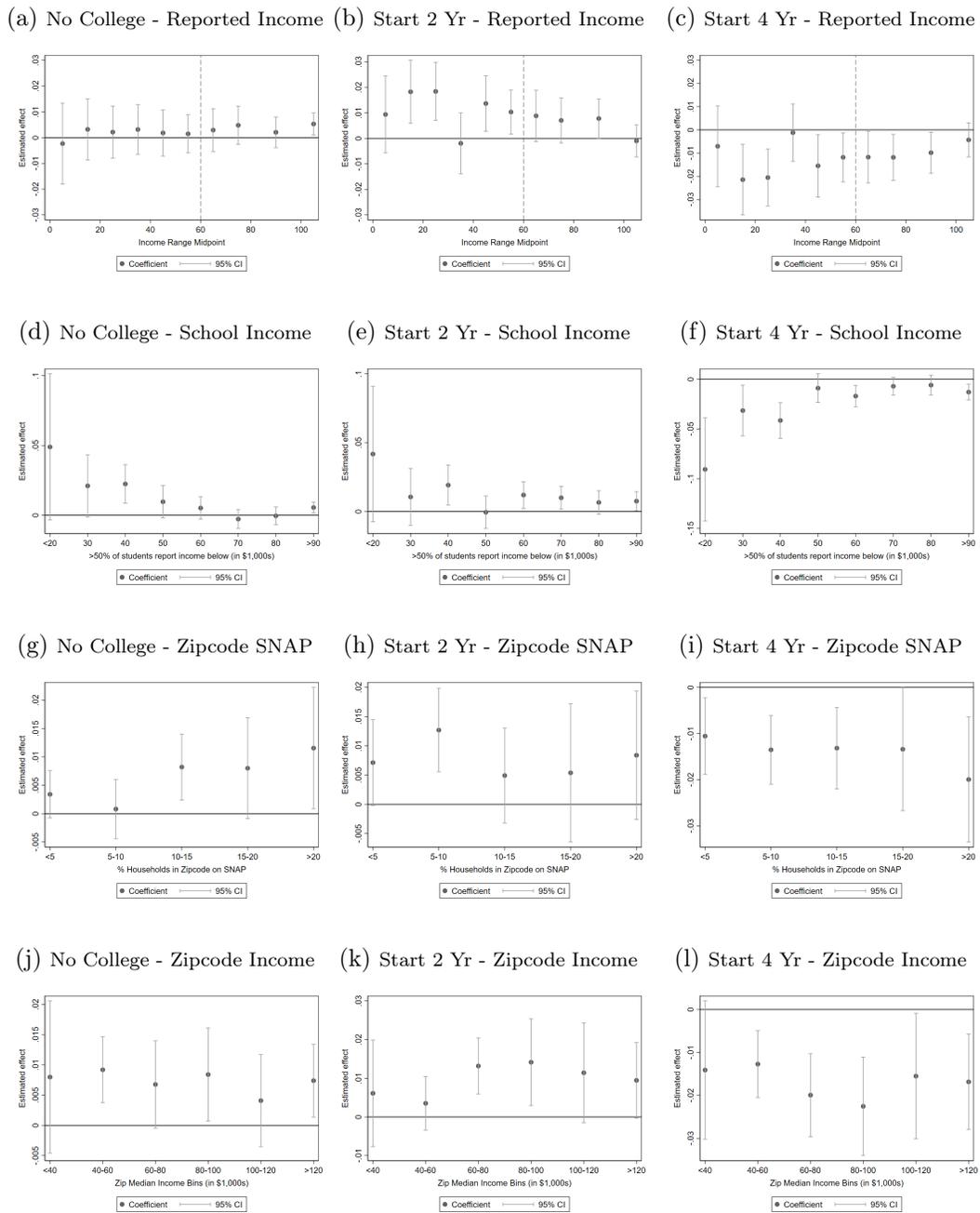


(b) Dropping Each Exam



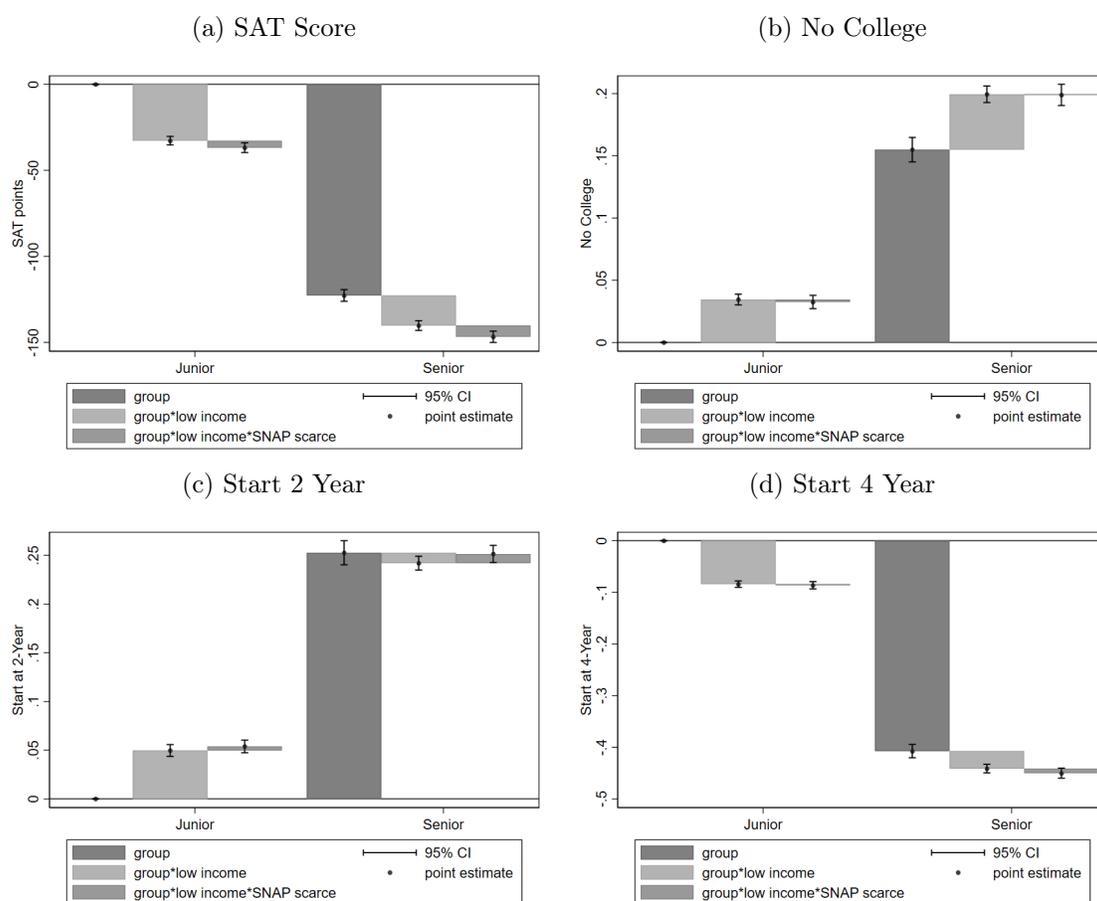
Notes: Figures are based on data from The College Board on SAT scores from 2009–2014 cohorts. Each figure displays the main results where we estimate Equation (2) with controls including indicator variables for race, ethnicity, and gender. The variable of interest is  $SNAP_{icst} * lowincome_{icst}$ . In Panel (a), we drop each state, and in Panel (b), we drop each exam. The outcome variable is composite SAT score. Standard errors are clustered on the state-by-disbursement day-of-month-by-cohort level.

Figure A5: Effects of SNAP Timing on College Attendance, by Various Poverty Measures



Notes: Data on SAT scores are from The College Board, and Zipcode attributes are from the American Community Survey. Coefficients and 95% confidence intervals are generated by estimating Equation (2), interacting whether a student is “SNAP scarce,” with income measure bins. The top row corresponds to reported income. Each bin in the second row indicates that at least half of the students report an income below a given threshold, but less than half indicate income below a previous threshold. The third row pertains to SNAP usage by families in the student’s home zip code, and the last row is by median family income. Standard errors are clustered at the state-by-disbursement day-of-month-by-cohort level.

Figure A6: Effects of SNAP Timing by High School Seniority



Notes: Estimates are based on data from The College Board on SAT scores and National Student Clearinghouse data on college attendance from 2009–2014 cohorts. We estimate an extension of Equation (2) that includes interactions of indicators for junior and senior students with the variable of interest ( $low - income * SNAPscarce$ ) as well as the “low-income” indicator. For each subgroup, we report the coefficient for the treatment effect for that group (“group\*low-income\*SNAP scarce”). Standard errors are clustered on the state-by-disbursement day-of-month-by-cohort level.