

ProPelled: The Effects of Grants on Graduation and Earnings

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Disclaimer

The conclusions of this research do not necessarily reflect the opinion or official position of the Texas Higher Education Coordinating Board, the Texas Workforce Commission, or the State of Texas.

Introduction

Large average private returns to college degree (Barrow & Malamud 2015)

College enrollment and completion may be suboptimally low

- ▶ Credit constraints, positive externalities
- ▶ Student optimization errors (e.g., wrt borrowing)

Rationale for expenditures (grants, loans, tax credits) by federal and state governments

This Study

Estimate effects of grant aid on:

- ▶ Contemporaneous outcomes (credits attempted, GPA)
- ▶ Longer-term outcomes (graduation, earnings, tax liabilities)
- ▶ Social costs (adtl grant aid due to behavioral responses, public subsidies to colleges)

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Texas administrative data + RDD for identification

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Companion paper uses theoretical framework to:

- ▶ Derive sufficient statistics for welfare implications of changes in grant generosity
- ▶ Providing adtl grant aid to low-income students would improve welfare in our setting

Federal Pell Grant Program

The largest federal grant program: \$28b in 2015-16

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Award amount based on Expected Family Contribution (EFC)

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Past research on attainment effects of Pell:

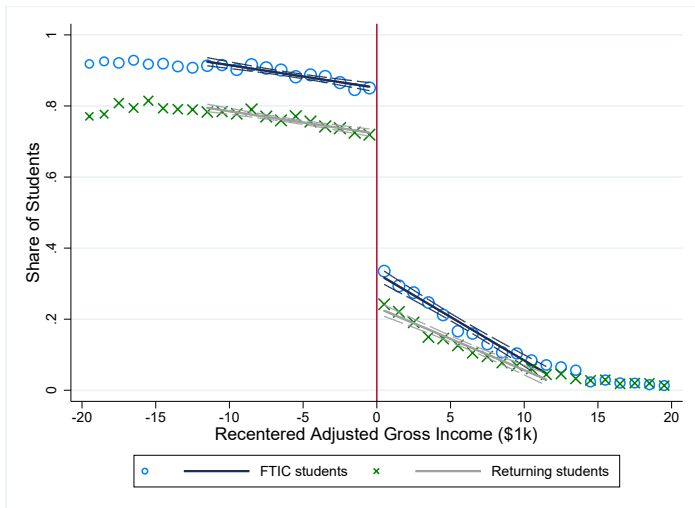
- ▶ No evidence of enrollment response for traditional-aged students ([Kane 1995](#); [Rubin 2011](#); [Turner 2014](#); [Carruthers & Welch 2015](#))
- ▶ Possible attainment gains for enrolled students when not offset by reductions in borrowing ([Marx & Turner 2018](#))

Identifying Variation: Automatic Zero EFC

Dependent students with parental AGI $<$ a set threshold are eligible for [automatic zero EFC](#)

- ▶ Threshold in [\$20k, \$30k] [over the period we study](#)
- ▶ Above the threshold: grant depends on income, assets, etc.
- ▶ Below the threshold: maximum Pell Grant (if file 1040A/EZ)

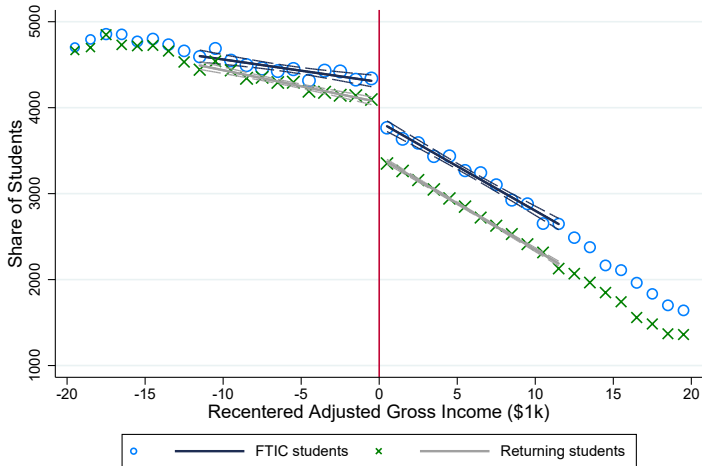
First Stage: $\Pr[EFC = 0]$



FTIC students: 0.519 (0.014)**

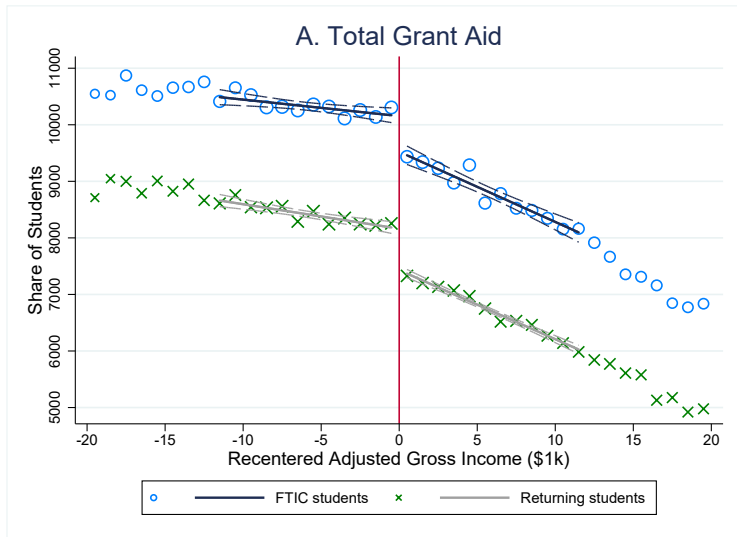
Returning students: 0.487 (0.011)**

B. Pell Grant Aid



FTIC students: 489 (37)**

Returning students: 659 (39)**



FTIC students: 653 (95)**

Returning students: 758 (73)**

[\[Loans\]](#) [\[TEXAS Grant aid\]](#) [\[Other grant aid\]](#) [\[Work-study\]](#)

Data and Sample

Texas individual-level panel data on education and earnings

- ▶ Students enrolled in public institutions
- ▶ Quarterly earnings for all UI-covered jobs in Texas
- ▶ Federal tax liabilities estimated via NBER TAXSIM

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Analysis sample

- ▶ New and returning bachelor's degree seeking, dependent students
- ▶ 2007-08 through 2011-12 entry cohorts (TX public colleges)

[\[Additional details\]](#) [\[Student characteristics\]](#)

Identification

Fuzzy RDD using local linear regression [\[Specification\]](#)

- ▶ Treatment = eligibility for auto-zero EFC
- ▶ Median IK bw: \$12,000 of eligibility threshold

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No evidence of:

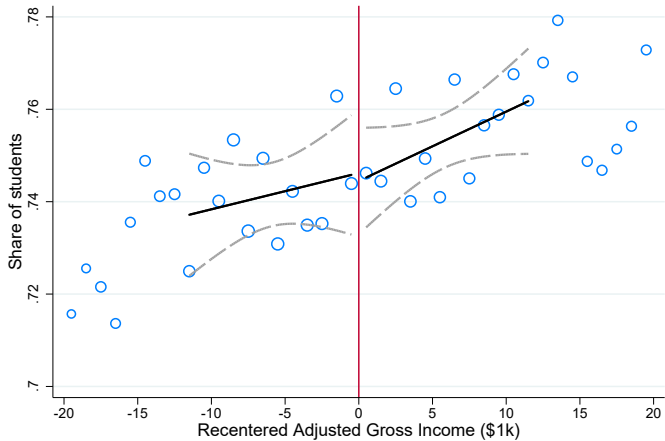
- ▶ Manipulation ([continuity in predetermined chars](#))
- ▶ Effects on enrollment ([density test](#))
- ▶ Effects on [remaining in state](#) (enrolled or w/ UI earnings)

Small Impacts on Contemporaneous Attainment...



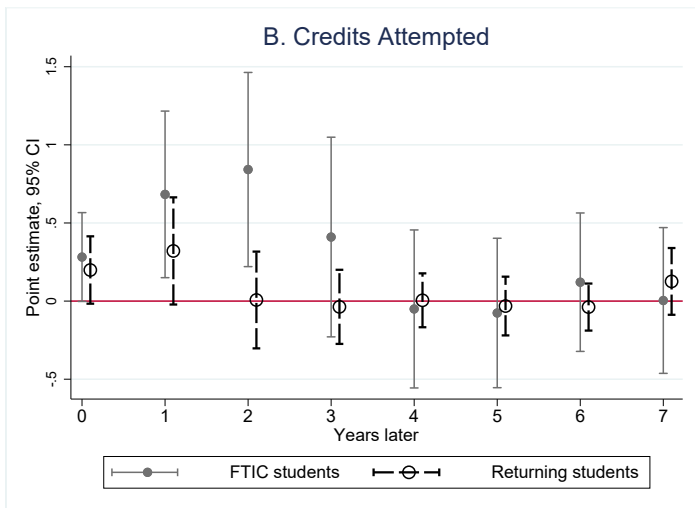
0.256 (0.138)+

C. Enrollment 1 Year Later

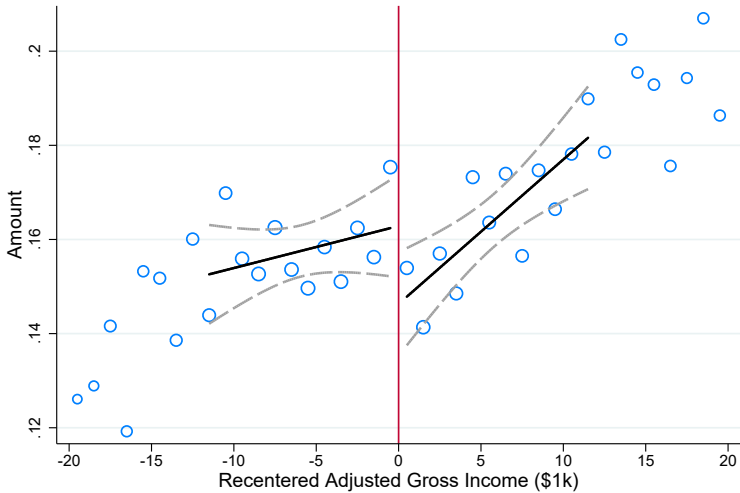


0.0005 (0.009)

...But Significant Effects for FTIC Students Over Longer-Run

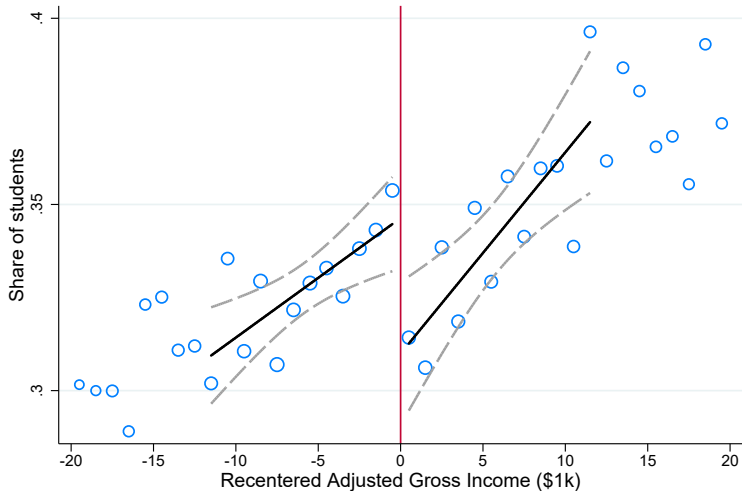


A. Graduate within 4 Years



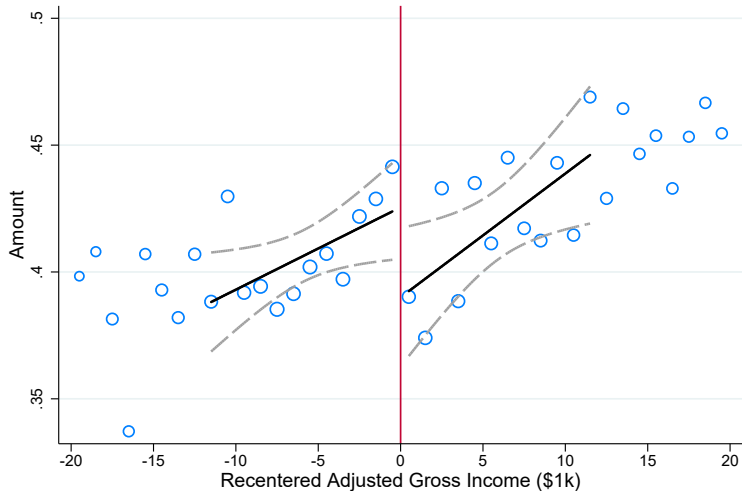
0.015 (0.008)+

B. Graduate within 5 Years



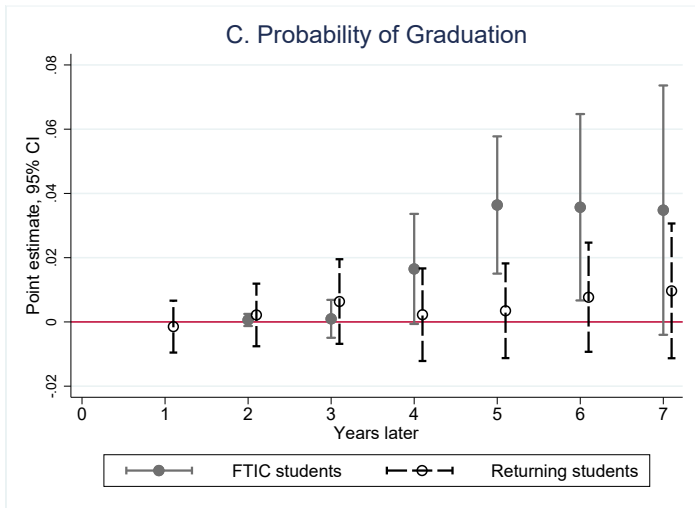
0.033 (0.010)**

C. Graduate within 6 Years



0.033 (0.014)*

4+ Year Graduation Rate Increases for FTIC Students



[IV estimates]

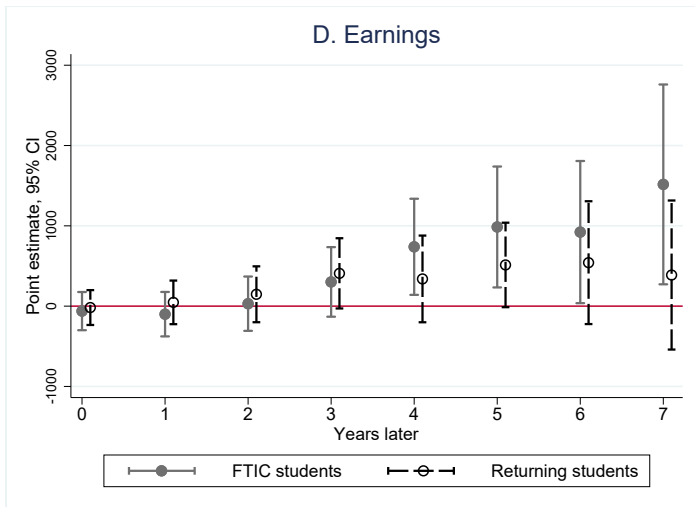
Contextualizing FTIC Attainment Results

Small/no effect on short-run academic outcomes

Sizeable increases in graduation rates

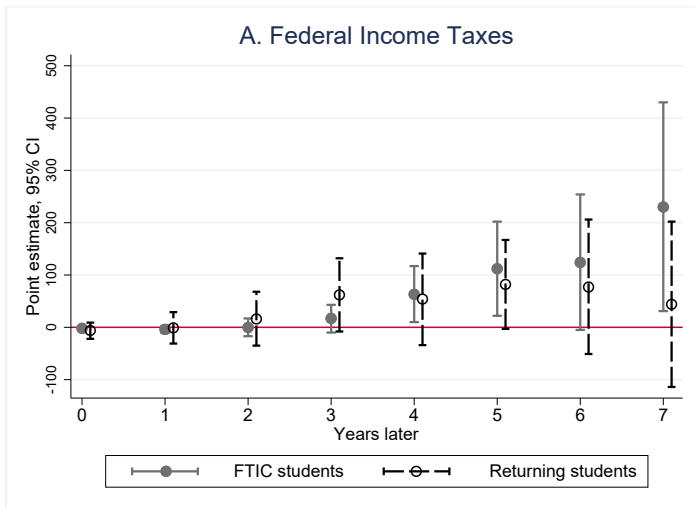
- ▶ Eligibility => 1.5-3 pp (8-11%) increase
- ▶ 2-5 pp per \$1000 grant aid at entry
- ▶ More students graduating ([Bettinger et al. 2016](#))? Or reduced time to degree ([Scott-Clayton & Zafar 2016](#))?
- ▶ To completely close eligible-ineligible graduation gap, 10-year grad rate for ineligible students must be > 50 pp higher than rate for eligible students
- ▶ Postsecondary returns decreasing in time-to-degree ([Flores-Lagunes & Light 2010](#))

Corresponding Increases in Annual Earnings...



[Scatterplots] [IV estimates] [Nonwinsorized]

And Estimated Income Tax Liabilities



Effects on Cumulative Financial Aid, Earnings, Taxes

	(1) Grants	(2) Loans	(3) Earnings	(4) Fed. income taxes	(5) FICA taxes
<i>A. FTIC students</i>					
Automatic zero eligible	1163*** (436)	-277 (383)	3797** (1676)	540*** (201)	565** (249)
Mean ineligible	\$30,708	\$15,279	\$102,972	\$4,088	\$15,347
<i>B. Returning students</i>					
Automatic zero eligible	1012*** (168)	-195 (146)	1869 (1431)	328 (233)	280 (213)
Mean ineligible	\$10,175	\$46,765	\$202,386	\$17,357	\$30,127

Notes: ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$

For FTIC students, govt completely repaid within:

- ▶ 7 years if FICA taxes counted as revenue
- ▶ 10 years if income tax effects persist for adtl 2-3 years

Channels for FTIC Earnings Gains

Potential mechanisms:

1. Changes in college and/or major quality
 - ▶ No evidence of impacts on college entry, [college quality](#)
 - ▶ Small increases in % earning [STEM degrees](#)

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2. Increased degree receipt
 - ▶ Impacts on earnings comparable to estimated effects of additional grant aid/degree receipt in other settings ([Bettinger et al. 2016](#); [Zimmerman 2014](#))

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3. Increased student loan debt affects job choice
 - ▶ No effect on [cumulative loan debt](#)
4. Predictability/guarantee of additional grant aid
 - ▶ Eligibility => 4 pp increase in [TEXAS Grant aid](#) receipt
 - ▶ Program structure provides incentives for institutions to target students with large fed grants
 - ▶ Only first-year students qualify, funding guaranteed in future years

Theoretical Framework

Sufficient statistic approach ([Chetty 2009](#))

Individuals choose schooling investment and other goods, face general constraints (e.g., borrowing, time)

Government makes a small change to level or slope of tuition, funded by adjusting future transfers

Welfare Implications

Welfare effect depends on:

1. Net externalities from behavioral responses

- ▶ Fiscal externalities > 0 provides lower bound (assm. nonfiscal externalities ≥ 0)
- ▶ Tax revenue net of additional public spending (grant aid, direct subsidies to schools)

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2. Direct consumption smoothing effect

- ▶ Pre/post-college ratio of marginal utilities is sufficient
- ▶ Estimated for CRRA utility functions using CEX
- ▶ Nonzero for commonly used risk aversion parameters, discount rate as large as 1.03

Conclusions

For low-income, traditional aged, BA degree seeking students in Texas, additional Pell Grant aid:

- ▶ Speeds up (increases?) degree receipt
- ▶ Generates earnings increases
- ▶ Increases tax payments
- ▶ Recovers govt cost within 7-10 years

Most likely mechanism: guarantee of predictable future funding

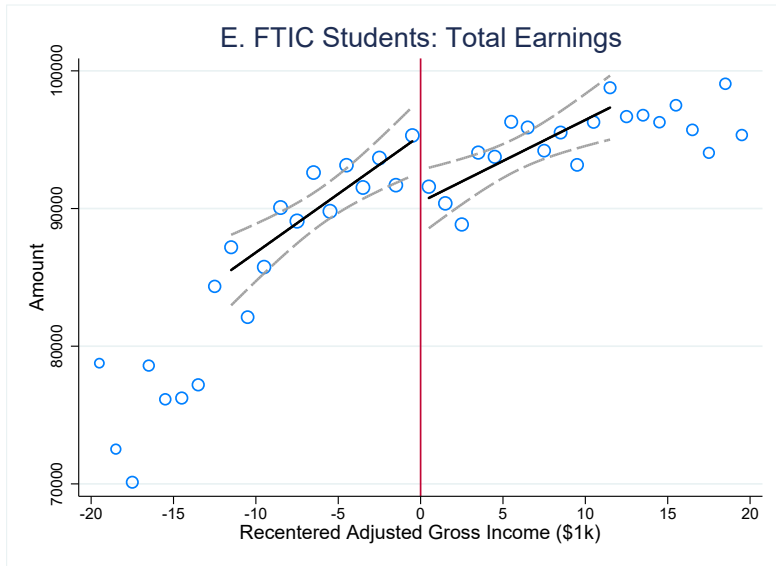
- ▶ Complementarities between federal and state grant programs

Theoretical framework:

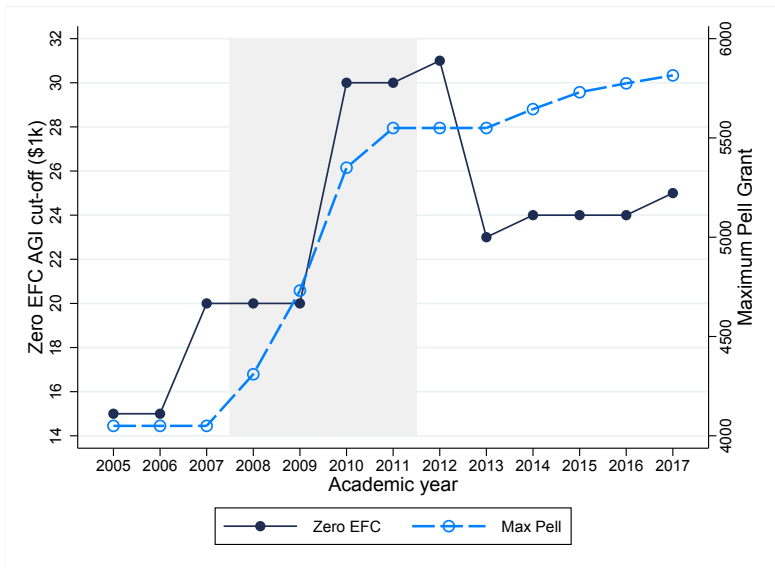
- ▶ Sufficient statistics for welfare implications of change in prices
- ▶ Additional grant aid => welfare gain in TX setting

Thank you!

Impacts on Cumulative Earnings



Trends in AZ EFC Cut-Off & Max Pell Award



Student Characteristics

Relatively low income

- ▶ Average auto-zero threshold = \$25,000

Low parental education

- ▶ Less than 30% have college educated parent

Substantial [financial aid](#) (even for auto-zero ineligible students)
Largely similar to [nationally representative sample](#) of BA seeking students enrolled in public institutions in same AGI range

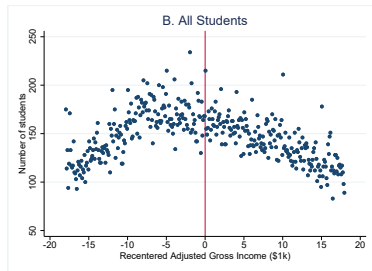
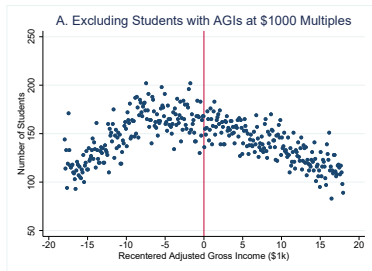
[\[Back\]](#)

Comparison with Nationally Representative Sample

	FTIC students		Returning students	
	(1) Analysis sample	(2) 2008 NPSAS	(3) Analysis sample	(4) 2008 NPSAS
<i>A. Student demographics</i>				
Male	0.45	0.43	0.43	0.41
Age	18.6	18.4	20.9	20.7
In-state student	0.97	0.93	0.98	0.96
Race				
Asian	0.05	0.09	0.08	0.12
Black	0.24	0.26	0.20	0.23
Hispanic	0.21	0.23	0.25	0.19
White	0.47	0.40	0.45	0.44
Parental education				
Mother < college degree	0.68	0.64	0.67	0.64
<i>B. Financial aid</i>				
EFC = 0	0.56	0.53	0.46	0.45
Pell Grant aid	\$3,877	\$3,392	\$3,569	\$3,068
Total Grants	\$9,605	\$8,648	\$7,600	\$7,356
Loans	\$2,693	\$3,345	\$4,038	\$4,352
Earnings	\$3,803	\$2,949	\$7,312	\$4,967
Work Study	\$133	\$350	\$194	\$303

1. Rounded to nearest 0.1 per NCES confidentiality requirements.

Sample Selection: Bunchers



Heaping at round numbers \Rightarrow exclude students with these AGIs

No evidence of excess bunching at eligibility threshold

Results robust to including bunchers in estimation sample

Automatic Zero EFC and Pell Grant Aid

Expected Family Contribution:

Automatic Zero EFC and Pell Grant Aid

Expected Family Contribution:

- ▶ Federal government's estimate of ability to pay for college

Automatic Zero EFC and Pell Grant Aid

Expected Family Contribution:

- ▶ Federal government's estimate of ability to pay for college
- ▶ Function of family structure, assets, siblings in college, etc. (X_{it}), and AGI

Automatic Zero EFC and Pell Grant Aid

Expected Family Contribution:

- ▶ Federal government's estimate of ability to pay for college
- ▶ Function of family structure, assets, siblings in college, etc. (\mathbf{X}_{it}), and AGI
- ▶ Set to zero when AGI falls below year-specific threshold

$$\widetilde{AGI}_{it} = AGI_{it} - agi_t^0$$

Automatic Zero EFC and Pell Grant Aid

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($\widetilde{AGI}_{it} = AGI_{it} - agi_t^0$)

$$EFC_{it} = \mathbf{1} \left[\widetilde{AGI}_{it} > 0 \right] \times f (AGI_{it}, \mathbf{X}_{it})$$

Automatic Zero EFC and Pell Grant Aid

Expected Family Contribution:

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Pell Grant award:

Automatic Zero EFC and Pell Grant Aid

Expected Family Contribution:

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- ▶ Function of family structure, assets, siblings in college, etc. (\mathbf{X}_{it}), and AGI
- ▶ Set to zero when AGI falls below year-specific threshold
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$$EFC_{it} = \mathbf{1} \left[\widetilde{AGI}_{it} > 0 \right] \times f (AGI_{it}, \mathbf{X}_{it})$$

Pell Grant award:

- ▶ Function of EFC, year-specific maximum Pell Grant ($maxPell_t$), and year-specific minimum EFC (efc_t^0)

Automatic Zero EFC and Pell Grant Aid

Expected Family Contribution:

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Pell Grant award:

- ▶ Function of EFC, year-specific maximum Pell Grant ($maxPell_t$), and year-specific minimum EFC (efc_t^0)
- ▶ Zero EFC => maximum Pell Grant award

Automatic Zero EFC and Pell Grant Aid

Expected Family Contribution:

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- ▶ Function of family structure, assets, siblings in college, etc. (\mathbf{X}_{it}), and AGI
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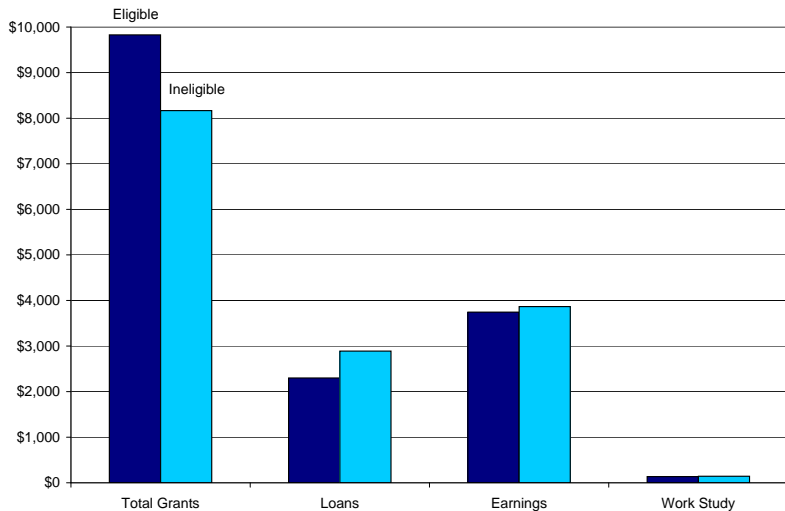
Pell Grant award:

- ▶ Function of EFC, year-specific maximum Pell Grant ($maxPell_t$), and year-specific minimum EFC (efc_t^0)
- ▶ Zero EFC => maximum Pell Grant award

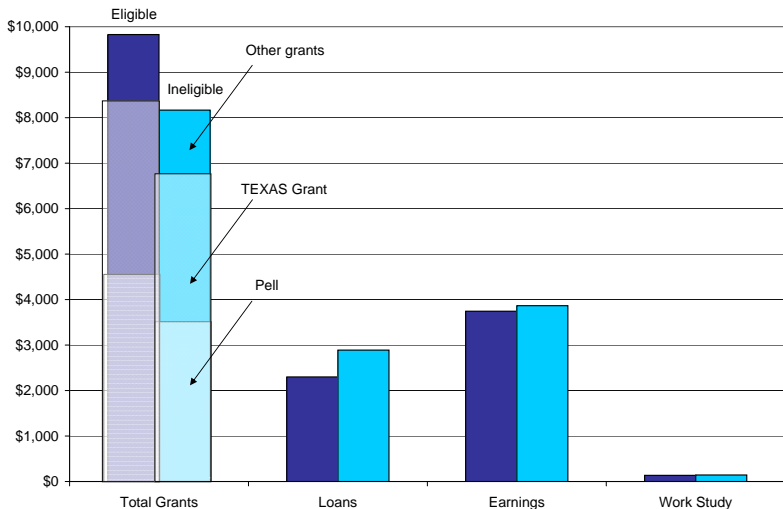
$$Pell_{it} = (maxPell_t - EFC_{it}) \times \mathbf{1} [EFC_{it} < efc_t^0]$$

[\[Back\]](#)

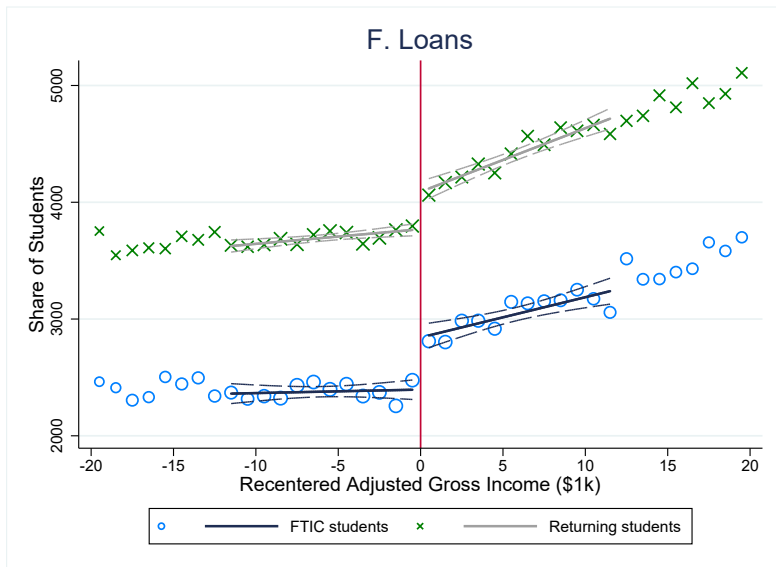
Financial aid receipt and earnings from employment



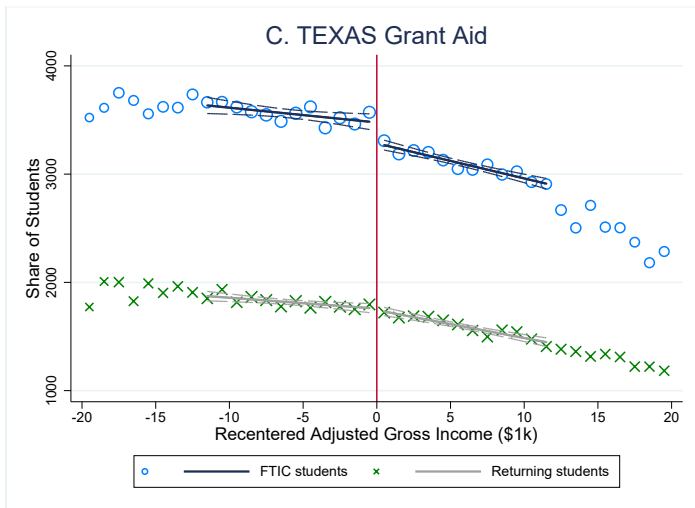
Financial aid receipt and earnings from employment



Loan Aid by Distance to AZ Threshold

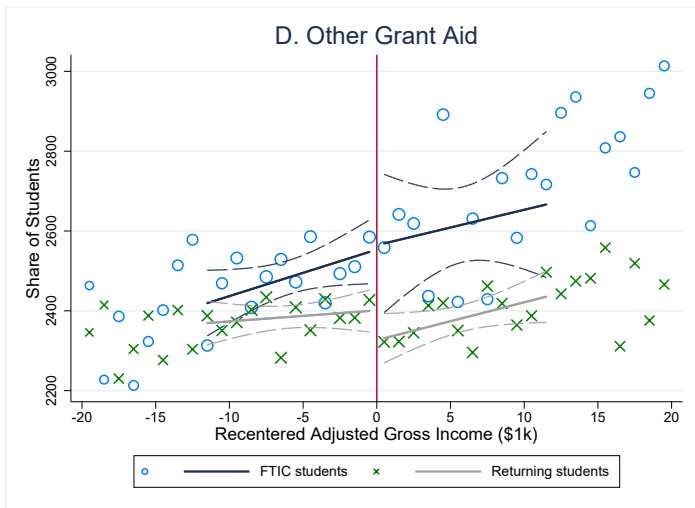


TEXAS Grant Aid by Distance to AZ Threshold



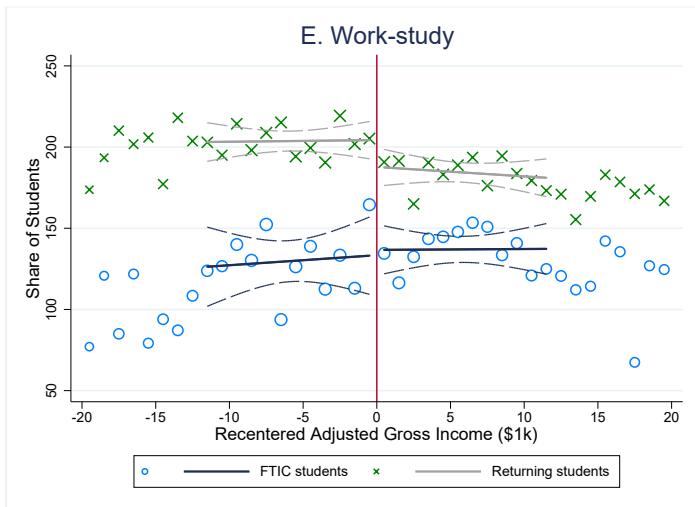
FTIC students: 151 (63)*
Returning students: -10 (34)

Other Grants by Distance to AZ Threshold



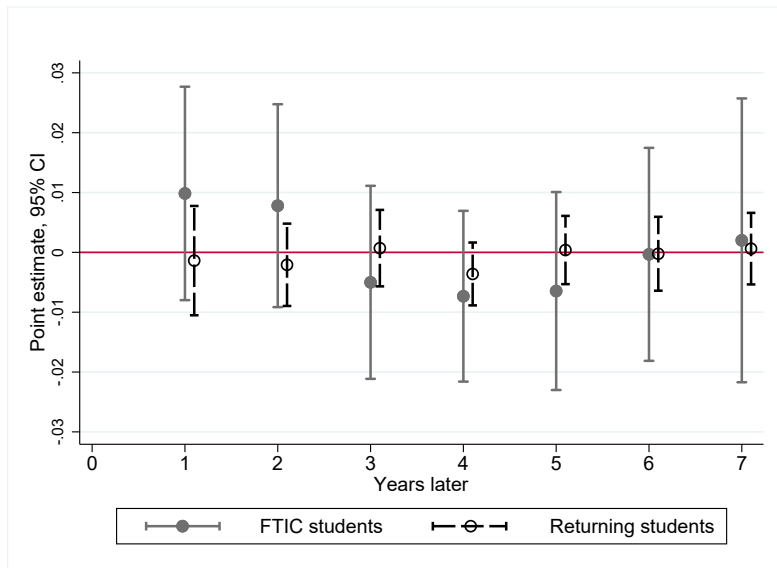
FTIC students: 25 (83)
Returning students: 99 (46)*

Work Study by Distance to AZ Threshold

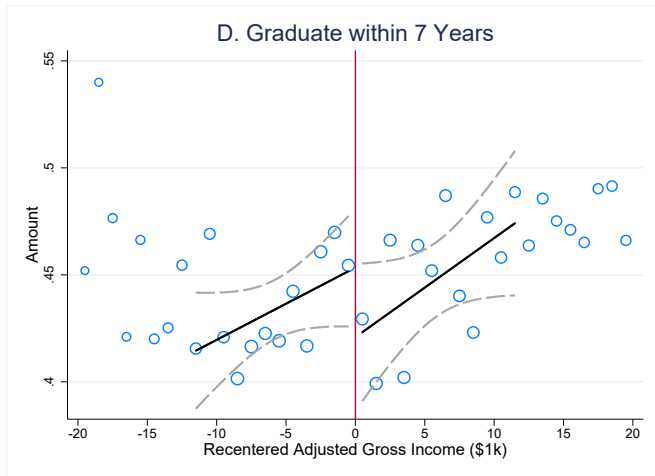


FTIC students: -5 (14)
Returning students: 17 (10)+

No Evidence of Transfers to TX CCs



Graduate within 7 Years



0.030 (0.018)+

[Back]

Earnings: 4 Years Post-Entry



674 (292)*

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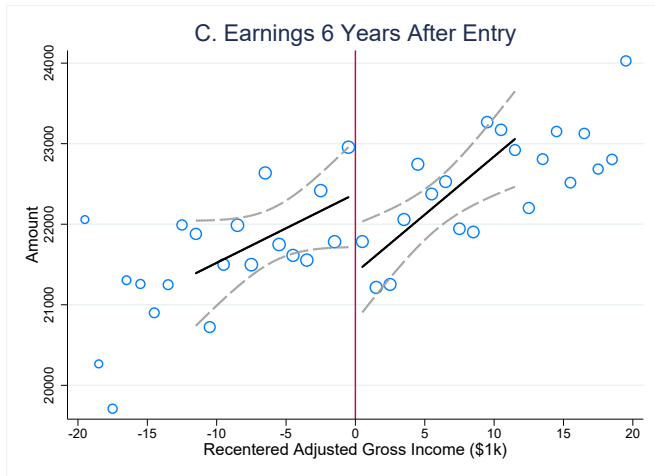
Earnings 5 Years Post-Entry



894 (366)*

[Back]

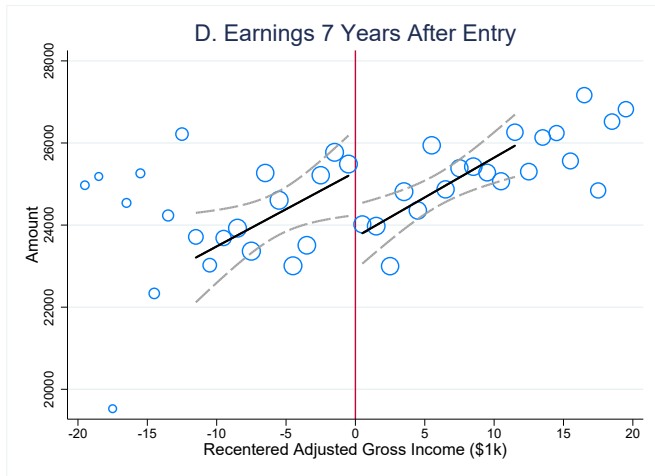
Earnings 6 Years Post-Entry



821 (437)+

[Back]

Earnings 7 Years Post-Entry



1421 (629)*

[\[Back\]](#)

IV Estimates: Effects on Attainment

$X =$	1	2	3	4	5	6	7
<i>A. New students: enrollment X years later</i>							
Baseline grant aid (\$1k)	0.001 (0.014)	0.008 (0.016)	0.029* (0.017)	0.013 (0.017)	-0.014 (0.016)	-0.011 (0.017)	0.026 (0.031)
Mean ineligible	0.74	0.61	0.55	0.38	0.20	0.10	0.07
Observations	37,227	37,227	37,227	37,227	26,707	17,308	8,225
<i>B. Returning students: enrollment X years later</i>							
Baseline grant aid (\$1k)	0.012* (0.007)	0.003 (0.007)	0.001 (0.006)	0.004 (0.006)	0.002 (0.006)	-0.011* (0.007)	0.004 (0.006)
Mean ineligible	0.56	0.28	0.13	0.06	0.04	0.03	0.02
Observations	110,603	110,603	110,603	110,603	79,215	51,939	25,131
<i>C. New students: graduate within X years</i>							
Baseline grant aid (\$1k)	-- --	0.001 (0.001)	0.001 (0.005)	0.022* (0.012)	0.051*** (0.015)	0.050** (0.021)	0.062* (0.036)
Mean ineligible	--	<0.01	0.01	0.15	0.31	0.39	0.42
Observations	--	37,227	37,227	37,227	37,227	26,707	17,308
<i>D. Returning students: graduate within X years</i>							
Baseline grant aid (\$1k)	-0.002 (0.005)	0.003 (0.006)	0.007 (0.008)	0.001 (0.009)	0.002 (0.009)	0.009 (0.011)	0.015 (0.016)
Mean ineligible	0.35	0.59	0.72	0.78	0.80	0.82	0.82
Observations	110,603	110,603	110,603	110,603	110,603	79,215	51,939

Notes: ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$.

IV Estimates: Effect on Earnings

$X =$	1	2	3	4	5	6	7
<i>A. New students: earnings X years later</i>							
Baseline grant aid (\$1k)	-220 (208)	-8 (255)	411 (326)	1033** (435)	1369** (563)	1270* (702)	2916* (1545)
Mean ineligible	\$5,651	\$7,483	\$9,517	\$13,422	\$17,914	\$21,428	\$23,728
Observations	37,227	37,227	37,227	37,227	37,227	26,707	17,308
<i>B. Returning students: earnings X years later</i>							
First year grant aid (\$1k)	16 (181)	154 (228)	502* (282)	423 (347)	618* (330)	668 (564)	458 (874)
Mean ineligible	\$15,803	\$21,344	\$25,338	\$28,727	\$31,550	\$33,798	\$35,723
Observations	110,603	110,603	110,603	110,603	110,603	79,215	51,939

Notes: ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$.

Effects on Pr(in-state) by Years Post-Entry

	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>A. FTIC students</i>								
Automatic zero eligible	-0.015 (0.009)	-0.006 (0.008)	-0.010 (0.009)	-0.002 (0.008)	0.011 (0.007)	0.012 (0.007)	0.004 (0.008)	0.016 (0.012)
Mean ineligible	0.68	0.73	0.76	0.78	0.78	0.78	0.79	0.77
Observations	37,227	37,227	37,227	37,227	37,227	37,227	26,707	17,308
<i>B. Returning students</i>								
Automatic zero eligible	-0.007 (0.005)	-0.003 (0.005)	0.000 (0.005)	-0.001 (0.005)	0.003 (0.004)	0.004 (0.004)	0.003 (0.005)	0.005 (0.008)
Mean ineligible	0.81	0.83	0.83	0.83	0.83	0.82	0.81	0.79
Observations	110,603	110,603	110,603	110,603	110,603	110,603	79,215	51,939

Notes: ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$. In-state = in UI data or enrolled in a public higher education institution at any point during the year.

Effects on Earnings by Years Post-Entry

	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>A. FTIC students</i>								
Automatic zero eligible	-134 (112)	-143 (135)	-3 (168)	278 (220)	682** (293)	922** (379)	794* (475)	4552 (2986)
Mean ineligible	\$3,829	\$5,651	\$7,483	\$9,517	\$13,429	\$17,963	\$21,505	\$23,672
Observations	37,227	37,227	37,227	37,227	37,227	37,227	26,707	17,308
<i>B. Returning students</i>								
Automatic zero eligible	-144 (121)	-4 (146)	109 (182)	449* (230)	391 (276)	422 (268)	549 (404)	280 (590)
Mean ineligible	\$10,204	\$15,922	\$21,553	\$25,551	\$29,009	\$31,933	\$34,317	\$36,796
Observations	110,603	110,603	110,603	110,603	110,603	110,603	79,215	51,939

Notes: ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$

Robustness of Estimated Effects: FTIC Students

	<u>Contemporaneous outcomes:</u>				<u>Graduate within:</u>				<u>Earnings after</u>			
	(1) EFC = 0	(2) Total Grants	(3) Credits attempted	(4) GPA	(5) 4 years	(6) 5 years	(7) 6 years	(8) 7 years	(9) 4 years	(10) 5 years	(11) 6 years	(12) 7 years
<i>A. No covariates</i>												
Automatic zero eligible	0.521*** (0.013)	633*** (0.103)	0.282* (0.145)	0.037 (0.029)	0.017* (0.009)	0.036*** (0.011)	0.036** (0.015)	0.035* (0.020)	739** (305)	986** (384)	922** (452)	1516** (635)
Observations	37,227	37,227	37,227	37,227	37,227	37,227	26,707	17,308	37,227	37,227	26,707	17,308
<i>B. Including buncbers</i>												
Automatic zero eligible	0.518*** (0.014)	640*** (94)	0.226* (0.134)	0.030 (0.025)	0.015* (0.008)	0.033*** (0.010)	0.031** (0.014)	0.028 (0.018)	641** (291)	934** (368)	865** (439)	1338** (635)
Observations	38,022	38,022	38,022	38,022	38,022	38,022	27,271	17,643	38,022	38,022	27,271	17,643
<i>C. \$6K bandwidth</i>												
Automatic zero eligible	0.488*** (0.018)	660*** (131)	0.256 (0.197)	0.052 (0.034)	0.026** (0.011)	0.040*** (0.013)	0.054*** (0.017)	0.052** (0.021)	781* (437)	1337*** (483)	1363** (645)	2396** (973)
Observations	19,223	19,223	19,223	19,223	19,223	19,223	13,916	9,137	19,223	19,223	13,916	9,137
<i>D. \$18K bandwidth</i>												
Automatic zero eligible	0.554*** (0.013)	566*** (83)	0.165 (0.111)	0.026 (0.022)	0.015** (0.007)	0.020** (0.008)	0.022* (0.011)	0.011 (0.015)	505** (220)	613** (286)	581* (327)	825 (545)
Observations	51,777	51,777	51,777	51,777	51,777	51,777	36,254	22,388	51,777	51,777	36,254	22,388
<i>E. \$18K bandwidth, quadratic in AGI</i>												
Automatic zero eligible	0.489*** (0.015)	712*** (0.111)	0.285 (0.178)	0.039 (0.032)	0.018* (0.009)	0.044*** (0.012)	0.046*** (0.016)	0.051** (0.012)	816** (374)	1233*** (470)	919 (615)	1839** (860)
Observations	51,777	51,777	51,777	51,777	51,777	51,777	36,254	22,388	51,777	51,777	36,254	22,388

Notes: ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$

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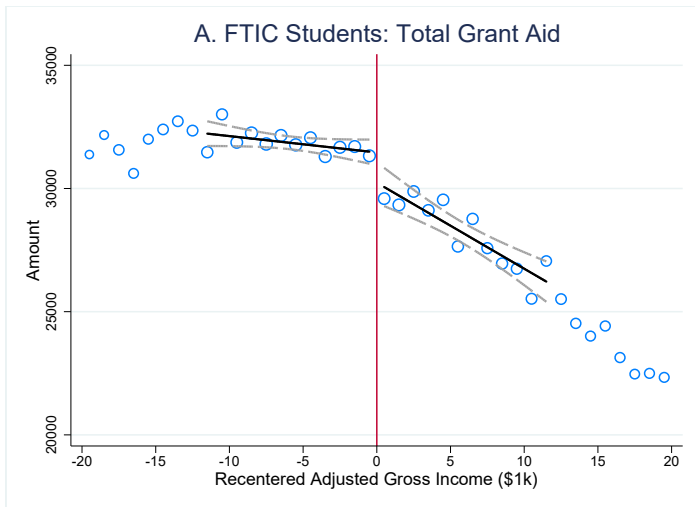
Robustness of Estimated Effects: Returning Students

	<u>Contemporaneous outcomes:</u>				<u>Graduate within the next:</u>				<u>Earnings after</u>			
	(1) EFC = 0	(2) Total Grants	(3) Credits attempted	(4) GPA	(5) 3 years	(6) 4 years	(7) 5 years	(8) 6 years	(9) 4 years	(10) 5 years	(11) 6 years	(12) 7 years
<i>A. No covariates</i>												
Automatic zero eligible	0.488*** (0.011)	713*** (75)	0.199* (0.110)	0.020 (0.016)	0.006 (0.007)	0.002 (0.007)	0.003 (0.008)	0.008 (0.009)	339 (275)	513* (268)	542 (390)	388 (474)
Observations	110,607	110,607	110,607	110,607	110,607	110,607	110,607	79,219	110,607	110,607	79,219	51,943
<i>B. Including bunchers</i>												
Automatic zero eligible	0.487*** (0.011)	725*** (76)	0.192* (0.108)	0.013 (0.013)	0.005 (0.006)	0.001 (0.007)	0.001 (0.007)	0.005 (0.008)	274 (266)	400 (248)	378 (363)	66 (432)
Observations	112,923	112,923	112,923	112,923	112,923	112,923	112,923	80,841	112,923	112,923	80,841	53,013
<i>C. \$6K bandwidth</i>												
Automatic zero eligible	0.456*** (0.013)	792*** (99)	0.248 (0.158)	0.015 (0.018)	0.011 (0.008)	0.004 (0.009)	0.000 (0.008)	0.013 (0.010)	914** (380)	1154*** (372)	1464*** (472)	1123** (564)
Observations	57,453	57,453	57,453	57,453	57,453	57,453	57,453	41,596	57,453	57,453	41,596	27,879
<i>D. \$18K bandwidth</i>												
Automatic zero eligible	0.514*** (0.011)	742*** (70)	0.248*** (0.095)	0.003 (0.011)	0.006 (0.005)	0.002 (0.006)	0.001 (0.006)	0.005 (0.006)	209 (206)	309 (210)	384 (301)	414 (381)
Observations	155,056	155,056	155,056	155,056	155,056	155,056	155,056	108,883	155,056	155,056	108,883	68,330
<i>E. \$18K bandwidth, quadratic in AGI</i>												
Automatic zero eligible	0.462*** (0.012)	775*** (84)	0.242* (0.138)	0.022 (0.016)	0.008 (0.007)	0.002 (0.008)	0.003 (0.008)	0.010 (0.010)	689** (341)	791** (324)	627 (476)	311 (601)
Observations	155,056	155,056	155,056	155,056	155,056	155,056	155,056	108,883	155,056	155,056	108,883	68,330

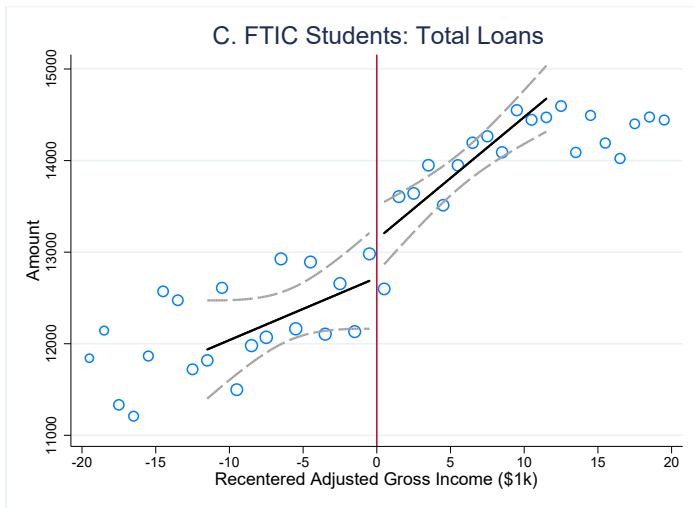
Notes: ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$

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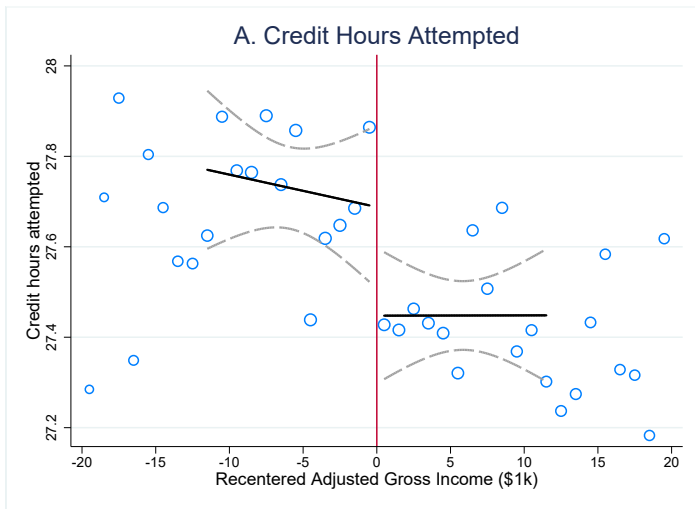
Effects on Cumulative Financial Aid



Effects on Cumulative Loan Debt

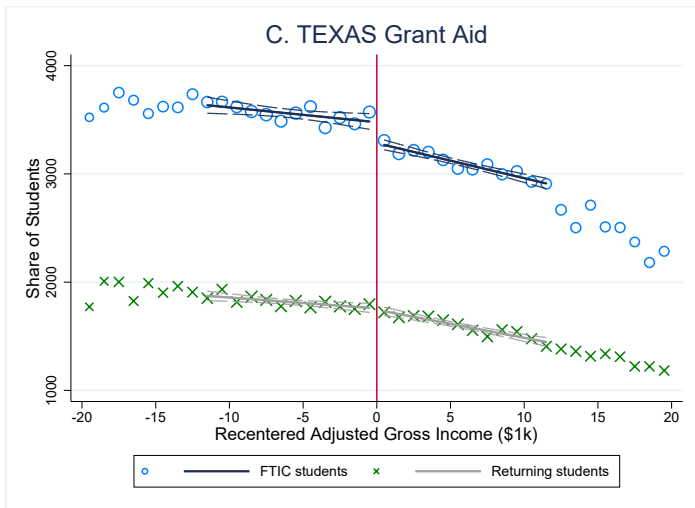


Small Impacts on Contemporaneous Attainment...



0.220 (0.109)*

Small Impacts on Contemporaneous Attainment...



FTIC students: 151 (63)*
Returning students: -10 (34)

RDD Implementation

Local linear regression, uniform kernel, ~median optimal IK (2012)
bw across outcomes

$$Y_{it} = \beta_1 D_{it} + \beta_2 \widetilde{AGI}_{it} + \beta_3 D_{it} \widetilde{AGI}_{it} + \mathbf{X}_i \gamma + \delta_t + \epsilon_{it}$$

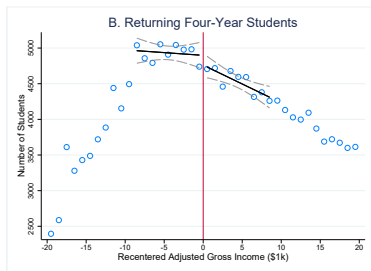
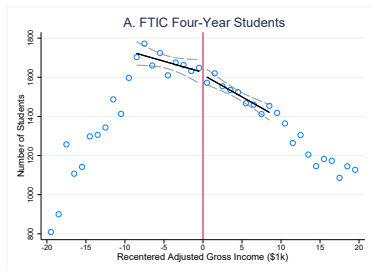
Where:

- ▶ $D_{it} = \mathbf{1} [\widetilde{AGI}_{it} < 0]$
- ▶ $\widetilde{AGI}_{it} = AGI_{it} - agi_t^0$ (distance from year-specific auto-zero threshold)
- ▶ \mathbf{X}_i is a vector of controls for predetermined characteristics
- ▶ δ_t is a vector of entry cohort fixed effects
- ▶ Standard errors are clustered at the entry institution by entry cohort level

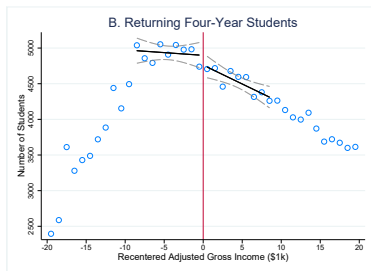
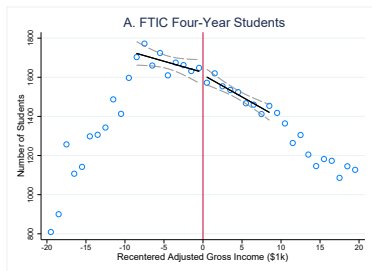
2SLS models: effect of additional grant aid

- ▶ Requires additional assumption of monotonicity in first stage (or homogeneous TE)

RDD Testable Implications: Continuous Density



RDD Testable Implications: Continuous Density



No evidence of excess number of students below eligibility threshold

- ▶ Implies that additional Pell dollars do not increase 4-year enrollment
- ▶ Consistent with most past studies on enrollment margin
- ▶ We can rule out increases > 3 percent

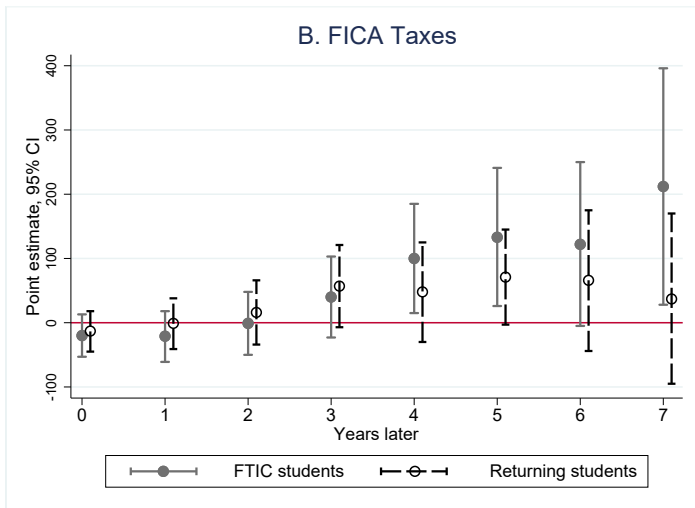
RDD Testable Implications: Continuity in Pred. Chars.

	(1) Linear prediction	(2) Father college deg.	(3) Mother college deg.	(4) White	(5) Black	(6) Hispanic	(7) Asian	(8) Age	(9) Texas resident	(10) Male
Automatic zero eligible	0.001 (0.002)	-0.0002 (0.009)	0.001 (0.010)	0.004 (0.014)	-0.013 (0.017)	0.008 (0.011)	-0.0003 (0.006)	-0.005 (0.015)	0.008 (0.005)	0.0005 (0.010)
Mean ineligible	0.14	0.22	0.28	0.47	0.26	0.20	0.06	18.6	0.96	0.45
	(11) Father < HS deg	(12) Father HS degree	(13) Father missing ed	(14) Mother < HS deg	(15) Mother HS degree	(16) Mother missing ed	(17) 2008 cohort	(18) 2009 cohort	(19) 2010 cohort	(20) 2011 cohort
Automatic zero eligible	0.012* (0.007)	-0.020* (0.011)	0.004 (0.009)	0.011 (0.008)	-0.002 (0.011)	-0.011 (0.008)	-0.0004 (0.011)	0.010 (0.016)	-0.005 (0.013)	-0.004 (0.013)
Mean ineligible	0.13	0.47	0.18	0.11	0.50	0.11	0.22	0.24	0.26	28

Notes: ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$

Spec (1): linear prediction of 5 year graduation probability from regression on all predetermined characteristics

Estimated FICA Liabilities



Effects on College Quality: FTIC Students

A. Summary and inputs

	<u>SAT scores</u>					<u>Share of students:</u>		<u>Admissions</u>	
	(1) First principal component	(2) Verbal, 25th percentile	(3) Verbal 75th, percentile	(4) Math, 25th percentile	(5) Math, 75th percentile	(6) Receiving Pell	(7) Borrowing	(8) Applicants admitted	(9) Yield
Automatic zero eligible	0.134 (0.137)	5 (4)	6 (5)	5 (4)	6 (5)	-1.129 (0.911)	-0.979 (0.853)	0.824 (0.717)	0.873* (0.496)
Mean ineligible	0.990	443	548	466	567	45.5	50.7	67.5	40.2
Observations	35,419	31,795	31,795	32,119	32,119	35,419	35,419	34,730	34,730

B. Resources and outputs

	<u>Retention rate</u>				<u>Graduation rate</u>		<u>Expenditures per FTE:</u>		
	(1) Tuition and Fees	(2) Student-faculty ratio	(3) Full-time students	(4) Part-time students	(5) Within 4 years	(6) Within 6 years	(7) Instruction	(8) Academic support svc.	(9) Student services
Automatic zero eligible	-35 (41)	0.150 (0.127)	0.842 (0.805)	1.714 (1.634)	0.705 (0.693)	1.122 (1.176)	-78 (94)	-21 (46)	-6 (17)
Mean ineligible	6927	20.9	71.8	52.0	21.5	43.4	7619	2539	1440
Observations	35,418	35,419	35,418	35,418	35,351	35,351	35,419	35,419	35,419

Notes: ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$

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Effects on College Quality: Returning Students

A. Summary and inputs

	<u>SAT scores</u>					<u>Share of students:</u>		<u>Admissions</u>	
	(1) First principal component	(2) Verbal, 25th percentile	(3) Verbal 75th percentile	(4) Math, 25th percentile	(5) Math, 75th percentile	(6) Receiving Pell	(7) Borrowing	(8) Applicants admitted	(9) Yield
Automatic zero eligible	0.055 (0.107)	2 (3)	3 (4)	3 (3)	3 (4)	-0.426 (0.694)	-0.698 (0.649)	0.573 (0.456)	0.354 (0.343)
Mean ineligible	1.605	456	563	480	582	43	49.2	66.3	40.8
Observations	105,485	96,757	96,757	97,258	97,258	105,485	105,485	103,842	103,842

B. Resources and outputs

	<u>Retention rate</u>			<u>Graduation rate</u>		<u>Expenditures per FTE:</u>			
	(1) Tuition and Fees	(2) Student-faculty ratio	(3) Full-time students	(4) Part-time students	(5) Within 4 years	(6) Within 6 years	(7) Instruction	(8) Academic support svc.	(9) Student services
Automatic zero eligible	-36* (21)	0.124 (0.088)	0.543 (0.604)	1.137 (1.211)	0.386 (0.524)	0.737 (0.886)	-93* (56)	21 (32)	-3 (11)
Mean ineligible	7130	20.9	74.3	55.8	23.9	47.0	8139	2732	1459
Observations	105,118	105,485	105,118	105,118	104,878	104,878	105,485	105,485	105,485

Notes: ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$

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