ProPelled: The Effects of Grants on Graduation and Earnings

Jeffrey T. Denning       Benjamin M. Marx       Lesley J. Turner
BYU                        UIUC                        UMD

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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
Federal Pell Grant Program

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Award amount based on Expected Family Contribution (EFC)

- Nonlinear (& opaque) fn of income, assets, family size, etc.
Federal Pell Grant Program

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

Award amount based on Expected Family Contribution (EFC)

▶ Nonlinear (& opaque) fn of income, assets, family size, etc.

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: $\text{Pr}[EFC = 0]$

FTIC students: 0.519 (0.014)**
Returning students: 0.487 (0.011)**
B. Pell Grant Aid

FTIC students: 489 (37)**
Returning students: 659 (39)**
A. Total Grant Aid

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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▶ Students enrolled in public institutions
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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
Identification

Fuzzy RDD using local linear regression [Specification]

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

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...

A. Credit Hours Attempted

![Graph showing the relationship between credit hours attempted and recentered adjusted gross income. The graph includes a linear regression line with a coefficient of 0.256 (0.138) with a positive slope.]

0.256 (0.138)+
C. Enrollment 1 Year Later

Share of students vs. Recentered Adjusted Gross Income ($1k)

0.0005 (0.009)
...But Significant Effects for FTIC Students Over Longer-Run

B. Credits Attempted

[IV estimates]
A. Graduate within 4 Years

0.015 (0.008)+
B. Graduate within 5 Years

Share of students vs. Recentered Adjusted Gross Income ($1k)

0.033 (0.010)**
C. Graduate within 6 Years

\[ 0.033 (0.014)^* \]
4+ Year Graduation Rate Increases for FTIC Students

C. Probability of Graduation

[Graph showing probability of graduation for FTIC students and returning students over different years, with confidence intervals indicated by error bars.]
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...

D. Earnings

[Scatterplots] [IV estimates] [Nonwinsorized]
Estimated Income Tax Liabilities

A. Federal Income Taxes

FTIC students

Returning students

[FICA taxes]
## Effects on Cumulative Financial Aid, Earnings, Taxes

<table>
<thead>
<tr>
<th></th>
<th>(1) Grants</th>
<th>(2) Loans</th>
<th>(3) Earnings</th>
<th>(4) Fed. income taxes</th>
<th>(5) FICA taxes</th>
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<tbody>
<tr>
<td><strong>A. FTIC students</strong></td>
<td></td>
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<tr>
<td>Automatic zero eligible</td>
<td>1163***</td>
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<td>3797**</td>
<td>540***</td>
<td>565**</td>
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<td>(436)</td>
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<td>Mean</td>
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<td><strong>B. Returning students</strong></td>
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<td></td>
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<td>Automatic zero eligible</td>
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<td>1869</td>
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<td>280</td>
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<td>(168)</td>
<td>(146)</td>
<td>(1431)</td>
<td>(233)</td>
<td>(213)</td>
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<td>Mean</td>
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<td>$10,175</td>
<td>$46,765</td>
<td>$202,386</td>
<td>$30,127</td>
</tr>
</tbody>
</table>

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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   ▶ No effect on cumulative loan debt
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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)
Welfare Implications

Welfare effect depends on:

1. Net externalities from behavioral responses
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   - Tax revenue net of additional public spending (grant aid, direct subsidies to schools)

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

E. FTIC Students: Total 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.
## Comparison with Nationally Representative Sample

<table>
<thead>
<tr>
<th></th>
<th>FTIC students</th>
<th>Returning students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Analysis sample</td>
<td>(2) 2008 NPSAS</td>
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<tr>
<td><strong>A. Student demographics</strong></td>
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<tr>
<td>Male</td>
<td>0.45</td>
<td>0.43</td>
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<tr>
<td>Age</td>
<td>18.6</td>
<td>18.4</td>
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<tr>
<td>In-state student</td>
<td>0.97</td>
<td>0.93</td>
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<tr>
<td>Race</td>
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<td></td>
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<tr>
<td>Asian</td>
<td>0.05</td>
<td>0.09</td>
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<tr>
<td>Black</td>
<td>0.24</td>
<td>0.26</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.21</td>
<td>0.23</td>
</tr>
<tr>
<td>White</td>
<td>0.47</td>
<td>0.40</td>
</tr>
<tr>
<td>Parental education</td>
<td></td>
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</tr>
<tr>
<td>Mother &lt; college degree</td>
<td>0.68</td>
<td>0.64</td>
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<tr>
<td><strong>B. Financial aid</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFC = 0</td>
<td>0.56</td>
<td>0.53</td>
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<tr>
<td>Pell Grant aid</td>
<td>$3,877</td>
<td>$3,392</td>
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<tr>
<td>Total Grants</td>
<td>$9,605</td>
<td>$8,648</td>
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<tr>
<td>Loans</td>
<td>$2,693</td>
<td>$3,345</td>
</tr>
<tr>
<td>Earnings</td>
<td>$3,803</td>
<td>$2,949</td>
</tr>
<tr>
<td>Work Study</td>
<td>$133</td>
<td>$350</td>
</tr>
</tbody>
</table>

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:

EFC_{it} = \begin{cases} \tilde{AGI}_{it} < 0 \\ \times f(AGI_{it}, X_{it}) \end{cases} \quad (\\tilde{AGI}_{it} = AGI_{it} - agi_{0t})

Pell_{it} = (\text{maxPell}_{t} - EFC_{it}) \times \begin{cases} 1 \quad \text{EFC}_{it} < \text{efc}_{0t} \end{cases}
Automatic Zero EFC and Pell Grant Aid

Expected Family Contribution:

▶ Federal government’s estimate of ability to pay for college

\[ EFC_{it} = \begin{cases} \tilde{\text{AGI}}_{it} & \text{if } \tilde{\text{AGI}}_{it} > 0 \\ f(\text{AGI}_{it}, X_{it}) & \text{otherwise} \end{cases} \]

Pell Grant award:

▶ Function of EFC, year-specific maximum Pell Grant (\( \text{maxPell}_{it} \)), and year-specific minimum EFC (\( \text{efc}_{0t} \))

▶ Zero EFC => maximum Pell Grant award

\[ \text{Pell}_{it} = (\text{maxPell}_{it} - EFC_{it}) \times \begin{cases} 1 & \text{if } EFC_{it} < \text{efc}_{0t} \\ 0 & \text{otherwise} \end{cases} \]
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

\[
EFC_{it} = \begin{cases} 
1 & \text{if } \tilde{\text{AGI}}_{it} > 0 \\
\times f(\text{AGI}_{it}, X_{it}) & \text{otherwise}
\end{cases}
\]

Pell Grant award:

\[
Pell_{it} = (\text{maxPell}_{t} - EFC_{it}) \times 1 \begin{cases} 
\text{if } EFC_{it} < \text{efc}_{0t} \\
\end{cases}
\]
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
- Set to zero when AGI falls below year-specific threshold ($\tilde{AGI}_{it} = AGI_{it} - agi_{0}^t$)
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
- Set to zero when AGI falls below year-specific threshold \(\tilde{AGI}_{it} = AGI_{it} - agi^0_t\)

\[
EFC_{it} = 1 \left[ \tilde{AGI}_{it} > 0 \right] \times f \left( AGI_{it}, X_{it} \right)
\]
Automatic Zero EFC and Pell Grant Aid

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

Pell Grant award:
Automatic Zero EFC and Pell Grant Aid

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\[
\tilde{AGI}_{it} = AGI_{it} - agi_t^0
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Pell Grant award:

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

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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

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- Function of EFC, year-specific maximum Pell Grant ($maxPell_t$), and year-specific minimum EFC ($efc_0^t$)
- Zero EFC => maximum Pell Grant award

\[
Pell_{it} = (maxPell_t - EFC_{it}) \times 1 \left[ EFC_{it} < efc_0^t \right]
\]
Financial aid receipt and earnings from employment

- Total Grants
- Loans
- Earnings
- Work Study

Eligible Ineligible

$0 $1,000 $2,000 $3,000 $4,000 $5,000
$6,000 $7,000 $8,000 $9,000 $10,000

Bar chart showing eligible and ineligible financial aid receipt and earnings from employment.
Financial aid receipt and earnings from employment

- Total Grants
- Loans
- Earnings
- Work Study

Eligible
Ineligible
Pell
TEXAS Grant
Other grants
Loan Aid by Distance to AZ Threshold

F. Loans

FTIC students: -343 (63)**
Returning students: -225 (47)**
C. TEXAS Grant Aid

FTIC students: 151 (63)*
Returning students: -10 (34)
Other Grants by Distance to AZ Threshold

D. Other Grant Aid

FTIC students: 25 (83)
Returning students: 99 (46)*
Work Study by Distance to AZ Threshold

E. Work-study

FTIC students: -5 (14)
Returning students: 17 (10+)
No Evidence of Transfers to TX CCs

![Graph showing no evidence of transfers.](image_url)
Graduate within 7 Years

D. Graduate within 7 Years

0.030 (0.018)+

[Back]
Earnings: 4 Years Post-Entry

A. Earnings 4 Years After Entry

674 (292)*
Earnings 5 Years Post-Entry

B. Earnings 5 Years After Entry

Recentered Adjusted Gross Income ($1k)

Amount

894 (366)*

[Back]
Earnings 6 Years Post-Entry

C. Earnings 6 Years After Entry

821 (437)+
Earnings 7 Years Post-Entry

D. Earnings 7 Years After Entry

1421 (629)*
### IV Estimates: Effects on Attainment

<table>
<thead>
<tr>
<th></th>
<th>X = 1</th>
<th>X = 2</th>
<th>X = 3</th>
<th>X = 4</th>
<th>X = 5</th>
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<tr>
<td>A. New students: enrollment X years later</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Baseline grant aid ($1k)</td>
<td>0.001</td>
<td>0.008</td>
<td>0.029*</td>
<td>0.013</td>
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<td>-0.011</td>
<td>0.026</td>
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<td>(0.014)</td>
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<td>(0.016)</td>
<td>(0.017)</td>
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<td>Mean</td>
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<td>0.61</td>
<td>0.55</td>
<td>0.38</td>
<td>0.20</td>
<td>0.10</td>
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<td>Observations</td>
<td>37,227</td>
<td>37,227</td>
<td>37,227</td>
<td>37,227</td>
<td>26,707</td>
<td>17,308</td>
<td>8,225</td>
</tr>
</tbody>
</table>

| B. Returning students: enrollment X years later |
| Baseline grant aid ($1k) | 0.012* | 0.003 | 0.001 | 0.004 | 0.002 | -0.011* | 0.004 |
| (0.007) | (0.007) | (0.006) | (0.006) | (0.006) | (0.007) | (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 |

| C. New students: graduate within X years |
| Baseline grant aid ($1k) | -- | 0.001 | 0.001 | 0.022* | 0.051*** | 0.050** | 0.062* |
| -- | (0.001) | (0.005) | (0.012) | (0.015) | (0.021) | (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 |

| D. Returning students: graduate within X years |
| Baseline grant aid ($1k) | -0.002 | 0.003 | 0.007 | 0.001 | 0.002 | 0.009 | 0.015 |
| (0.005) | (0.006) | (0.008) | (0.009) | (0.009) | (0.011) | (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

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

*Notes:* ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$. 
### Effects on Pr(in-state) by Years Post-Entry

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

**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

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

*Notes: ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$
## Robustness of Estimated Effects: FTIC Students

<table>
<thead>
<tr>
<th></th>
<th>Contemporaneous outcomes:</th>
<th>Graduate within:</th>
<th>Earnings after</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(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</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>A. No covariates</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic zero eligible</td>
<td>0.521*** (0.013) 633*** (0.103) 0.282* (0.029) 0.037 (0.009) 0.017* (0.011) 0.036*** (0.015) 0.036** (0.020) 0.035* (0.015) 739** (305) 986** (384) 922** (452) 1516** (635)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>37,227 37,227 37,227 37,227 37,227 37,227 37,227 37,227 37,227 37,227 37,227 37,227 17,308</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B. Including bunchers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic zero eligible</td>
<td>0.518*** (0.014) 640*** (94) 0.226* (0.025) 0.030 (0.008) 0.015* (0.010) 0.033*** (0.014) 0.031** (0.018) 0.028 (0.018) 641** (291) 934** (368) 865** (439) 1338** (635)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>38,022 38,022 38,022 38,022 38,022 38,022 38,022 38,022 38,022 38,022 38,022 38,022 17,643</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C. $6K bandwidth</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic zero eligible</td>
<td>0.488*** (0.018) 660*** (131) 0.256 (0.034) 0.052 (0.011) 0.026** (0.013) 0.040*** (0.017) 0.054*** (0.021) 0.052** (0.021) 781* (437) 1337*** (483) 1363** (645) 2396** (973)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D. $18K bandwidth</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic zero eligible</td>
<td>0.554*** (0.013) 566*** (83) 0.165 (0.022) 0.026 (0.007) 0.015** (0.008) 0.020** (0.011) 0.022* (0.015) 0.011 (0.015) 505** (220) 613** (286) 581* (327) 825 (545)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>E. $18K bandwidth, quadratic in AGI</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic zero eligible</td>
<td>0.489*** (0.015) 712*** (111) 0.285 (0.032) 0.039 (0.009) 0.018* (0.012) 0.044*** (0.016) 0.046*** (0.012) 0.051** (0.012) 816** (374) 1233*** (470) 919 (615) 1839** (860)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$
## Robustness of Estimated Effects: Returning Students

<table>
<thead>
<tr>
<th></th>
<th>Contemporaneous outcomes:</th>
<th>Graduate within the next:</th>
<th>Earnings after</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) EFC = 0 (2) Total (3) Credits (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</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>A. No covariates</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic zero eligible</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 0.488***
(0.011) & 713***
(75) & 0.199*
(0.016) & 0.020
(0.007) & 0.006
(0.007) & 0.002
(0.008) & 0.003
(0.009) & 0.008
(275) & 339
(268) & 513*
(390) & 542
(474) & 388 |
| Observations |
| **B. Including bunchers** |
| Automatic zero eligible |
| 0.487***
(0.011) & 725***
(76) & 0.192*
(0.013) & 0.013
(0.006) & 0.005
(0.007) & 0.001
(0.007) & 0.001
(0.008) & 0.005
(266) & 274
(248) & 400
(363) & 378
(432) & 66 |
| Observations |
| **C. $6K bandwidth** |
| Automatic zero eligible |
| 0.456***
(0.013) & 792***
(99) & 0.248
(0.018) & 0.015
(0.008) & 0.011
(0.009) & 0.004
(0.008) & 0.000
(0.010) & 0.013
(380) & 914**
(372) & 1154***
(472) & 1464***
(564) & 1123** |
| Observations |
| **D. $18K bandwidth** |
| Automatic zero eligible |
| 0.514***
(0.011) & 742***
(70) & 0.248***
(0.011) & 0.003
(0.005) & 0.006
(0.006) & 0.002
(0.006) & 0.001
(0.006) & 0.005
(206) & 209
(210) & 309
(301) & 384
(381) & 414 |
| Observations |
| **E. $18K bandwidth, quadratic in AGI** |
| Automatic zero eligible |
| 0.462***
(0.012) & 775***
(84) & 0.242*
(0.016) & 0.022
(0.007) & 0.008
(0.008) & 0.002
(0.008) & 0.003
(0.010) & 0.010
(341) & 689**
(324) & 791**
(476) & 627
(601) & 311 |
| Observations |

**Notes:** **p < 0.01, * p < 0.05, + p < 0.10**
Effects on Cumulative Financial Aid

A. FTIC Students: Total Grant Aid
Effects on Cumulative Loan Debt

C. FTIC Students: Total Loans

Recentered Adjusted Gross Income ($1k)

Amount

[Back]
Small Impacts on Contemporaneous Attainment...

A. Credit Hours Attempted

0.220 (0.109)*
Small Impacts on Contemporaneous Attainment...

C. TEXAS Grant Aid

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

Local linear regression, uniform kernel, $\sim$median optimal IK (2012)
bw across outcomes

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

Where:

- $D_{it} = 1 \left[ \widetilde{AGI}_{it} < 0 \right]$
- $\widetilde{AGI}_{it} = AGI_{it} - agi_0^t$ (distance from year-specific auto-zero threshold)
- $X_i$ is a vector of controls for predetermined characteristics
- $\delta_t$ 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

A. FTIC Four-Year Students

B. Returning Four-Year Students

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: 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.

<table>
<thead>
<tr>
<th>Spec (1): linear prediction of 5 year graduation probability from regression on all predetermined characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>(1) Linear prediction</td>
</tr>
<tr>
<td>Automatic zero eligible</td>
</tr>
<tr>
<td>Mean ineligible</td>
</tr>
</tbody>
</table>

| | (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* | -0.020* | 0.004 | 0.011 | -0.002 | -0.011 | -0.0004 | 0.010 | -0.005 | -0.004 |
| Mean ineligible | 0.13 | 0.47 | 0.18 | 0.11 | 0.50 | 0.11 | 0.22 | 0.24 | 0.26 | 28 |

Notes: ** \( p < 0.01 \), * \( p < 0.05 \), + \( p < 0.10 \)
Estimated FICA Liabilities

B. FICA Taxes

Years later
FTIC students
Returning students
B. FICA Taxes

[Back]
## Effects on College Quality: FTIC Students

### A. Summary and inputs

<table>
<thead>
<tr>
<th>SAT scores</th>
<th>Share of students:</th>
<th>Admissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) First principal component</td>
<td>(6) Receiving Pell</td>
<td>(8) Applicants admitted</td>
</tr>
<tr>
<td>(2) Verbal, 25th percentile</td>
<td>(7) Borrowing</td>
<td>(9) Yield</td>
</tr>
<tr>
<td>(3) Verbal 75th percentile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Math, 25th percentile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Math, 75th percentile</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Automatic zero eligible</th>
<th>0.134</th>
<th>5</th>
<th>6</th>
<th>5</th>
<th>6</th>
<th>-1.129</th>
<th>-0.979</th>
<th>0.824</th>
<th>0.873*</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.137)</td>
<td>(4)</td>
<td>(5)</td>
<td>(4)</td>
<td>(5)</td>
<td>(0.911)</td>
<td>(0.853)</td>
<td>(0.717)</td>
<td>(0.496)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean</th>
<th>ineligible</th>
<th>0.990</th>
<th>443</th>
<th>548</th>
<th>466</th>
<th>567</th>
<th>45.5</th>
<th>50.7</th>
<th>67.5</th>
<th>40.2</th>
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<tbody>
<tr>
<td></td>
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<td>35,419</td>
<td>31,795</td>
<td>31,795</td>
<td>32,119</td>
<td>32,119</td>
<td>35,419</td>
<td>35,419</td>
<td>34,730</td>
<td>34,730</td>
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</table>

### B. Resources and outputs

<table>
<thead>
<tr>
<th>Retention rate</th>
<th>Graduation rate</th>
<th>Expenditures per FTE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Tuition and Fees</td>
<td>(2) Student-faculty ratio</td>
<td>(3) Full-time students</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Automatic zero eligible</th>
<th>-35</th>
<th>0.150</th>
<th>0.842</th>
<th>1.714</th>
<th>0.705</th>
<th>1.122</th>
<th>-78</th>
<th>-21</th>
<th>-6</th>
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</thead>
<tbody>
<tr>
<td>(41)</td>
<td>(0.127)</td>
<td>(0.805)</td>
<td>(1.634)</td>
<td>(0.693)</td>
<td>(1.176)</td>
<td>(94)</td>
<td>(46)</td>
<td>(17)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean</th>
<th>ineligible</th>
<th>6927</th>
<th>20.9</th>
<th>71.8</th>
<th>52.0</th>
<th>21.5</th>
<th>43.4</th>
<th>7619</th>
<th>2539</th>
<th>1440</th>
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</thead>
</table>

**Notes:** **p < 0.01**, *p < 0.05*, +p < 0.10
# Effects on College Quality: Returning Students

## A. Summary and inputs

<table>
<thead>
<tr>
<th>SAT scores</th>
<th>Share of students:</th>
<th>Admissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) First principal component</td>
<td>(2) Verbal, 25th percentile</td>
<td>(3) Verbal 75th percentile</td>
</tr>
<tr>
<td>Automatic zero eligible</td>
<td>0.055</td>
<td>2</td>
</tr>
<tr>
<td>(0.107)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Mean</td>
<td>ineligible</td>
<td>1.605</td>
</tr>
<tr>
<td>66.3</td>
<td>40.8</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>105,485</td>
<td>96,757</td>
</tr>
</tbody>
</table>

## B. Resources and outputs

<table>
<thead>
<tr>
<th>Retention rate</th>
<th>Graduation rate</th>
<th>Expenditures per FTE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Tuition and Fees</td>
<td>(2) Student-faculty ratio</td>
<td>(3) Full-time students</td>
</tr>
<tr>
<td>Automatic zero eligible</td>
<td>-36*</td>
<td>0.124</td>
</tr>
<tr>
<td>(21)</td>
<td>(0.088)</td>
<td>(0.604)</td>
</tr>
<tr>
<td>Mean</td>
<td>ineligible</td>
<td>7130</td>
</tr>
</tbody>
</table>

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