How can we help students make better investments in college?

Financial Aid and STEM

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Joint work with Ben Castleman and Zack Mabel
Focus: STEM Fields
(Science, Technology, Engineering and Math)

Overall, unemployed people outnumbered job posting by 3.6 to one.

In STEM occupations, job posting outnumbers unemployed persons 1.9 to one.
**Does Need-Based Aid Improve STEM Selection, Achievement, and Attainment?**

Possible Financial Barriers

- Added costs (e.g. lab and material fees, etc.) make STEM majors more expensive than other options
- Work commitments make pursuing STEM difficult
- Institutional differences exacerbate gaps in STEM outcomes due to high-quality versus low-quality programs

→ *Does eligibility for need-based aid increase the number of STEM credits that students attempt and accumulate in college?*

→ *Does eligibility increase students’ probability of earning a bachelor’s degree in STEM fields?*
**Focus: Florida Student Access Grant**

- Need-based Grant: $1,300 in 2000-01
  - 57% of tuition & fees at FL public 4yrs
  - 90% of tuition and fees at CCs

- Students also received the Pell Grant (about $1,750)
  → a good test for an increase in need-based aid
**Focus: Florida Student Access Grant**

- **FSAG Eligibility Cut-Off**
  - FSAG: $3050
  - No FSAG: $1750

Discontinuity we exploit to estimate the effect of an FSAG eligibility on students’ outcomes.
Data Set and Samples

FLDOE K-20 Data Warehouse:

• All FL public HS seniors in AY 1999-00 (N=101,094)
• Detailed student-level data (demographics, HS and college transcripts; aid eligibility and receipt)

Students who completed the FAFSA in 1999-2000 (N=45,727)
Castleman and Long (2016)
“Looking Beyond Enrollment: The Causal Effect of Need-based Grants on College Access, Persistence, and Graduation”

Credit completed within 3 years

- Positive impact on early persistence & credit accumulation
- Positive impact bachelor’s degree receipt within 5, 6, and 7 years (2.5, 3.5, and 4.0 percentage points per $1,000)
Data Set and Samples

FLDOE K-20 Data Warehouse:
- All FL public HS seniors in AY 1999-00 (N=101,094)
- Detailed student-level data (demographics, HS and college transcripts; aid eligibility and receipt)

Students who completed the FAFSA in 1999-2000 (N=45,727)

Demonstrate readiness for STEM:
  a) Students who surpass college-ready math standards on Florida Math placement test or SAT Math exam (N=20,738)
  b) Students who completed trigonometry or a more advanced Math class in high school (N=8,907)
Castleman, Long, and Mabel (2017)

**STEM Credits Earned after Seven Years**
(Locally Linear Regressions fit on either side of the FSAG cut-off)

A. College Math Sample
B. HS Trig+ Sample
Castleman, Long, and Mabel (2017)

BA/BS Degree in STEM after Seven Years
(Locally Linear Regressions fit on either side of the FSAG cut-off)

A. College Math Sample

B. HS Trig+ Sample
### Table 5: The Effect of FSAG Eligibility on STEM Outcomes Through Year 7

<table>
<thead>
<tr>
<th></th>
<th>STEM Credits Attempted</th>
<th>STEM Credits Completed</th>
<th>BA/BS Degree in STEM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: College Math Sample (N = 2,834)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eligible for FSAG</td>
<td>2.701</td>
<td><strong>3.705</strong></td>
<td><strong>0.027</strong></td>
</tr>
<tr>
<td></td>
<td>[2.076]</td>
<td>[1.800]</td>
<td>[0.015]</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.195</td>
<td>0.204</td>
<td>0.191</td>
</tr>
<tr>
<td>Outcome mean above cut-off</td>
<td>23.55</td>
<td>18.27</td>
<td>0.043</td>
</tr>
<tr>
<td><strong>Panel B: HS Trig+ Sample (N =1,283)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eligible for FSAG</td>
<td><strong>5.456</strong></td>
<td><strong>7.259</strong></td>
<td><strong>0.028</strong></td>
</tr>
<tr>
<td></td>
<td>[4.115]</td>
<td>[3.533]</td>
<td>[0.032]</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.300</td>
<td>0.310</td>
<td>0.290</td>
</tr>
<tr>
<td>Outcome mean above cut-off</td>
<td>26.47</td>
<td>20.98</td>
<td>0.059</td>
</tr>
</tbody>
</table>

*** p<0.01 ** p<0.05 * p<0.10

Notes: Robust standard errors, clustered at the HS level, are shown in brackets. All results are from multiple imputation OLS/LPM specifications estimated with an EFC window +/- $1,000 around the FSAG cut-off and include the following covariates: race/ethnicity dummy variables; female dummy variable; HS senior year GPA; SAT math and verbal scores (imputed where missing); whether the student was in a gifted and talented program; parental AGI; student age, and whether the student was eligible for the Bright Futures Scholarship. All models also include high school fixed effects and a constant.
Conclusions: Eligibility for additional need-based aid…

- Increased STEM credit completion 16-19 percent over students who were ineligible for FSAG (33 percent for the sample who had taken at least trigonometry in HS)
- Robust to different specifications
- Effects on degree attainment are imprecise but suggest that STEM degree production may have increased by 50 percent
- Results appear to be driven by shifting students into STEM-heavy course loads, suggesting aid availability impacts the academic choices students make after deciding to enroll
Policy Implications

• For academically-qualified students, need-based aid may be an effective instrument to increase STEM attainment
• Policy efforts should continue to focus on improving the math and science preparation in high school
• But aid also helps with academic persistence

Additional Questions for Future Research

• Are academically-qualified students experiencing a STEM mismatch (given institutional differences)?
• Do the impacts of financial aid on STEM achievement and attainment vary by STEM field?
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CAPSEE is funded through a grant (R305C110011) from the Institute of Education Sciences, U.S. Department of Education.