Undergraduate Research Benefits for Community College Students

High Impact Practices at TBR institutions

Statewide HIP Conference
January 13, 2022
We examine several questions:

Does undergraduate research affect:

- Likelihood of graduation, transfer & departure?
- Academic performance?
- Progression to completion, transfer & departure?

Objectives:

- Estimate the participation effect.
- Dissect the effect by frequency.
Participants & non-participants are systematically different

Participants may have:

- better preparation
- different backgrounds
- higher motivation

Some differences affect both participation & outcomes

- Better preparation  Better outcomes
- Complicates teasing out participation effect
How do we address the selection bias?

Make sure to compare outcomes of similar students

Use appropriate methods:

- Machine learning for propensity scores
- Weighting on inverse probability of participation
- Logistic & OLS regression, EHA

- Attribute difference in outcomes to participation
We account for 33 key factors

Demographic:
- Age, gender, ethnicity, residency, Pell eligibility

Academic:
- ACT score, HS GPA, diploma type, learning support, Promise, attempted credits, attendance, delay, TTP, major groups

Financial aid:
- Grant amount: Pell, TN Promise, TN Lottery, TSAA

College of enrollment
Weighting makes groups similar on key factors

Due to weighting, a good balance is achieved in the observed student characteristics.
We track UR participation & outcomes for 4 years

21,578 freshmen

<table>
<thead>
<tr>
<th>Undergraduate research</th>
<th>Once</th>
<th>Twice</th>
<th>3+ times</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,300</td>
<td>1,891</td>
<td>753</td>
<td>656</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 1 (Fa '17)</th>
<th>Term 2</th>
<th>Term 3</th>
<th>Term 4</th>
<th>Term 5</th>
<th>Term 6</th>
<th>Term 7</th>
<th>Term 8</th>
<th>Term 9</th>
<th>Term 10</th>
<th>Term 11 (Sp '21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(percent of all terms of observation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.3</td>
<td>31.2</td>
<td>1.8</td>
<td>14.5</td>
<td>16.2</td>
<td>1.7</td>
<td>5.1</td>
<td>3.7</td>
<td>0.5</td>
<td>1.4</td>
<td>1.7</td>
</tr>
</tbody>
</table>
Participants graduate & transfer in greater shares

21,578 freshmen tracked over 12 terms

Data from: TBR & NSC
How to interpret statistically significant findings:

Participants & non-participants are similar re:

- Likelihood of UR participation
- Control variables

Results are unlikely to be due to chance

Different analyses are presented together

- Binary: *Did or did not participate?*
- Frequency: *How many times?*
Participants tend to have higher GPA, on average.

Participants’ GPA is .43 points higher than that of similar non-participants.

Estimated effect increases with participation frequency.

Frequency analysis:
- UR: Once: 0.32
- UR: Twice: 0.47
- UR: 3+ times: 0.62

95% confidence interval

Mean GPA: 2.99
St. Dev.: 1.02
Participants show higher probability of graduation

<table>
<thead>
<tr>
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<th>Average non-participant</th>
<th>Average UR participant</th>
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<tbody>
<tr>
<td>Undergrad. research</td>
<td>.24</td>
<td>.45</td>
</tr>
<tr>
<td>UR – once</td>
<td>.22</td>
<td>.35</td>
</tr>
<tr>
<td>UR – twice</td>
<td>.22</td>
<td>.42</td>
</tr>
<tr>
<td>UR – 3+ times</td>
<td>.22</td>
<td>.56</td>
</tr>
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</table>
Participants are more likely to graduate than similar non-participants

Participants are 21 pp more likely to graduate

Probability is predicted to increase with each frequency level
Difference in predicted probability of graduation is observed for any ACT score.

Note: Sample size decreases at the higher end of ACT score distribution.
There is no evidence that UR participation affects time to completion

All confidence intervals include the value of “no effect”
### Participants have higher probability of university transfer

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<th>Average UR participant</th>
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<tbody>
<tr>
<td>Undergrad. research</td>
<td>.21</td>
<td>.35</td>
</tr>
<tr>
<td>UR – once</td>
<td>.20</td>
<td>.28</td>
</tr>
<tr>
<td>UR – twice</td>
<td>.20</td>
<td>.35</td>
</tr>
<tr>
<td>UR – 3+ times</td>
<td>.20</td>
<td>.47</td>
</tr>
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</table>
Participants are more likely to transfer to university than similar non-participants.

- Participants are 14 pp more likely to transfer.
- Probability is predicted to increase with each frequency level.
Participants show a lower probability of departure

Participants are 31 pp less likely to stop out
Participants are less likely to drop out in any term

Hazard for departure is predicted to decrease with each frequency level

Participants are 65% less likely to depart faster
Progression to departure slows down with frequency
In general, we find:

Undergraduate research participation

- Higher probability of graduation & transfer
- Higher GPA
- Better persistence

Results improve with an increase in frequency

Effect sizes are substantial