Effective Use of National and Regional Survey Data in Evaluating Graduate Program Performance

SIZING THINGS UP

PROGRAM SIZE AND DEGREE COMPLETION:
A LOOK AT THE DATA

PRESENTATION FOR THE CGS 2011 ANNUAL MEETINGS
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The Graduate Degree Landscape:

- Roughly 950 Doctorate and Masters granting US institutions (Carnegie Classification)
- 222 Research Universities (doctoral granting)
- 96 RU/VH, including Tufts
- RU/VH enroll 2.4 million students, 13.5% of Higher Education Enrollment
- Average Enrollment at RU/VH is 25,000
- 2/3 of RU/VH are large public universities
Tufts and its “neighborhood”:

- Tufts is a relatively small RU/VH
- Student Enrollment 9,658
- 5150 Undergraduates, 2534 Graduate Students and 1827 first Professional
- Liberal heart nested among Graduate and Professional schools
- Medical or Life Sciences footprint
- Characteristics define whose “close” or a Peer School
An NRC look at our neighbors:

- In 2010 GSAS identified for each Doctoral Program a list of Peer Schools
- Prepared Analysis of how each one of our Doctoral Programs compared to its Peers based on NRC data
- Reviewed the R and S Methodologies
- Difference in Weights Generated by R and S
R-Ranking Range of English Doctoral Programs: Tufts and its Peers
<table>
<thead>
<tr>
<th>Category</th>
<th>What We Do (Regression)</th>
<th>What We Say (Survey)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publications per Allocated Faculty</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>% Faculty with Grants</td>
<td>0.1</td>
<td>0.05</td>
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<tr>
<td>% Faculty Interdisciplinary</td>
<td>0.0</td>
<td>0.05</td>
</tr>
<tr>
<td>% Non-Asian Minority Faculty</td>
<td>0.0</td>
<td>0.05</td>
</tr>
<tr>
<td>% Female Faculty</td>
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<td>Awards per Allocated Faculty</td>
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<tr>
<td>Average Student GRE</td>
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<tr>
<td>% 1st Yr. With Full Support</td>
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<td>0.15</td>
</tr>
<tr>
<td>% 1st Yr. With External Funding</td>
<td>0.0</td>
<td>0.15</td>
</tr>
<tr>
<td>% Non-Asian Minority Students</td>
<td>0.0</td>
<td>0.15</td>
</tr>
<tr>
<td>% Female Students</td>
<td>0.0</td>
<td>0.15</td>
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<tr>
<td>% International Students</td>
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<td>0.15</td>
</tr>
<tr>
<td>Average # Ph.D.’s 2002-06</td>
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<td>0.15</td>
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<tr>
<td>% Completing Within 6 Years</td>
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<td>0.15</td>
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<tr>
<td>Time to Degree Full &amp; Part Time</td>
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<tr>
<td>% Students in Academic Positions</td>
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<td>Student Work Space</td>
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<td>Health Insurance</td>
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<td>0.15</td>
</tr>
<tr>
<td># Student Activities</td>
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<td>0.15</td>
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</table>
2011 Focus: Program Size and Degree Completion

- NRC data: 5,000 doctoral programs in 62 fields at 212 universities in the U.S.
- Fields grouped into 6 broad Categories:
  - Agricultural Science
  - Biological and Health Sciences
  - Engineering
  - Humanities
  - Physical and Mathematical Sciences
  - Social and Behavioral Sciences
NRC Variables for Study:

- **Degree completion**: Average Completion Rate for cohorts entering Doctoral Programs from AY1997-2001 (AY 1997-1999 for Humanities) who completed in 6 years or less (8 years or less)
- **Program Size**: Total number of Students Enrolled in Fall 2005
- **Faculty Productivity**: Grants: percent of Faculty whose work is currently (2005-06) supported by Extramural Grant or contract
- **Student Quality**: Average GRE score: verbal for Humanities, quantitative for all others (AY2004-6 scores)
Relationship investigated:

- Regress Degree Completion on:
  - Program Size
  - Program Size Squared
  - Conditional on: Measures of Faculty Productivity and Student Quality
  - Why non linear or scale effects: mentoring, specialization, peer cohort
### Summary Data:

<table>
<thead>
<tr>
<th>Field</th>
<th>Completion</th>
<th>Size</th>
<th>Grant</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Max</td>
<td>Min</td>
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<tr>
<td>All</td>
<td>45.3%</td>
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<td>0</td>
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<tr>
<td>PhyMaSci</td>
<td>42.8%</td>
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<td>0</td>
</tr>
<tr>
<td>SocBehSci</td>
<td>36.8%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>BioHeaSci</td>
<td>49.3%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Engineering</td>
<td>50.5%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Humanities</td>
<td>42.4%</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Program Size and Degree Completion Rates

Does this relationship between completion rate and size characterize all programs? Or does it reflect just a few?
Program Size and Degree Completion Rates

There are Potentially Important Scale Effects in the Physical & Mathematical Sciences. Programs on the order of 225 Achieve the same Completion Rates as the Typical Program (Size = 60), and Larger Programs Do Much Better

![Graph showing program size and completion rates](image-url)
The Marginal Impact of Grants On Completion Rates

There is also a Significant if Small Role for Grants. If the Proportion of Faculty Receiving Grants Increased by 20% (Current Mean =75%) the Completion Rate would Rise by 2.8%
Social and Behavioral Sciences

There are Important Size Considerations in the Social Sciences, too. Here though, it seems unlikely that programs should grow to the over 200 size required to duplicate the current average completion rate (37%). Instead, many programs may need to shrink.

Average Program has 52 students and 37% Completion Rate
The Marginal Impact of Grants On Completion Rate

Grants Seem to Play a Significant Role in the Social Sciences. If Proportion of Faculty Receiving Grants Increased by 20% (Current Mean of 44%). Completion Rate would Rise by 3.3%
While Size Does not Seem to Matter in the Biological and Health Sciences, there appears to be a role for grant funding. If the Proportion of Faculty Receiving Grants Increased by 20% (Current Mean of 82%) Completion Rate would Rise by 1.6%.
The Effect of Program Size on Completion Rates

Engineering Looks a lot Like the Biological & Health Sciences. There is not much size effect but there is a small funding effect. If the proportion of faculty with grants rose by 20% (Current Mean = 80%) Completion Rate would Rise by 2.1%
The Effect of Program Size on Completion Rates

Size Does not Seem to Matter Much for Completion Rates in the Humanities and there is No Statistically Significant Effect of Faculty Grants on Completion Rates in this Field either.
GRE Scores Statistically Significant In Influencing Completion Rates

If Proportion of Faculty Receiving Grants Rose by 20% (Current Mean = 44%) *and* GRE rose by 50 points (Current Mean = 662) Completion Rate would Rise by 3.3% + 1.5% = 4.8%
Comparing Outcomes at Tufts

Difference in Predicted and Actual Tufts Completion Rates

-30.00%
-20.00%
-10.00%
0.00%
10.00%
20.00%
30.00%
40.00%
50.00%
60.00%
70.00%

Civil And Environmental Engineering
Chemical Engineering
Electrical Engineering
Mechanical Engineering
English
History
Drama
Chemistry
Mathematics
Physics
Child Development
Psychology
Some Concluding Thoughts

- Suggestive Relationship between Program Size and Degree Completion
- Depends on how Knowledge is Created Across Disciplines
- In most STEM disciplines: Scale Effects
- Small Impact of Grants in the Biological & Health Sciences and in Engineering may Result from the Fact that Funding is already High and Very Common
- A Goldilocks Size—Need Cost Data
- Small scale: niche, specialized program, mentoring
- Large scale: training, specialization
- The Findings May also Be Useful as a Starting Point for thinking about Programs Given Their Size and Funding—How Do Programs Compare with Programs of Similar Scale & Grants