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What Price Success? Research Funding as a Criterion for Tenure at Non-PhD Granting Engineering Institutions

Dr. Richard J. Puerzer, Hofstra University
Dr. David M. Rooney, Hofstra University

David Rooney is Professor of Engineering at Hofstra University, where his primary research interests are in experimental aerodynamics.

WHAT PRICE SUCCESS? RESEARCH FUNDING AS A CRITERION FOR TENURE AT NON-PHD GRANTING ENGINEERING SCHOOLS

David Rooney and Richard Puerzer
DeMatteis School of Engineering and Applied Science, Hofstra University

Abstract

Tenure and promotion guidelines for non-PhD granting engineering schools are subject to evolving expectations of those schools and the universities which house them. The "striving institution" may seek to align their guidelines with more prestigious institutions in order to seek gains in stature and reputation. Yet there remain two distinct categories of engineering school: the approximately 200 which offer PhD programs, and a similar number of schools which do not. The research facilities, number of faculty and graduate students, and previous history of obtaining grants at the former are on average far greater than at the latter. A survey of the practices of non-PhD granting engineering schools relative to requiring faculty to obtain external funding to earn tenure and promotion was undertaken to determine whether the paradigm of these schools' expectations has shifted in recent years. The correlation between funding and reputation was analyzed, as well as practices relative to internal start-up funding for new faculty. It was found that there is no correlation between reputational ranking and amount of institutional research funding.

Introduction

Over the past three decades, a number of educational researchers have focused on documenting changes in tenure requirements at institutions that were formerly recognized as teaching schools, but that have subsequently sought to burnish their image by elevating faculty research productivity requirements, a process emblematic of the so-called "striving institution" that has been analyzed by Gardner and Veliz (2014). This phenomenon has been occurring in schools and departments of engineering, and a sub-genre of the literature describing tenure and promotion guidelines is devoted specifically to the manifestation of this striving among these programs. The established approach is to conduct a survey for a given field or program, and to analyze the results factoring in institutional support (e.g., McGill and Settle 2012), faculty perceptions of tenure requirements (e.g., Wheatley et al 2020, Tymvios and Christou 2019, Miskioglu et al 2020), and the drivers of change (Youn and Price 2009). Other surveys simply report the requirements for a given geographic subset of engineering schools (Hardin and Hodges 2006, Aggarwal and Vernaza 2011). Finally, some investigators and commentators suggest a broader approach to the determination of faculty productivity (Wankal and Oreovicz 2003, Yeung 2006, Estes et al 2008, Sanberg et al 2014).

Engineering schools are divided roughly equally between approximately 200 institutions where the highest degree is a PhD, and somewhat more than 200 where the highest degree is at the

Master's level, or in many cases, the Bachelor's level. It is a commonplace to assume that a higher level of research activity takes place in the former than in the latter, although many non-PhD granting schools maintain an ethos of rigorous research as well. This despite their not typically having anywhere near the number of available researchers to carry out projects at the forefront of a specific field of inquiry. Faculty at all institutions are obviously recruited from the PhD granting institutions and consequently have typically spent four or more years conducting advanced research usually on grant money, have authored papers and reports based on their work, and therefore enter the academic world already aware of, and presumably now able to execute on their own, similar projects.

However, other factors come in to play. Some new hires in non-PhD granting programs are specifically drawn to such schools because they are more interested in teaching what they know to undergraduates than they are in directing graduate students in research work. Others have toggled back and forth between industry and academic life since earning their PhDs, and are no longer familiar with the grant-seeking process. On the other hand, some enter the lists maintaining their old research group ties, and can easily contribute as co-PIs on grants where the weight of the former institution is critical in obtaining the funding that supports their work. Some gain access to sources of funding by spending summers at one or another federal or private research entity.

Issues such as the base teaching load influence the ability to devote sufficient time for seeking funding. Teaching loads are generally much higher at non-PhD granting institutions (Wheatley et al 2020). The impact of higher teaching loads clearly limits the time available to seek and adequately perform funded research, particularly if a faculty member cannot exploit already existing ties and is trying to break into a research area that, while offering copious opportunities for funding, is not their prior specialty. The non-PhD school usually employs fewer faculty and therefore fewer opportunities to collaborate with colleagues pursuing similar research programs, a factor that has been cited as correlating with faculty productivity (Dundar and Lewis, 1998).

In addition, many non-PhD granting schools are private and have significantly higher tuition costs for aspiring students. Likewise, these schools often promote themselves based on their relatively small class sizes. The expectation of those undergraduate students is that faculty will be most active as teachers, not as forefront researchers. The latter is seen as a bonus, and the possibility of working with a faculty member on research projects is particularly attractive to highly motivated students, but the nature of these projects is also different from what a doctoral student can be expected to execute, and the likelihood of the work attracting funding is correspondingly diminished. As Hardin and Hodges (2006) observe, while Tier 1 engineering programs view research as a multi-year continuously funded enterprise, smaller schools view it as a largely summer-bounded effort.

Because of these and other academic environmental factors, administrators and tenure committees evaluating the progress of a tenure track candidate over their six years probationary period historically have applied somewhat different standards of achievement depending on which of the two broad categories of institutions the program resides in. The Tier I research institution will usually look to see that an individual has been able to generate sufficient external

funding to support part of their salary (sufficient to reduce their base teaching load), and to support the salaries of several PhD and Master's students, along with perhaps acquiring equipment to outfit a research laboratory. The individual must also produce some minimum number of journal and conference papers in readily recognizable quality venues sufficient to project an image of rising authority in their chosen field. Some published departmental tenure requirements even give a specific multiplier times the start-up funding as a minimum threshold for external funding if a candidate is to be successful.

The administrators and tenure committees in non-PhD programs can hardly demand such rarefied productivity among their candidates. Recourse to data contained in the National Science Foundation Higher Education Research and Development: Fiscal Year 2019 (ncses.nsf 2019) shows that of 403 engineering schools ranked in terms of dollars of research money obtained in 2019 from all funding sources, all but one of the top 100 are PhD granting institutions. The amount of annual funding of the 100th ranked engineering school was $32,368,000. If one focuses on the highest-ranking 67 schools based on the 2020 *US News & World Report* data for non-PhD granting engineering schools (representing rankings from #1 to #52 out of a total of 212 programs nationwide) 49 of the 67 reported some funding for 2019, and the median amount of annual funding for those 49 schools was $945,000. The disparity in funding for the two types of institutions is incontestable. There is also no correlation between reputational ranking and amount of institutional research funding as the following graph indicates ($R^2 = 0.0161$).

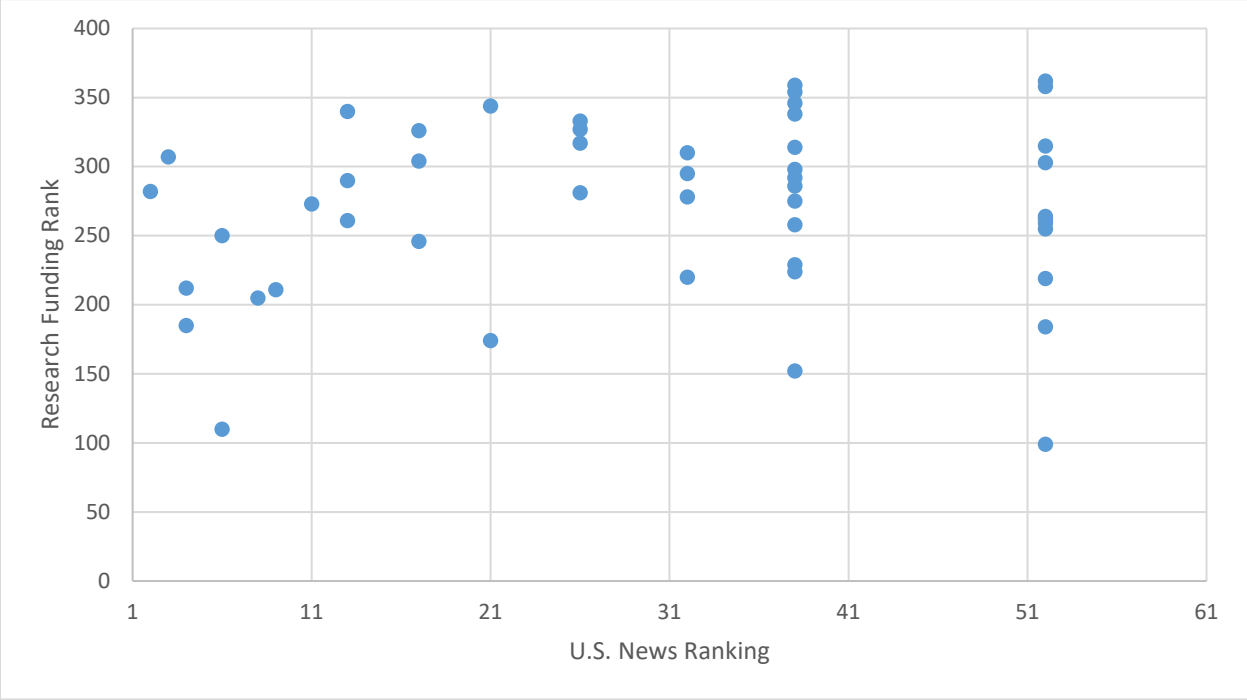

Figure 1: Plot of U.S. News Ranking vs Research Funding Rank for Non-PhD Granting Engineering Schools

This stark reality raises the question to what extent the non-PhD granting institutions ought to weigh grant activity among the criteria for tenure for its faculty. This is a question that each university's administration and faculty need to consider independently, based on whatever level is deemed appropriate based on many factors, including those outlined above. There can be no uniform answer to such a question, but it is always helpful to ascertain current practices among schools, and that is the import of the remaining sections of this paper.

Institutional Survey

A survey was conducted of engineering program administrators at the highest ranking 67 non-PhD granting institutions to ascertain practices respecting the weight given to pursuit of grants and other external funding as part of the requirements for obtaining tenure. The survey was distributed via email directly to Deans, or similarly titled engineering school leaders. After a few weeks, a second email effort was made, and responses were eventually received from 32 schools (listed in alphabetical order at the end of this report) for a 47.8% response rate. In addition to eliciting answers to seven specific questions relevant to the issue, additional comments that might give context to the responses were also invited.

We begin by presenting the breakdown of responses to those questions, with the exact wording of the question given:

Response	Count	Percentage (%)
Yes	31	96.9
No	1	3.1

Table 1: Question 1- Do you give new faculty start-up funds?

Response	Count	Percentage (%)
Less than $50,000	16	51.6
$50,000 - $100,000	10	32.3
More than $100,000	5	16.1

Table 2: Question 2 - If yes, a typical new faculty start-up package is:

Response	Count	Percentage (%)
Yes	16	50.0
No	16	50.0

Table 3: Question 3 - Does your institution require faculty to SEEK external funding in order to earn tenure?

Response	Count	Percentage (%)
Yes	4	12.5
No	28	87.5

Table 4: Question 4 - Does your institution require faculty to OBTAIN external funding in order to earn tenure?

Response	Count	Percentage (%)
Less than $50,000	1	25.0
$50,000 - $100,000	1	25.0
More than $100,000	1	25.0
Unspecified	1	25.0

Table 5: Question 5 - If yes, the amount of external funding required to earn tenure is:

Response	Count	Percentage (%)
Strongly Agree	19	59.4
Somewhat Agree	10	31.3
Somewhat Disagree	2	6.3
Strongly Disagree	1	3.1

Table 6: Question 6 - My administration beyond the school or department has realistic expectations about what grants can be obtained by junior faculty.

Response	Count	Percentage (%)
Yes	25	78.1
No	7	21.9

Table 7: Question 7 - My administration is committed to continuing to provide start-up funding even without the prospect of faculty obtaining external grants.

Discussion

Before looking at the nuances brought out in many comments that preclude hard and fast distinctions between various institutions' expectations based on the binary choices inherent in many of the survey questions, we will inquire whether any purely statistical trends emerge from the data. This cursory examination is based solely on the response to Question 3, which indicates an even split on the issue of requiring some form of grant activity, despite the absence of faculty obtaining funding.

It seems worthwhile to see if there exists a correlation between grant activity expectations and the size of start-up packages. Among the sixteen schools not requiring grant activity, nine give average start-up packages under $50,000, six give start-up packages between $50,000 and $100,000, and one gives start-up packages in excess of $100,000. Among the sixteen schools which do require grant activity, seven give less than $50,000, four give between $50,000 and $100,000, and four give more than $100,000. That suggests a weak correlation at the high end of start-up packages, but no strong divergence in making funds available for research activity and viewing it as potential seed money. Interestingly, one school gives no start-up funding and yet not only expects grant activity, but is also one of the four schools which actually require funded research for obtaining tenure.

Is there a correlation between responses to Question 3 and the sense that the expectations of the institution's higher administration are congruent with the school's outlook, as indicated by the response to Question 6? Among the sixteen schools not requiring grant activity, ten report strong agreement on faculty expectations from higher administration, five report some agreement, and one registers some disagreement. Of the twelve schools with grant activity requirements but no requirement to obtain funding, six report strong administrative agreement, five report some agreement, and one reports some disagreement. The respective ratios of strong agreement suggest that there might be some more tension between levels of administration in the schools requiring grant activity, possibly based on expectations of recouping an institutional investment in start-up funding. Finally, among the four schools actually requiring success in funding activity, three report strong administrative agreement, and one reports strong disagreement. This last institution is the one which provides no start-up funding.

We conclude this brief analysis of the data with select contextualizing comments provided by a number of the respondents. They are grouped according to the three categories emerging from Questions 3 and 4, and are randomly ordered within that category so that their comments will not be recognizable by school. Some are slightly edited for brevity's sake without omitting relevant information.

Reading the comments, one also sees that in actuality there is no strong distinction between schools and their expectations; rather a spectrum of expectations is found. For example, two of the schools which do not require grant activity (# 8 and #11 in that category) nevertheless indicate extremely high rates of faculty actually procuring funding prior to tenure. On the other hand, several of those indicating grant activity as required (particularly #4 and #5 in that category) do not appear to weigh it as an absolute *sine qua non* for a favorable tenure decision. Another takeaway is that many schools may still be evolving their criteria, as several suggest that there are no specific written guidelines, and yet a predominant culture of what constitutes sufficient scholarly productivity exists.

Herewith their comments:

<u>Schools not requiring grant activity</u>:

1) I typically can give up to ~$25K in start up funding (from Academic Affairs), and can also help acquire specialized equipment that is necessary for their research that does not

count against their start up (from School of Engineering funds). . . Grant writing is strongly encouraged, but not required for us. . . For tenure, they must be excellent teachers *and* be producing high-quality scholarship within a productive laboratory. We also have a competitive internal mechanism for buying down teaching load from the required 3/3 to 3/2.

2) Start-up Funding comes from restricted funds and fees. It is not part of the college's budget.
3) Our start-up packages are typically quite modest (< $15K). We work to provide them the equipment they need, but it may happen over their first couple of years. While grant seeking and getting is encouraged, it is not required for tenure. We don't see the start-up package as a "loan" against future external funding.
4) Our campus tenure policies do not explicitly require obtaining funding as a condition of tenure unless it is written into the offer letter as constituting part of their academic (teaching) assignment . . . on obtaining grants here is our wording "all faculty who do seek and/or obtain external funding should be appropriately credited commensurate with the competitive nature of the funding and the level of the success of the application. Department guidelines may establish standards for judging the level of achievement represented by the efforts to seek and/or obtain external funding." However no departments in engineering have these guidelines yet. When we do, they are likely to have an expectation to seek funding.
5) Our college has a multi-million dollar endowment, and start-up funding for new tenure-track faculty comes from the earnings of this endowment. The fact that the college self-funds start-up packages may explain why the Provost has not pressured our college to make grant applications or external funding a prerequisite for a successful tenure decision.
6) While I answered NO to questions about seeking and obtaining external funding for tenure, most of my new faculty do as I provide other incentives. These activities are highly desirable for tenure, but not required. However, quality (typically journal) publication is required.
7) Funded grants and (to a lesser extent proposals) are considered to be a form of scholarship which is considered alongside peer-reviewed journal articles, conferences, etc., when making tenure decisions.
8) While there are no strict requirements to earn tenure at [my school], it would be very strange for a tenure track engineering faculty member to not apply for external funding, and in my 30 years here we have never had a tenure track faculty member not apply for external funding. And every [my school] engineering faculty member to be tenured has succeeded in procuring some kind of external funding.
9) Emphasis is put on idea generation and publication. If grants are necessary to carry out the work, then faculty are expected to seek them. But grants, in and of themselves, are not required for tenure. Because of the nature of the work, this can put some experimentalists in a more challenging spot. That said, many of our faculty have had good luck in obtaining funding.

10) Since our institution is very teaching focused and we have a broad view of what constitutes professional development, we don't have a set requirement for peer reviewed publications. Many do achieve a number of peer reviewed publications, however.
11) Require to SEEK/OBTAIN external funding?: I said NO, because our official campus policy indicates that external funding is an "example of" research success. I would be grieved by the faculty union, if I were to say that seeking/obtaining external funding is REQUIRED. Having said that, I constantly preach about the importance of seeking/obtaining external funding. As such, no one has received tenure on my watch (six years) without at least SUBMITTING grants proposal(s) to state or federal agencies. And 99% of all who have received tenure on my watch have OBTAINED some amount of external funding.
12) We are not a PhD granting institution. We invest in a quality undergraduate experience. An expectation for grantsmanship is not realistic.
13) Start-up funds are very modest. Well below the $50,000 minimum category limit. They are provided by the college (not the university) on a case-by-case basis.

<u>Schools requiring grant activity</u>

1) Expectations for external grants vary from department to department.
2) We provide startup packages, but they are not a set amount, and must be justified by the incoming faculty member and the Dean. While it is not necessarily assumed that this will directly generate dollars, it is assumed that the faculty can show productivity based on those startup funds.
3) The startup listed (< $50K) is the average for tenure-track and PPP's. The tenure-track average would be in the $50-100K range.
4) [My school] is a primarily undergraduate institution. Teaching loads are very high, so externally funded research is not extensive. At the college level, I use a portion of the indirects returned to support start-up packages, and other research funding opportunities for the faculty. The awards are quite modest; ~$10K for start up; lesser amounts for other research and professional development activities. I am always impressed with what can be accomplished, though, with these funds.
5) We require "external validation" in terms of grants or papers for tenure, but do not have hard numbers on grant dollars and numbers of papers published.
6) Meritorious review of a grant proposal is accepted in lieu of obtaining external grants.
7) A first step on hiring is start-up funding for research. The funding amount is negotiated in the hiring phase and the awards given are based on merit and available monies. Typically startups in lab based disciplines are in the range of $30,000 - $100,000. There is a one semester junior sabbatical leave given during the tenure track period. . . This sabbatical must result in a Grant proposal to a federal grant agency. . . Internal monies are available to any faculty member, and comprise a merit-based award. . . max fund for this seed grant is $7500. . . [and it] must contain a path for external funding.

Schools requiring obtaining external funding

1) [My school's] research activity has increased rapidly in the last few years, so I don't think we can be considered a typical non-PhD granting. Technically we are R-2 now. . . We have no explicit requirements for applying for funding or for securing funding prior to tenure, although we do require faculty to "establish an externally funded research program" and we look for it to be "sustainable." So it is difficult to imagine a scenario in which an engineering faculty member would obtain tenure without external funding. What level of external funding is needed? We have no written criteria. It needs to be enough to support their scholarly activity and support their graduate students. We need to see a good ROI on their startup. We look at the reports of funding applied for, in addition to funding received. If faculty are not applying for external funding, we catch that early on and encourage them to apply. We do have an ADR who will work with them to identify funding programs, collaborators, etc.

It was deemed appropriate to place these statements in the text precisely as they were written in the comments section of the survey, the better to highlight that each school is unique, and that while some generalizations can emerge from looking at their answers to the survey questions, incorporating the complete explanatory quotations more authentically conveys their perspective.

Conclusions

The goal of this survey was to obtain insight into the state of administrative thinking on the importance of tenure-track faculty seeking and obtaining external funding as a measure of their scholarly activity in non-PhD granting engineering schools. Using data related to the top-ranked tier of these schools, there is no correlation between the ranking of the school and the ranking of funding obtained by the school. Additionally, the data from this survey show that most such schools do not have expectations of funding prior to faculty earning tenure. Despite this, most schools are prepared to offer start-up funds in support of research activities, regardless of whether they serve as potential seed money for grants. Finally, given these trends and as explicated by the collected comments, there is a spectrum of resources made available and expectations made of tenure-track faculty at these schools.

List of Participating Institutions:

Bradley University

Bucknell University

California State Polytechnic University - Pomona

California Polytechnic State University - San Luis Obispo

California State University - Fullerton

California State University - Sacramento

Central Michigan University

Grand Valley State University

Hofstra University

James Madison University

Kettering University

Loyola University Maryland

Manhattan College

Mercer University

Northern Arizona University

Northern Illinois University

New York Institute of Technology

Ohio Northern University

Rose-Hulman Institute of Technology

Rowan University

San Jose State University

Seattle University

Smith College

SUNY Polytechnic Institute - Utica

Texas Christian University

The College of New Jersey

Trinity College

Trinity University

Union College

University of San Diego

University of Wisconsin Platteville

Valparaiso University

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