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Our report briefly summarizes findings from the 2002 Cornell Higher Education Research Institute survey of start-up costs at the over 220 universities classified as Research and Doctoral universities by the Carnegie Foundation in 1994. It reports the mean start-up cost packages across institutions for new assistant professors and senior faculty, broken down by institutional type (public/private), Carnegie classification and field (biology, chemistry, engineering, physics and astronomy) and also discuses the sources of funding for start-up costs.

Disciplines

Other Business

Comments

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START-UP COSTS IN AMERICAN RESEARCH UNIVERSITIES

by

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I. Introduction

Scientific research has come to dominate many American university campuses. The growing importance of science to our society has been accompanied by a growing flow of funds to universities from the federal and state governments, corporations and foundations to support research. As a result, viewed in terms of 1998 dollars, the weighted (by faculty size) average volume of total research and development expenditures per faculty member across 228 American research and doctoral universities increased from about $70,000 per full-time professorial faculty member in 1970-71 to $142,340 per full-time professorial faculty member in 1999-2000.[1]

What is not well recognized, however, is that in spite of the generous external support that has been provided to universities for research, increasingly the costs of research are being borne by the universities themselves. During the 1970-71 to 1999-2000 period, the weighted average of institutional expenditures on research per full-time professorial faculty member at the 228 universities more than tripled. As a result the weighted average percentage of universities' total research expenditures being financed out of internal funds rose from about 11 to 19 percent during the period. Increasingly academic institutions themselves are bearing a greater share of the ever-increasing costs of scientific research.

There are a number of forces that have led to the costs of research being borne by universities to soar over the past few decades.[2] Theoretical scientists, who in a previous generation required only desks and pencils and papers, now often require supercomputers. Experimental scientists increasingly rely on sophisticated laboratory

[1] These figures and the ones that follow immediately are all computed from the NSF WEBCASPAR system (http://caspar.nsf.gov). Professorial faculty include assistant, associate and full professors.
[2] Ehrenberg (2000) discusses these forces in much more detail.

facilities that are increasingly expensive to build and operate. Research administration now includes strict monitoring of financial records and environmental safety, as well as the detailed review and monitoring of human subjects. At the same time that these research administration costs were increasing, the average indirect cost rate at private research and doctoral universities, which was over 60% in 1983, fell to about 55% in 1997 and was still at that level in 2000 (Ehrenberg 2000, 2003).[3] So, on average, for any given level of direct cost funding that their faculty members received, private universities received 8.3% less funds from the federal government to support their research infrastructure and administration costs in the late 1990s than they did in the early 1980s. In recent years the federal government has also placed increasing pressure on universities to provide "matching" institutional funds for any research proposals that they submit.

Finally, as scientists' equipment became more expensive and the competition for top-quality scientists intensified, the start-up funding that universities needed to provide to attract both young and senior scientists intensified. Universities typically cannot recover these expenses in their indirect cost billings, because new young scientists rarely have their own external funding when they first arrive at a university. During the late 1990s, it was often alleged, although no systematic data existed to support this claim that the universities were providing young scientists in the range of $250,000 to $500,000 to set up their labs. The start-up costs of attracting distinguished senior scientists was often

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[3] Average indirect cost rates are lower at public research universities than they are at privates. This does not imply that the publics spend less on research infrastructure and administration than their private counterparts do. Rather much of the funding that the publics receive for infrastructure comes from the states in the form of financial support for buildings and the states often do not require their public universities to recoup these costs in indirect cost recoveries and then reimburse the state governments for them. Inasmuch as faculty members believe that high indirect cost rates result in a reduction in the probability that they will win grants and/or a reduction in the magnitudes of the amount of direct costs that they can apply for, the faculty puts pressure on public university administrators to keep their indirect cost rates low. The administrators have tended to oblige them but as state support for public higher education tightened in the 1990s, many publics allowed their indirect cost rates to float up a bit.

alleged to be much greater and even if these scientists brought their own federally funded research grants with them, their start-up costs too were often not recoverable in indirect cost recovery pools because the institutions faced caps on their recoveries in a number of categories.

II. The 2002 Cornell Higher Education Research Institute *Survey of Start-Up Costs and Laboratory Allocation Rules*

Because no systematic data on start-up costs has previously been collected, the Cornell Higher Education Research Institute conducted a *Survey of Start- Up Costs and Laboratory Space Allocation Rules* during the late spring and summer of 2002.[4] Three to six science and engineering departments were identified at each of 222 universities classified as research and doctoral universities in the 1994 Carnegie Foundation classification of academic institutions (Carnegie Foundation 1994). Separate surveys were sent to the chairs of each department, the deans of the colleges in which each of these departments were located and the vice president/vice provost for research in each university. In total 1031 chairs, 408 deans and 206 vice presidents/vice provosts received copies of the surveys.

The Cornell Computer Assisted Survey Team (CAST) administered the survey. Respondents were given the opportunity to reply by mail, email, telephone, FAX and/or the World Wide Web. When the survey was closed in October of 2002, we had received usable responses from 572 (55%) of the chairs, 216 (53%) of the deans and 85 (38%) of

[4] Laboratory space allocation rules were also a focus of the survey because many scientists and engineers are approaching ages when they might consider retiring and the promise of being able to keep their labs after retirement may be a powerful tool to encourage them to retire. Such promises, however, are also very costly.

the vice provosts/vice presidents.[5] In what follows, we briefly summarize some of what we learned about start-up costs from the three surveys. Interested readers will find copies of the three survey questionnaires and tabulations of the responses to each question from each survey, cross-tabulated by Carnegie Category and form of control (public/private) on the CHERI web site (http://www.ilr.cornell.edu/cheri).

The survey of departments began by describing things that are usually included in start-up costs (such as the construction and renovation of laboratories, materials and equipment, support for laboratory staff, graduate assistants and postdoctoral fellows, summer salaries for faculty members, reduced teaching loads, travel money and unrestricted research funds). We then asked the respondents to provide information on the average and/or range of start up costs that they incur for new assistant professors and for senior faculty members in their field, similar information for the most expensive subfield in their discipline, and on the sources of funding for start-up costs. A second part of the survey dealt with laboratory allocation rules and is not discussed here.

At the new assistant professor level, Carnegie Research I universities provided start-up packages that were statistically significantly greater than the package provided by other universities in the sample and private universities provided start-up packages

[5] The response rates to the survey varied across type of institution. In particular, response rates were higher for departments and deans associated with public institutions than from those associated with private institutions, with by far the lowest response rate coming from private Research I's. For the chair surveys, the response rates for the private Research I's, public Research I's, private other and public other groups were respectively 39.1, 59.8, 51.1 and 60.0. Differential response rates may lead one to worry about how representative our samples are. To address this issue, we collected data on institutional expenditures on research per full-time faculty member from WEBCASPAR for the last year that it was available (FY2000) and then, for each type of institution, estimated equations in which the dependent variable was a dichotomous variable (1, 0) for whether the department reported start-up cost information to us and the explanatory variable was the institution's institutional expenditures on research per faculty member. Using either a linear probability or probit model, the coefficients of the institutional expenditure on research per faculty member variable were never statistically significantly different from zero at even the .10 level of significance, which suggests that in each case our sample of respondents is not disproportionately drawn from either low or high institutional research expenditure per faculty member institutions.

that were statistically significantly greater than the packages provided by public universities.[6] Table 1 summarizes some of the differences we found, when the respondents are broken down into four broad fields - physics/astronomy, biology, chemistry and engineering.[7]

The average assistant professor start up package at private Research I universities varied across fields from a low of $390,000 in engineering to a high of just under $490,000 dollars in chemistry. Estimates of the average high-end (most expensive) assistant professor start-up packages at these institutions varied across fields from $416,875 in engineering to $580,000 in chemistry. However, in each of these cases, while the mean did vary across fields, the standard deviations within each field of the start-up cost packages were so large that we can not reject the hypotheses that mean start-up costs were the same across fields.[8]

Start-up cost packages for senior faculty members are considerably larger. For example, again in the private Research I universities, the average start-up cost package ranged from about $700,000 in Physics to $1.44 million in engineering; the comparable range for the average high-end senior faculty start-up cost package at private Research I universities ranged from $1.0 million in physics to $1.8 million in engineering. The average high-end senior faculty start-up cost package appears to be larger in two fields (physics and chemistry) at public Research I universities than it was at private Research I

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[6] In a regression of a department's mean start up costs for new assistant professors on dichotomous variables for whether the institution is a Research I institution, whether the institution is a private institutions, and each of the four fields, the dichotomous variables for Research I and private institution were $180,244 and $51,528, respectively and each was significantly different from zero.
[7] When a department reported a range for start up costs rather than an average, the midpoint of the range was used in the computations that follow
[8] Formally regressions of average start-up costs for departments in private Research I universities on dichotomous variables for the four fields, indicate that none of the coefficients are statistically significantly different from any of the others, at the .05 level of significance.

universities, this may reflect efforts by a number of the publics to move their departments to a higher level by hiring a few key senior faculty members. However, again in each of these cases, while the mean did vary across fields and across public and private Research I universities, we can not reject the hypotheses that the mean start-up or mean high end start-up costs for senior faculty do not vary across fields at private Research I universities and that the mean high-end start up costs for senior faculty in the physical science and engineering are the same at public and private Research I universities.

Estimates of average start-up cost packages provided by the deans who responded to our survey were similar to those provided by the chairs. This is not surprising because we know from our interactions with many institutions during the survey process that deans' offices often called us to find out which of their departments were in the survey so that they could base their responses to our survey on their departments' responses. Similarly, a number of vice presidents/vice provosts for research provided us with responses based upon the aggregations of the responses from the deans of their colleges. So in fact we did not truly have three independent surveys.

Where the deans probably were better informed than the chairs, however, was on the sources of start-up funds. On average, deans reported that the largest source of start-up cost funds was the general budgets of the college and university, with 45% of start-up costs coming from these sources. Deans reported that of the remaining 55%, 20% came from sources other than keeping positions vacant (and thus using budgeted salary dollars), including endowment income and gifts, state appropriations, and the operating budgets of their departments. In notes that often accompanied their answers, they often indicated that the "other sources" were indirect cost recoveries. As we noted above, unless new faculty members bring external research funding with them, most start-up costs cannot be included in the indirect cost base. So what the deans really mean here is that their universities incur expenses from their general budgets for research administration and infrastructure and when these costs are reimbursed through the indirect cost pool, this permits the universities to spend funds from their own general budgets on start-up costs.

One point of concern is the extent to which institutions generate start-up costs by keeping faculty positions vacant. Deans at public institutions reported that they generated a greater percentage (13%) of their start-up cost funding from keeping positions vacant than deans at private universities did (7%) and the difference between the two types of institutions was statistically significantly different from zero at the .10 level of significance.[9] Hence the need to generate start-up cost funding appears to adversely influence the teaching programs of public universities more than it does the teaching programs of private universities.

[9] Formally this comes from a regression of the share of start-up cost funding coming from keeping positions vacant on a dichotomous variable indicating whether the institution was public. The estimated coefficient was 6.07 and its t statistic was 1.86.

References

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Table 1

Average Mean Start-Up Costs for Departments Reporting in the Category*
(Number of Departments Reporting)

		R1 Private	Other Private	R1 Public	Other Public
AA	PHY	395,746 (9)	147,944 (18)	320,932 (42)	169,491 (56)
AA	BIO	403,071 (14)	199,754 (26)	308,210 (38)	172,582 (55)
AA	CHEM	489,000 (20)	221,052 (29)	441,155 (43)	210,279 (71)
AA	ENG	390,237 (19)	152,010 (20)	213,735 (52)	112,875 (46)
HA	PHY	563,444 (9)	254,071 (14)	481,176 (41)	248,777 (47)
HA	BIO	437,917 (12)	208,886 (22)	430,270 (37)	217,082 (49)
HA	CHEM	580,000 (17)	259,348 (23)	584,250 (40)	284,269 (60)
HA	ENG	416,875 (16)	209,057 (21)	259,494 (50)	146,831 (43)
AP	PHY	701,786 (7)	90,000 (2)	740,486 (29)	359,783 (23)
AP	BIO	957,143 (7)	481,458 (12)	651,087 (23)	438,227 (31)
AP	CHEM	983,929 (14)	532,046 (11)	989,688 (32)	550,349 (33)
AP	ENG	1,441,667 (9)	326,694 (14)	408,443 (38)	223,292 (23)
HP	PHY	1,000,000 (4)	418,333 (3)	1,110,577 (24)	455,882 (17)
HP	BIO	1,575,000 (5)	555,500 (10)	856,250 (16)	709,444 (27)
HP	CHEM	1,172,222 (9)	575,000 (8)	1,187,115 (26)	648,913 (23)
HP	ENG	1,807,143 (7)	452,000 (10)	472,806 (34)	254,597 (23)

* Tabulation of responses to the Cornell Higher Education Research Institute *Survey of Start-Up Costs and Laboratory Space Allocation Rules* that was mailed to 3 to 5 chairs of selected biological science, physical science and engineering departments at each research and doctoral university during the summer of 2002

Where

AA average start-up costs for new assistant professors
HA high-end start-up costs for new assistant professors
AP average start-up costs for senior faculty
HP high end start-up costs for senior faculty

PHY physics and astronomy
BIO biology
CHEM chemistry
ENG engineering