Indirect cost rate variation determinants in university research, an empirical investigation

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The U.S. government funds approximately $15 billion in primary research each year, conducted mainly at colleges and universities. Since universities are charged with the dual purpose of conducting research and educating students, many facilities and functions support both purposes. In recognition of the need to reimburse for the full cost of research, U.S. agencies have developed a complex set of guidelines for developing individual reimbursement rates designed to capture the differences in cost and reimburse universities accordingly. Currently, universities that do research have no choice except to participate in the very costly process of individual rate setting. However, there has long been doubt whether the rate-setting process resulted in a rate that adequately reflected the actual cost of research. This study empirically examines individual characteristics of 163 individual universities and the relationship between these characteristics and the applicable rate. These results suggest that the process of determining the rates may be failing to capture the actual cost of providing these services. Since the entire cumbersome, costly process is justified on the basis that these costs of inputs are different for different institutions and thus should be negotiated individually, we must consider the possibility that the variability in rates is not actually due to difference to cost but rather can be explained by some other element.

Keywords: F&A Rate, facilities and administrative rate, university overhead rate, research reimbursement

Introduction

The U.S. government funds approximately $15 billion in primary research each year. Unlike Europe where most primary research is performed at independent research laboratories, primary research in the United States is conducted mainly at colleges and universities. Since universities are charged with the dual purpose of conducting research and educating students, many facilities and functions support both purposes. As early as 1947, the Office of Naval Research recognized a responsibility to reimburse universities for overhead expenses that supported both research and other university activities. Primary research funding is now provided by agencies within the Department of Defense and the Department of Health and Human Services. These government agencies, known as cognizant agencies, recognize that research projects benefit from facilities and administration that also support education. Under guidelines from the Office of Management and Budget (OMB Circular A-21), a percentage of each grant awarded goes to cover general facilities and administrative (F&A) costs incurred by the university. Some examples of these costs are: depreciation; maintenance; library costs; interest on debt; general administrative expenses; departmental administrative expenses; sponsored projects administration; and student administration expenses.

Thus, each federal research grant allows for reimbursement of the direct costs that can be specifically identified with the approved research project and the indirect cost of shared facilities and administration. Every university receiving federal grants must individually negotiate to determine an overhead reimbursement percentage (its F&A rate) every three years.

Rates are set based on what the university shows to be actual indirect cost divided by direct costs of research activities. Determining the total of indirect costs is in itself a very time consuming and costly process (Brown & Rosenzweig, 1993). The rate setting process involves the submission of an F&A rate proposal, an audit of that proposal by the cognizant agency, and finalization (negotiation) of the rate for the institution. Currently these rates commonly range from 29.8% to 69% of the direct cost of research.

Accumulating, compiling, and recording the cost, then negotiating the rate is time consuming and disruptive for university financial personnel and the process is often supplemented with the use of highly paid consultants to help obtain the highest possible rate. Although the costs associated with negotiating the rate are a fraction of all grant compliance spending, the costs are high and each dollar and hour spent means that the university has fewer resources to support actual research or instruction.

The term indirect cost was changed to facilities and administrative costs in 1996 under OMB Circular A-21, but for all practical purposes the meanings are identical and the two terms are used interchangeably. Universities must identify these costs and allocate them to cost categories based on the function (i.e., depreciation, library costs, and interest on debt). These costs are also split into two areas: facilities cost (debt interest and depreciation for buildings and equipment, investments in equipment and capital improvements, operation and maintenance expenses, and library expenses) and administrative cost (general administration, departmental administration, sponsored projects administration, and student administration and services).

Many university administrators and funding agency personnel support the current practice of setting individual rates because they recognize that actual costs vary and that differences in accounting policies across universities affect the ability to accurately trace costs to different functions. However, this process of setting individual rates consumes a high level of university resources and is especially onerous for small universities. Fredrick Rogers, Senior

Vice-president Emeritus of Cornell and an advocate for simpler rates, said that efforts toward the increasingly detailed calculation of overhead cost had become counter-productive. In his view, a rate setting approach that reduced record-keeping, negotiating costs and audits could save universities significant amounts of money (Cordes, 1995).

Prior Research

Over a decade ago two Stanford University researchers (Massy & Olson, 1994) identified four sources of variation in overhead rates: 1) differences in university structure, including a university's mix of research and teaching and its institutional incentives to recognize and recover indirect cost; 2) differences in the price of elements supporting research activities, such as building space and power; 3) differences in university policy, primarily accounting policies that determine the treatment of particular costs as direct or indirect; and 4) differences in treatment by the various cognizant agencies due to the negotiation process. Their study focused on two of the four broad sources identified: the cost of utilities, building, and interest and university accounting policy differences. Using detailed data obtained from seven major research universities, they simulated a standardization of costs by eliminating the cost effects of these elements. Results show that, far from explaining differences in rates by decreasing rate variation, the standardization of these elements produced an increase in rate variation. The results suggest that the source of variation in F&A is neither due to differences in the cost of inputs nor differences in accounting treatment. Since the elements in the Massy and Olson (1994) study were designed to capture variability in rates due to actual costs differences or accounting treatment, this research seems to suggest that perhaps university structure, including the mix of research to instruction, difference in treatment by governmental agencies negotiating the rate or perhaps institutional incentives to recover cost are influencing the rate level.

Another analysis of the rates was reported by the Council on Governmental Relations (COGR) in 1998. COGR conducted two studies a decade apart (1987 and 1997) on the same (selected /non-random) fourteen research-intensive universities attempting to explain the reasons for variation in F&A rates. Because a 26% maximum for the administrative portion of the rate was set in 1991, they focused on the facilities component of the rate. The studies identify a number of specific influencing elements (average interest rate, energy costs, age of plant, outstanding debt, investment in plant, investment in equipment, and research square footage). This study reported that rate variations were likely to be attributed to actual cost differences from university to university, but it made no attempt to determine statistical significance or measure what portion of the variability was attributable to actual costs. The researchers went on to recognize that variation might be due to differences in a university's cost recovery approach and the government agency's rate negotiation practice (Council for Governmental Relations, 1998).

The current study seeks to expand the work of Massy and Olson (1994). The four elements they identified are differences in university structure (STRUCTURE), differences in the price of elements supporting research activities (COST), differences in university policy (POLICY), and differences in treatment by the various cognizant agencies. Their study concentrated on differences in the price of elements supporting research activities and differences in university policy using detailed information provided by seven participating major research universities. The current study uses a much larger data set and examines not only differences in university policy (POLICY), and differences in the price of elements supporting research activities (COST), but also differences in university structure (STRUCTURE).The forth

item identified by Massy and Olson (1994), difference in treatment by cognizant agency, was not investigated because the majority of universities share the same cognizant agency, the Department of Health and Human Services.

The degree to which universities emphasize research relevant to instruction is one of the elements of university structure (STRUCTURE). Because more research intensive universities devote a different proportion of resources to research, it is reasonable to expect that the mix of research and instruction may have an impact on the F&A cost recovery rate. However, the relationship may be positive or negative. A greater emphasis on research would likely lead to higher F&A costs which would tend to increase the F&A cost recovery rate; however, it would also lead to a higher volume of research projects over which to spread its investment which would tend to decrease the F&A cost recovery rate.

Differences in institutional policy (POLICY) regarding cost recovery should be evident between private and public institutions. Because private universities obtain a much smaller percentage of their support from public sources than to public universities, private universities may have an institutional incentive to be more aggressive in pursuing higher F&A cost recovery rates. Public universities often have less incentive to identify and recover indirect costs because of their relations to state funding sources that require certain recovered costs be forfeited. Private universities have different sources of financing and benefit more from cost recovery. (Massy & Olson, 1994; Rosenzweig, 1998).

The price of physical inputs (COST) is likely dependent on the local cost of general labor, construction, transportation, energy and other items that are impacted by the regional economy and climate. For these costs, one would expect variation by geographic region, the cost of living in the region around the university, and/or the degree of urbanization of the campus. All three of these variables were used in an attempt to capture variation in element prices.

The F&A rate agreements of individual universities are available under the 1966 Freedom of Information Act, but they must be requested individually for each institution. This process is too costly and time consuming to be appropriate for data collection purposes. Information on rates for institutions is not available from either the Department of Defense or the Department of Health and Human Services in any other form. Individual university sites on the World Wide Web were chosen as the best source of information on the negotiated F&A reimbursement rates. A search of university web sites yielded 163 U.S. colleges and universities with published F&A rate agreement forms from which the rate information was extracted (RATE).

See Table 1: Sample Characteristics.

The Carnegie Foundation for the Advancement of Teaching classifies universities and colleges in the United States as Doctoral/Research Extensive (Doc I, meaning the university awards doctoral degrees in a wide range of disciplines), Doctoral/Research Intensive (Doc II, meaning the university awards doctoral degrees in a narrow range of disciplines), or Master's colleges and universities. Carnegie Foundation makes a distinction between Master I, meaning the university awards master's degrees in a wide range of disciplines and Master II meaning the university awards a narrow range of disciplines, but due to the fact that only one of the sample universities fell into the Master II classification, they were combined. Since these classifications and the types of degrees offered are analogous to the research emphasis of the university, this classification categorization was used to rank the universities based on the structure

(STRUCTURE) of the university and the mix of instruction to research. Therefore STRUCTURE was modeled using a discrete variable with three values.

In addition, The Carnegie Foundation reports whether the institution is public, private not-for-profit, or private for-profit. All the universities for which F&A rate information was available for this study were either public or private not-for-profit institutions. This classification provides a surrogate measure of the institution's incentive to recover the full cost of research and reflects university rate negotiation policy (POLICY). Policy was modeled as a discrete variable with two values.

Three different types of measures were chosen as representative of the cost of inputs; geographic Region (COST 1), the Consumer Price Index for the US Postal Zip Code in which the university is located (COST 2), and the degree of urbanization (COST 3). First, the universities were grouped into geographic regions (COST 1) using the regions designated by the Department of Energy. The regions along with their codes are: Pacific (1) *Alaska, California, Hawaii, Oregon, Washington;* Mountain (2) *Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming;* West North Central (3) *Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota;* West South Central (4) *Arkansas, Louisiana, Oklahoma, Texas;* East North Central (5) *Illinois, Indiana, Michigan, Ohio, Wisconsin;* East South Central (6) *Alabama, Kentucky, Mississippi, Tennessee;* New England (7) *Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont;* Middle Atlantic (8) *New Jersey, New York, Pennsylvania;* South Atlantic (9) *Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia.* Thus COST 1 is a discrete variable with nine possible values. The cost of living or doing business in the area of each university (COST 2) was measured using the region's Consumer Price Index (CPI) as reported in Sperling's Best Places (http://www.bestplaces.net/zip-code). Sperling's lists characteristics for each Postal Zip Code in the United States. Sperling's data is obtained from U.S. Census Bureau American Community Survey Current Population Survey. This source provided a concise compendium searchable by zip code. The Zip Code of each University is listed on the Rate Agreement. Thus COST 2 is a continuous variable that can assume values from 65.4 for Jackson, Mississippi, to 330.1 for San Francisco, California. Third, the degree of urbanization (COST 3) was based on three measures. The first (COST 3-A) was the classification of the degree of urbanization of the area by Sperling's Best Places (http://www.bestplaces.net/zip-code). The classifications range from Rural (least dense) through Small Town, Suburban, City Neighborhood, and Inner City (most dense). Thus, the variable COST 3-A is discrete and can take on 5 distinct values. Absolute population (COST 3-B) and population density (COST 3-C) of the county or metropolitan area were also used as measures of urbanization. Both the population density per square mile and the absolute population of the metropolitan or county areas represented a continuous variable that for density ranged from 8 people per square mile for Laramie, Wyoming to 25,750 people per square mile for Manhattan and for absolute population ranged from 10,062 for Hanover, New Hampshire, to 9,550,626 for Los Angeles, California.

A total of seven independent variables were examined. The university's Carnegie classification is used to measure its structure (STRUCTURE). Whether the university is public or private is used as a proxy for its rate negotiation policy (POLICY). The effect of differences in the price of the indirect cost inputs were measured using five variables: geographic region (COST 1), cost of living (COST 2), degree of urbanization (COST 3-A), population of the area (COST 3-B), and population density of the surrounding area (COST 3-C).

Analysis

All analysis was performed using SPSS version 14.0. A linear regression model was used to tests the significance of the impact of the seven independent variables – representing a university's structure, rate negotiation policy, and its cost of inputs – on the level of a university's F&A (overhead) rate. Of the seven predictive variables included in this study, three of the predictors are continuous measures, two are ordinal measures, and two are nominal measures. The population density of the surrounding area, the population of the area, and the cost of living index are continuous measures. The urbaneness of the location and the Carnegie classification are ordinal measures. The region of the country and whether the school is public or private are nominal measures.

Results

None of the three regression coefficients for the continuous variables – population density, area population and cost of living index – are significantly different from zero at the 0.05 level. This is also true of urbaneness, the Carnegie level of the university, and the region of the country. The only significant variable is the public or private status of the university. The average F&A rates for both categories of the significant variable appear in Table 2. The model has an R^2 value of 0.321. After this has been adjusted to account for possible spurious relationships between the independent variables an adjusted R^2 value of 0.291 is the result.

See Table:2 Overview of Rate Averages.

Surprising insignificant variables can sometimes be an indicator of multicollinearity which can also cause a model to be unstable from one data set to another. One measure of multicollinearity is the variance inflation factor. The variance inflation factor of an independent variable is found by regressing it against each of the other independent variables. The smallest possible variance inflation factor is 1, which would be associated with an R^2 of zero. Variance inflation factors in excess of 10 indicate a serious multicollinearity issue (Hair et al, 1998). Condition indices are another measure of multicollinearity. Condition indices are functions of the eigenvalues of the data's covariance matrix and are calculated automatically by SPSS when multicollinearity diagnostics are requested. A condition index greater than 30 indicates that a multicollinearity issue may exist (Hair et al, 1998). The largest variance inflation factor resulting from our analysis is 2.2 and the largest condition index is 18.8.

A second analysis, using only the public-private classification (the single significant categorical variables) as a predictor results in a bias adjusted R^2 of 0.245. Again the effect is significant with higher overhead rates associated with private universities than public which was as expected.

Conclusions

The effect of being a public university versus a private university was found to be significant with private universities having higher average rates. It is possible but unclear whether this difference might be attributable to differences in university incentives to recover costs. Neither region of the country, population density, area population, cost of living index, urbaneness, nor the Carnegie level of the university was significant as a predictor of differences

in the overhead rate.   The fact that these measures should capture much of the variability in the cost of providing research support makes it puzzling that none were significant. That the cost of building space and energy were not significant is particularly surprising, as building space and energy were specifically identified by Massy and Olson (1984) as elements of costs that should influence the level of F&A rates.

These results suggest that the process of determining the F&A rates may be failing to capture the actual cost of providing these services. Since the entire cumbersome, costly process is justified on the basis that these costs of inputs are different for different institutions and thus should be negotiated individually, we must consider the possibility that the variability in rates is not actually due to difference to cost but rather can be explained by some other element. Is it possible that universities enjoy a high F&A rate not because their costs are high, but because they are better at negotiating a high rate?

There is an obvious need for additional research in the area. All but one of the studies used small samples limited only to research intensive universities with no quantitative analysis, but none of them support the idea that rates reflect differences in input cost. Ideally, actual cost differences should be the source for F&A rate variation; however, it is the determination of actual cost that consumes inordinate amounts of university resources. This situation justifies another approach that would move away from an actual cost basis, and yet produce a satisfactory proxy for the current F&A rate. Another weakness of the current process is that it offers no incentive to minimize actual costs; quite to the contrary, universities that can document very high costs are awarded higher rates. Given a choice of enduring the arduous and expensive process of negotiating individual rates every three years or accepting a reasonable set rate, many institutions would save money by accepting the set rate even if it were somewhat lower. In addition, the institution would have an incentive to lower the cost of overhead to maximize return at a given rate.

Since the purported purpose of individually negotiating the rates is to reimburse universities for their actual costs, these other elements including the mix of research to instruction, difference in treatment by governmental agencies negotiating the rate or perhaps institutional incentives to recover cost should not be a legitimate basis for rate variation.

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Table 1: Sample Characteristics *N* = 163							
Categorical Variables							
Carnegie Classification		Public or Private University		Campus Environment		Region	
Doctoral/Research Universities—Extensive	87	Public	128	Rural or Small Town	29	Pacific	26
Doctoral/Research Universities—Intensive	31	Private, not-for-profit	35	Suburban	57	Mountain	14
Master's Colleges and Universities	45			City Neighborhood	43	East North Central	15
				Inner City	34	West South Central	13
						East North Central	23
						East South Central	13
						New England	15
						Middle Atlantic	12
						South Atlantic	32
Ranges for Continuous Variables							
Cost of Living		Population of County or Metropolitan Area		Population Density of County or Metropolitan Area			
65.4% to 330.1% of National Average		10,062 to 9,550,626 Residents		8 to 24,750 Residents per Square Mile			

Table:2 Overview of Rate Averages	
Average of All Schools	0.482
Average for Private Universities	0.544
Average for Public Universities	0.465
Northern Kentucky was the lowest at	0.298
City University of New York Highest at	0.690