Inefficiency in Higher Education: An Empirical Application to Peer Regional Universities

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INTRODUCTION

Wage setting methodologies for university faculty may be merit/ market based or administered. Failure to exploit the fact that faculty productivity depends on abilities *and incentives such as wages* results in inefficient use of university budgets. If such inefficiencies exist it suggests suboptimal productivity of the existing faculty and the inability of attracting new qualified faculty.

The topic of university faculty salaries has been addressed frequently through research with varying focal points of interest. Tuckman and Tuckman (The Journal of Higher Education, V47, 1976) show that academics is characterized by a significant variation in faculty salaries. Simpson (The Journal of Higher Education, V52, 1981) focuses on the structure of salaries as opposed to the distribution of actual faculty salaries. Hoenack (The Journal of Higher Education, V53, 1982) uses a theoretical approach to analyze how prices affect the choices made by faculty etc. involved in higher education. He concludes that inefficiency results from the existing prices and, it could be improved through changes in prices.

In a series of articles contained in the ASHE-ERIC Higher Education Report 28 (2001), several aspects of faculty compensation systems are addressed. Interestingly, one of the primary disadvantages of the single salary compensation system is listed as "a lack of efficiency in the use of human resources."

With regard to the methods that have been developed and utilized to measure technical and/or allocative inefficiency, the literature is replete with scholarly contributions (e.g., Kumbhakar and Wang, Journal of Econometrics, V134, 2006).

MODEL

For a given faculty member, let y denote "productivity", and let x denote a vector of university expenditures on productivity enhancement. In the simplest possible setting, output y could simply denote the number of published refereed journal articles. The vector x could include expenditures on wages and salaries, technology support, library facilities, conference travel support etc. The individual faculty member's output depends on effort e and the vector x. This "production function" is an increasing function of e and x_i. In addition, the faculty member's utility reflects the "disutility of effort". We assume that an increase in any x_i will increase the marginal benefit of an increase in y and reduces the additional effort necessary to achieve this increase in y. Given the vector x, the faculty member selects effort (and corresponding output) to maximize utility given the production function.

Given the university's overall budget constraint, under an administered salary program, it is essentially the case that (differences in rank notwithstanding) each faculty member receives the same fraction of the total budget allocation. Alternatively, suppose that salaries are set in such a way as to *maximize* total faculty output. Selection of individual salary levels on the basis of the optimality criterion permits the university to operate on the "efficient" production frontier whereas a non-optimal salary assignment rule forces the university below the efficient frontier.

DEA ESTIMATION METHOD

The basic idea of the DEA approach is to view universities as productive units with multiple inputs and outputs. DEA assumes that all universities have the same deterministic production frontier and that any deviation from the frontier is due to inefficiency. In this method the technical efficiency is identified as a proportional increase in the output vector with a given input vector. Therefore, the output-oriented measure of technical efficiency is the solution to a linear programming problem (Coelli, T.J., D.S.P. Rao, and G.E. Battese. *An Introduction to Efficiency and Productivity Analysis*, Kluwer Academic Publishers, 1998).

DATA SET

Our main focus in data collection was on the Finance Departments of 27 institutions that were identified as the peers to the University of Central Oklahoma by CUPA. The data collecting phase turned out to be extremely challenging. In the end we were able to collect the data on some variables of interest for only 17 institutions. Two output variables are: number of refereed articles/ authored books and other professional activities e.g., number of presentations. Three budget proxies (x) are: number of teaching staff, percentage of the faculty holding Doctorates and the percentage of the faculty that is tenured / tenure track. The justification here is that the higher the faculty salary, the better the university's ability to hire more faculty in general and have a higher percentage of those faculty tenured/ tenure track.

EMPIRICS

The DEA efficiency estimation for each institution was computed using DEAP 2.1 software developed by T.J. Coelli. The results suggest that universities are generally inefficient. Based on our theoretical model the technical inefficiencies stem from the existence of inefficient allocations of the total budgets.

Historically, universities with a larger proportion of the budget allocated to teaching staff are assumed to be more productive, i.e., higher efficiency. These universities generally have a higher percentage of faculty holding a Doctorate, tenured/on tenure track. Some examples are University of Colorado-Denver, University of Texas-San Antonio. These universities have 15 and 17 faculty with 115 and 100 refereed publications respectively, while the average for all the universities is 38. This observation does not hold for all universities, e.g., Purdue University with 4 faculty is more efficient than Oakland University with 7 faculty and Portland University with 8 despite the fact that both have more publications than Purdue. The most important shortcoming of these results stems from the ongoing difficulty in obtaining disaggregated salary data from universities.