Economies of scope in research and teaching: A non-parametric investigation

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ABSTRACT

We propose a non-parametric methodology to study the presence of economies of scope between teaching and research (i.e., the teaching–research nexus). In particular, the paper advocates a conditional version of the 'benefit-of-the-doubt' approach to estimate the relationship between professors' overall academic output, measured by a composite measure of multi-dimensional and importance-adjusted scores of teaching effectiveness and research productivity, and the time devoted to teaching and to research. The methodology is illustrated with a dataset of professors working at a Business & Administration department of a university college where the time allocation of teaching and research was assigned exogenously. The outcome of the analysis indicates the presence of limited scope economies for professors with an extensive research time.

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1. Introduction

The debate on the precise relationship between teaching and research – in particular whether teaching tasks hinder good research or whether research benefits the teaching effectiveness – is a long-standing and highly controversial one. A key reason for this controversy seems to be the involvement of multiple university stakeholders (such as students, professors themselves, university management, and policy makers) with sometimes diverging interests. Broadly speaking, there are two main streams in the debate: the believers in a positive teaching–research nexus and the skeptics. The believers argue that teaching and research go together in an essential and symbiotic way ([49,38]; and [57]). Therefore, they believe that it is unwise to separate teaching and research (i.e., assigning activities among professors and/or institutions such that there are only full-time teachers/teaching institutions and full-time researchers/research institutions). The skeptics strongly contest this alleged positive teaching–research nexus (e.g., [35,29,42]). In their opinion, this positive nexus is just a notion invoked by certain stakeholders who benefit from the presence of this perceived link. Most of the skeptics even question whether there exists any relationship at all between teaching and research. Hattie and Marsh, for example, posited that "*the widely held belief that teaching and research are inextricably entwined is an enduring myth. At best, research and teaching are very loosely coupled*" ([35] p. 529). Other non-believers (e.g., [4,47]; etc.) see the combination of teaching and research as a potential source of conflict with professors being forced to focus on one activity while partially neglecting the other.

The previous studies on the teaching–research nexus can be largely classified into two groups according to whether they used qualitative or quantitative approaches to examine the relationship between both core activities of professors. Qualitative studies frequently use semi-structured, in-depth interviews to collect information about the perceptions, attitudes, or opinions of the different university stakeholders on the teaching–research nexus. The quantitative studies ([32,34]; etc.) typically compute the linear correlation coefficient between the outputs of the teaching and research activities, respectively research productivity and teaching effectiveness. In general, both types of studies produced different results. Qualitative studies usually report a strong belief among university stakeholders that teaching and research are positively related. Specifically, most respondents indicate that this positive relationship predominantly works in one way, with the impact of research on teaching being far more important than the other way around. Conversely, most quantitative studies found that teaching and research (i.e., the output of both activities) are at maximum marginally correlated. So, findings from quantitative and qualitative studies seem contradictory. This should perhaps not be a surprise considering (1) the intrinsically complex nature of both the teaching and research activity

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as well as of the nexus between both activities and (2) the large differences between the qualitative and quantitative approaches used to capture this complexity.

Some recent studies, however, pointed to a number of important limitations of previous quantitative studies. A first important shortcoming is related to the use of simple correlation analysis in the majority of these studies. Particularly, whereas the lack of a priori precise knowledge on the true relationship between teaching and research calls for a methodology that is sufficiently flexible and does not make too strong assumptions, the correlation coefficient analysis implicitly assumes a linear relationship between both activities. Among others, Hattie and Marsh [35], Marsh and Hattie [42], Stack [55], and Locke [40], argued that the attempt to establish linear relationships between the outputs of both teaching and research activities may be flawed.

A second limitation relates to the proxies used to capture research productivity and teaching effectiveness. Typically, quantitative studies gage the output of professors in teaching and research by either using unidimensional measures (e.g., students ratings on one global questionnaire item proxy the professor's teaching effectiveness, and publication counts proxy the professor's research output) or simple summations of the professors' performances on underlying research and teaching criteria (so multidimensional outcome measures without any correction for differences in the importance of the underlying teaching and research criteria). Both an extensive academic literature (e.g., [30,31,46,24,25]; and [44]) and practical evidence suggest that measures of teaching effectiveness and research productivity of professors should be multidimensional (comprising the multiple aspects of, respectively teaching and research activity) and should be adjusted for value/importance differences of the underlying performance criteria.

A third important limitation of most quantitative studies is that they do not correct the estimations of the teaching–research association for the impact of factors that are often not (or only limitedly) controllable by the professors but may nevertheless influence their opportunities to teach effectively and do good research.

This paper contributes to the literature by examining scope economies using a quantitative approach that accommodates for the shortcomings just indicated. With respect to the first limitation, in contrast to most previous quantitative studies that employed parametric approaches such as computing simple linear correlation coefficients to examine the teaching–research relationship, this paper advocates using a non-parametric analysis approach. Particularly, we propose the 'benefit-of-the-doubt' approach (BoD, after [48]) to examine whether teaching, research or their combination foster academic performance. The BoD-methodology is related to the popular Data Envelopment Analysis-methodology (DEA, hereafter), a non-parametric technique originally developed by Farrell [28] and put into practice by Charnes et al. [13], to evaluate the efficiency performance of observations (e.g., companies, organizations, individuals, etc.) in complex settings. The belief is that the BoD-approach, thanks to its non-parametric nature, is well-suited to capture the complexity in the teaching–research nexus. The version of the BoD-model that is used in this paper is based on new insights of Cazals et al. [11], Daraio and Simar [20–22], and De Witte and Kortelainen [23]. To our best knowledge, this is the first paper to explore the relationship between teaching and research in a non-parametric fashion.

Regarding the second limitation, contrary to most previous quantitative studies, the output variables used in this paper to measure teaching effectiveness and research productivity consist of composite performance measures that comprise the multiple underlying teaching and research output criteria and account for differences in the importance of these underlying criteria.

In particular, we construct importance-adjusted composite performance measures of teaching effectiveness and research productivity by using stakeholder opinions for the selection and the weighting of the appropriate criteria of teaching and research.

The usefulness of the BoD-methodology to examine the teaching–research nexus is illustrated with a sample of academics working at a Business & Administration faculty of a large university college. This application is attractive for two reasons. First, the sample consists of a homogenous group (only Business and Administration faculty) such that biases due to differences across departments can be avoided. Second, the university college can be compared to the 'new' polytechnic universities in the UK and the colleges in the US where a teaching university is only recently research oriented. In this transformation, the research and teaching time has been allocated exogenously and did not depend on the professor's actual and past performance. This makes an attractive setting for studying the causal relationship between teaching and research.

The remainder of this paper unfolds as follows. The next section provides a brief literature review of previous quantitative studies. In a third section, we discuss at length the aforementioned limitations of most previous quantitative studies. Section 4 discusses the data for the professors working at the faculty of Business and Administration of the university college under study. Section 5 presents the methodology to estimate the existence of scope economies. Section 6 presents the findings for our data set. In a final section, we make some concluding remarks and provide some directions for further research.

2. Teaching–research nexus: A review of the literature

The relationship between teaching and research attracted significant attention during the 1970s and the 1980s. Recently, stimulated by the increased interest of both practitioners and policy makers, interest in the subject has been renewed. In this section, we present the most important findings of quantitative studies.

Five literature reviews gather the quantitative studies, up to the mid-1990s (i.e., [26,29,35,1]; and [8]), and three of these are meta-analyses. A first review of the empirical literature on the teaching–research nexus was performed by Faia in 1976. This review covered 11 studies that appeared between 1952 and 1975 and found indications of two possible relationships between teaching and research: a zero relationship (4 studies) and a positive, yet very weak association (7 studies).

Feldman [29] included 29 studies in his meta-analysis (14 other studies were excluded for various reasons, such as lack of information to retrieve the exact direction of the reported association and no sufficient data to adequately compute the relationship between teaching and research). Feldman reported correlations between teaching effectiveness and research productivity varying from a low of -0.31 to a high of $+0.39$. More in particular, he found a majority of the studies (i.e., 18 of the 29 studies) reporting average correlations that are not significantly different from zero, ten studies with average correlations that are significantly positive, and only one study reporting a significantly negative average correlation. After aggregating the correlations of the 29 studies (thereby combining the significance tests of the several studies into an overall pooled test statistic), Feldman obtained an average correlation of $+0.12$, hence, a positive, yet weak teaching–research nexus.[1]

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[1] [29] also found that average correlations were quite consistent for the various types of indicators used to measure research productivity.