Research Evaluation and Professors Teaching Performance

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Abstract

This paper studies the relationship between research activities and teaching quality in the context of the Spanish University system. Our aim is to investigate if there is any relationship between being an active researcher and the teaching quality of college professors in Spain. We use a panel data set from the University of Extremadura which contains information on teaching evaluations and research performance, among other variables, during a ten year period (from 2001-2002 to 2011-2012). Regardless of the specification and definition of research intensity adopted, our results suggest that professors who are more involved in research are also those obtaining better results in teaching evaluations, thus pointing to a positive link between research and teaching quality.

1. Introduction

This study aims to analyze the teaching-research nexus in the context of the Spanish University system. In most countries there is a shared view that universities should perform both research and teaching activities, which in the aggregate are seen as complements. Reasonable arguments for both positive and negative effects of research on teaching can be found in the literature. The complementary view usually bases on the idea that research may show positive spillovers on teaching by facilitating up-to-date courses and deeper understanding of the relevant topics. On the contrary, these activities could also be thought as being substitutes if one considers constraints of time, effort and funds allocation (Marsh and Hattie, 2002). Another alternative is to think about teaching and research as being rather independent tasks given that different abilities and skills might be required to perform them. We can hence find different relationships between research and teaching rather than a single link, with these relationships depending on contextual factors such as the type and level of research, the academic discipline, or the level and the mode of delivering of teaching (Brew, 1999).

The debate on the relationship between teaching and research has a long tradition among academics and brings to the forefront some relevant issues for university authorities and public policy as regards the links between these activities, the optimal mix between teaching and research, or the incentives set in order to improve the quality of both teaching and research as performed by universities. Whether research and teaching are complements or substitutes may motivate increased funding for one or another activity. So, if research contributes to improve the quality of teaching, this positive external effect of research would provide an argument for increasing the funding devoted to research activities. In a similar way, the net effect of research on teaching may motivate the debate on the need to integrate these activities or to specialize in one of them, thus having important implications at the organizational level of universities and departments. As noted by Hughes (2004), a positive relationship between research and teaching would motivate locating these activities closely together whereas a non-significant relationship (or a negative one) would support the idea of separating them into research-only and teaching-only institutions[1]. Finally, a crucial

[1] This discussion goes back to the nineties (see, for example, Elton, 1992), but there is still an opened fresh debate, at least in Europe, on the convenience (or not) of driving research and teaching further apart (see, for example, Dosi et al., 2006; or Karagiannis, 2009).

point to promote quality in both teaching and research refers to the incentive schemes, which could affect the allocation of time and effort to these activities. Although incentives to teaching are often established, most incentives schemes are based on research output and this may bias the optimal balance between teaching and research (Sylos Labini and Zinovyeva, 2008). If the emphasis to achieve career progression is mainly placed on the quality of research, many academics could regard teaching duties as a "necessary evil" (Karagiannis, 2009), thus neglecting their teaching activities or allocating less time and effort to them[2].

Universities in Spain, as it happens around the world, have the double mission of teaching and contributing to knowledge through research. These two activities are generally seen as complementary and incentives schemes are set to enhance teaching and research quality, although greater emphasis for the academic career is placed on research. As regards teaching activities, most universities rely on students' evaluation of teaching, which in most cases is the only available indicator. Although these subjective assessments do not directly measure learning outcomes and could be biased by the students' expectations, student questionnaires are commonly used in the literature to assess teaching performance[3]. For research performance, incentives build mainly upon officially recognized research evaluations that are conducted by Education Authorities following an external review process. Academics in Spain can submit their research for evaluation every six years and a national committee evaluates the five most relevant contributions corresponding to that six-year period and decides to accord (or not) an official recognition of that research period.

Given the incentive schemes and the measures generally used to approach teaching and research performance in Spain, in this study we use the students' evaluation of teaching and the recognized periods of research to proxy for teaching and research activities. In particular, we study the relationship between research and teaching in the University of

[2] Mas-Colell (2003) offers a good discussion on the incentives schemes to teaching and research and compares two extremes situations to achieve a given teaching-research mix: "The institution can choose first a high teaching talent… and then rely on incentives to reach the desired research level. Or it can focus first on research talent and rely on the incentive part to guarantee the teaching objective". Although "the idea to choose the academic staff mainly by its research potential is controversial in Europe and it is less practiced than in the USA", the second alternative seems superior to him.

[3] See McPherson (2006) on the determinants of students' assessments of teaching. Furthermore, the issue of whether student's evaluations really reflect effective learning has recently been questioned in several works (see, for example, Beleche et al., 2012; or Galbraith et al., 2012).

Extremadura, which is a medium size university located in the south-west of Spain. The lack of publicly available data across different universities in the country prevents us to run the study at the country level and, consequently, to generalize the obtained results. However, adding new evidence to the scarce empirical literature on the relationship between teaching and research could help us to gain new insights into the links between these two activities[4]. The structure of the remainder of the paper is as follows. Section 2 reviews the literature on the teaching-research nexus and presents the existing empirical evidence. Section 3 offers an overview of the institutional framework in Spain. Section 4 presents the empirical model and section 5 provides a description of the data used. Section 6 gives the results. Finally, the paper closes with a discussion of the results and some concluding remarks.

2. The teaching-research nexus: theory and empirical evidence

Newman (1992) coined the term "teaching-research nexus" to refer to the links between research and teaching. Different manifestations of the relationship between teaching and research may appear, within and between disciplines, depending on whether teaching/learning is conceived either as the transmission of knowledge or as the process of organizing and generating that knowledge (see, for example, Brew, 2003). In any case, several arguments have been raised in the literature to support the positive effects of research on learning. When teaching is seen as the transmission of knowledge, it is generally highlighted that research helps teachers in mastering current developments in their discipline and they may, consequently, teach more up-to-date courses and promote a deeper understanding of the relevant topics. On the other hand, when the process of learning is stressed, it has since long been argued that the process of scientific inquiry is the central organizing concept of learning, so researchers are better placed to motivate students, to develop attitudes of inquiry and to enhance research skills in students. Moreover, the positive impact of research on teaching has also been supported by the common abilities underlying both research and teaching, pointing that the values and competences that lead to excellence in research (e.g. dedication, organization,

[4] To our knowledge, only two works have recently analyzed the relationship between teaching and research in the context of the Spanish universities: Garcia-Gallego et al. (2012) for the University Jaume I, in Castellón; and Rodriguez and Rubio (2013) for the University Carlos III, in Madrid.

originality, or critical thinking) are also likely to lead to excel in teaching (e.g. knowledge of the subject, planning and presentation of the courses, or clarity of course objectives and requirements).

On the contrary, it has also been argued that research has a negative impact on teaching, mainly because of a trade-off in time and effort to be spent in each of these activities. Furthermore, when faculty career depends on research it provides incentives to reduce the time and effort spent on teaching, so allocation of time and effort would be biased in favor of research activities. Furthermore, one could think that research tends to be too specialized to enter into undergraduate courses and this could lead researchers either to offer courses at a too high level or to distort the curriculum toward their own research in detriment of a broader study program. As regards abilities, some authors highlight that different abilities and skills are required to perform both activities, suggesting that personality characteristics of supportiveness, tolerance and warmth tend to be positively correlated to effective teaching whereas they appear to be negatively related to research productivity (Feldman, 1987).

Given that the literature on the research-teaching nexus offers arguments to expect both positive and negative effects of research on teaching, the question of whether these activities are complements or substitutes, in the aggregate, becomes an empirical issue. Early work in the late eighties and early nineties suggest that the overall correlation between teaching and research is close to zero, although slightly positive (see the meta-analyses by Feldman, 1987; Allen, 1996; or Hattie and Marsh, 1996). Nevertheless, the diversity of results across studies makes the empirical evidence inconclusive. Although many empirical works have analyzed the link between teaching and research, empirical studies greatly differ in the way they measure research and teaching activities and in the scope of the analysis (see Verburgh et al., 2007, for a critical review of the existing empirical evidence). This heterogeneity in the variables under analysis and in the ways to measure them leads to very different results across studies. Moreover, comparable datasets across universities in different countries (or even within a given country) are not publicly available, so the results obtained are difficult to generalize and are often specific to a single university or department, or even to a specific discipline in a single institution.

More recent work on the teaching research nexus, although continues to suffer from relying on narrow datasets, has advanced in separating the effects at the individual and departmental (or institutional) levels, in considering the possibility that non-linearities exist, or in widening the variables under analysis. Complementarities between research and teaching may exist at the departmental (or university) level even when these activities appear to be not related, or negatively related, at the individual level. This would lead to an internal specialization where the department (or university) provides high quality teaching and research but some academics are specialized in research whereas others are involved in teaching activities (Coate et al., 2001; Gautier and Wauthy, 2007). It could also be the case that the combination of complementary relationships and the constraints of time and effort give rise to a non-linear relationship between teaching and research, so assuming a linear relationship, as was made in previous studies, would reduce the magnitude and significance of observed correlations. Several empirical works tend to support this view, pointing to a positive effect of research on teaching up to a threshold level, but once this level is reached increasing research efforts would reduce teaching performance (Mitchell and Rebne, 1995; Stack, 2003). Furthermore, the empirical work on the teaching-research nexus has broaden the field of study by considering students' performance related variables, such as students' performance in the labor market (Urwin and Di Pietro, 2005; Sylos Labini and Zinovyeva, 2008), or teachers' related variables, such as type of contract or tenure (Bettinger and Long, 2010; Figlio et al. 2013). In all cases, the recent empirical evidence suggests that teaching and research activities are not independent, but that a positive (often non-linear) relationship appears between them.

Most of the empirical work refers to Anglo-Saxon countries, whereas studies in continental Europe are relatively scarce. One notable exception is the work by Sylos Labini and Zinovyeva (2008), who work with a rich data set from Italian Universities and find that students' satisfaction with teaching positively correlates with department-level indicators of academic research quality, as measured by expert evaluation scores and bibliographic indicators. In the case of Spain, little empirical work has been carried out on the links between research and teaching. Nevertheless, two works have recently analyzed this relationship suggesting, in both cases, that a positive relationship hold between them. The work by Garcia-Gallego et al. (2012) employ data of 604 individual university professors at the University Jaume I, in Castellón, over the period 2002-2006.

This data cover various disciplines: humanities, social sciences, economics, management, natural sciences, and engineering. They find significant non-linear and positive effect of research on teaching quality. Finally, the study by Rodriguez and Rubio (2013) analyze the relationship between teaching quality and research productivity at University Carlos III, in Madrid. Their data go from the academic year 2008-2009 to 2011-2012 and cover the fields of Business Administration, Economics, and Finance and Accounting. Using value-added measures of students' performance they find a positive and significant relationship between high levels of research and teaching quality.

In sum, although the empirical evidence tends to be specific to single universities or to specific disciplines, the results of recent literature on the relationship between teaching and research suggest that, in the aggregate, these activities are complements, so the positive effects of research on teaching tend to offset the possible negative impact derived from time and effort constraints, at least up to a certain threshold.

3. Institutional Framework

In Spain there are seven different types of contract under which a Professor could be hired to teach at a University. Each contract has different requirements and implies different wages. A list of contracts and a brief explanation of each type is included in Table 1. A first distinction among contracts is between tenured and non-tenured contracts. Non-tenured contracts are similar to those in other systems such as American universities. There are three types of non-tenured contracts. A *Professor Asociado* (equivalent to Adjunct Professors) is a part-time non-tenure track contract intended for people whose full-time job is not academic. *Professor Ayudante* is a position equivalent to *Teaching Assistant*, and is the contract typically held by Ph.D. students while completing their dissertation. *Profesor Ayudante Doctor* (equivalent to Assistant Professor) is the standard tenure track contract hold by Professors immediately after they finish their Ph.D. The tenure-track contract has a term limit of five years, after which, the professor can be promoted to either *Contratado Doctor* or *Professor Titular*. Both ~~contracts of~~ *Contratado Doctor* and *Profesor Titular* are tenured contracts. To be promoted to either of these contracts the professor has to obtain an external positive tenure evaluation performed at the national level by a committee (ANECA). The tenure

requirements for each of the contracts are different, with the requirements for Professor Titular being significantly higher[5]. If a professor obtains a *Contratado Doctor* contract, she can later apply to a contract of *Professor Titular*, so this contract can be seen as a middle step towards a standard tenured Associate Professor Contract, which would be a contract of *Professor Titular*. A few years after a professor has been promoted to *Professor Titular*, another research evaluation will determine if she can be promoted to *Catedrático* (Full Professor)[6]. Finally, there are two other contracts under which a professor could be employed: *Profesor Titular de Escuela* and *Professor Colaborador*. These two contracts are teaching-only permanent contracts for which there is no Ph.D requirement and that are no longer available for new hires.

The salaries of tenured professors in all Spanish public universities are determined by two parts. The fixed part depends on the category of the professor and it is higher for Full Professors than for Associates and higher for Associates than for non-tenured faculty. The variable part of the wage has two parts, one of them depends on experience and results in a wage raise every three (*trienios*) and five years (*quinquenios*).

In addition, every six years professors holding a civil servant tenured contract (*Catedráticos* and *Profesores Titulares*) can apply for another wage increase based on their research output (*sexenio*). Contrary to the *quinquenios* and *trienios*, the *sexenios* are not awarded to every professor automatically. A national committee evaluates each application according to a set of guidelines that takes into account the quality of the publications, and only those professors who are evaluated positively receive the wage increase. Applying for the *sexenio* is voluntary but, as mentioned before, only civil servant tenured professors can apply. The research evaluations are considered somewhat tough and many professors are denied the *sexenio*.

In order to apply, professors need to submit their top five research contributions published during the six year period that they want to be evaluated. The six years to be evaluated do not need to be consecutive. For example a less active professor who has a first contribution in 1991, another in 1997 and three others in 2001, 2002 and 2008,

[5] In addition, the contract of *Professor Titular* is a civil-servant contract while the *Contratado Doctor* is a permanent labor contract. This implies some differences in the benefits associated with both types of contracts.

[6] The research requirements that determine promotions have substantially changed over the last decades, which means that professors with very different research productivities may hold the same contracts.

could choose to be evaluated for any six specific years between 1991 and 2008, and obtain one *sexenio* for the whole period. However, a more active researcher with many contributions in each of the years could apply during the same period for up to three *sexenios* (one every six years). This is a useful feature of the Spanish system because it allows us to classify professors working in the same university according to their different research intensity. This provides useful variation that we exploit in our identification strategy.

4. Empirical Model

Ideally, we would investigate the effects of research on teaching comparing two groups of identical professors, one of which does research while the other one does not. If both groups of professors are identical except for their research intensity, and the characteristics of their students are also identical, we could attribute differences in teaching to research. Obviously we cannot follow this strategy because the characteristics of professors who are active in research may be fundamentally different from that of professors who are not active in research (e.g. different motivation, ability, personal traits, etc). In addition the characteristics of the student body are likely to be different in different areas and degrees. Some of these differences are observable and can, therefore, be controlled in a regression framework as long as we obtain data on observable characteristics of students and professors. If this is the case we could run a regression of the type

$$Teaching\ Quality_{it}=b_0+b_1 Research\ Intensity_{it}+b_2 Professor\ Characteristics_{it}+b_3 Student\ characteristics_{it}+\lambda_t+\varepsilon_{it} \quad [1]$$

Where *Teaching quality* is a measure of teaching quality of each professor, such as student evaluations, *Research Intensity* is a measure of how active the professor is in research; *Professor Characteristics* are observable differences between professors such as age, gender, qualifications or field of expertise, and student characteristics are aggregates of the socio-demographic characteristics of the students taught by each professor. The coefficient of interest would be b_1 and would capture the effect of doing research on teaching effectiveness.

A potential problem with the specification in [1] is that differences between active researchers and non-researchers are not always observable (e.g. innate ability). If there are unobserved differences between the treatment and the control group, the estimates would suffer from a selection problem because the differences in teaching quality could be due to the differences in unobserved characteristics and not to differences in research intensity. To alleviate this concern we use a panel database, which allows us to account for professor's idiosyncratic characteristics and for time effects. However, given that our research variable is time invariant for most professors in our database, we cannot include a fixed effects term. We use instead a random effects specification, which requires the idiosyncratic term to be uncorrelated with the included regressors. In particular we estimate the following regression:

$$Teaching\ Quality_{it}=b_0+b_1 Research\ Intensity_{it}+b_2 Professors\ Characteristics_{it}+b_3 Student\ Characteristics_{it}+\alpha_i+\lambda_t+e_{it} \quad [2]$$

In this specification α_i is the random effects term and λ_t is a set of year dummies. To the extent that random effects in this specification do not fully account for unobserved differences in ability between professors, our results should be interpreted as correlational. For comparison purposes and given that estimation of a random effects model by GLS requires stronger assumptions than OLS we also show the results of the estimation of the OLS estimation of equation [1].

5. Data

We estimate equations [1] and [2] using data from the University of Extremadura. The University of Extremadura is one of the fifty Spanish Universities that are public. As of 2013 it had around 24,000 students and 2,000 professors. It offers classes and degrees in a wide range of fields and attracts students mostly from cities and towns within the region of Extremadura. Our database contains the teaching evaluations, the research performance and several other characteristics of all the professors of the university during the ten year period between 2001/2002 and 2011/2012[7].

Measure of Research Intensity

[7] The University of Extremadura provided a version of the database in which names of professors were substituted with an id number to preserve anonymity.

For each professor in our database we measure their research productivity as the ratio between the number of *Sexenios* they actually have and the maximum number of *Sexenios* they could have had. For example, the less active researcher in the example we used in a previous section (see the Institutional Framework section above), would have a research productivity of 1/3 because this professor obtained one *Sexenio* out of a maximum of three. The more active researcher that obtained three *Sexenios* would then be given a ratio of 1 because it obtained three *Sexenios* out of a maximum of three.

In order to compute the maximum number of evaluations we consider two possibilities. A more restrictive definition of research intensity considers that each tenured professor can obtain the first positive research evaluation one year after receiving tenure, which usually happens approximately six years after entering the system as Assistant Professor. In our second definition, which is more lenient, we consider that the first research evaluation happens within the first six years of tenure. Both definitions lead to similar results in the linear specification although they result in significantly different distributions of research intensity, with only 17% of researchers being highly active (research intensity higher than 2/3) in the first one, while near 40% would belong to this category if the second definition is used.

Measuring Teaching Quality

We measure teaching quality using the summary of the teaching evaluations of each professor in each class and each year. This measure was provided by the University of Extremadura in a scale from 0 to 10, where 0 stands for “very bad” and 10 stands for “very good”. The teaching evaluations were filled by students anonymously, in-class, during the last weeks of the semester and before the final grades were released.

Control variables

Our database includes the age of the professor, the number of *trienios* (which proxies for teaching experience, the category (Full or Associate) and the field of study. The variable field of study includes 147 different fields. For simplicity, and to facilitate the presentation of the results, in our estimation we grouped professors into 5 broader areas (Health Sciences, Experimental Sciences, Social Sciences, Arts and Humanities and Engineering and Architecture). Apart from controlling for differences among professors, the field dummies also capture differences among students. In addition, to

further account for student characteristics, we include the degree in which the class is taught, which is a variable with 114 categories. This accounts for differences among students taking classes in similar fields but pursuing different degrees. For example, *Principles of Economics* is taught to political science students, to engineering students, to students of economics and to students pursuing several other degrees. In the University of Extremadura, as in many other Spanish universities, students pursuing the same degree are grouped together in the same class. Therefore, including the degree in which the class is taught controls for student characteristics that differ across degrees. Finally, we also include a linear time trend and year dummies to capture trends and shocks that are common across observations in each year.

The unit of observation is the teaching evaluation, which means that for each professor we can have several observations corresponding to the same year. The total sample of both tenured and non-tenured professors consists of 13,118 observations belonging to 2,087 professors working in 147 different fields of research and teaching in 114 different degrees. The estimation sample of civil servant tenured professors consists of 5,387 observations corresponding to 777 tenured professors. On average we observe 9.07 evaluations per tenured professor in the sample.

6. Results

We start our discussion of the results with a description of the summary statistics of the main variables.

In table 2 we show the descriptive statistics. Column 1 shows the summaries for the whole sample of both tenured and non-tenured professors. In Column 2 we show the descriptive statistics of the sample of civil-servant tenured professors only, which are the ones used in the estimation. This column shows that approximately 20 per cent of our sample consists of Full Professors while 80 are Associates. The average age of Professors in the sample is 51.9 years. The average number of positive research evaluations is 1.89. Average research intensity (number of positive evaluations divided by the maximum possible number of positive research evaluations) is 0.5992 when we use the more lenient definition of the maximum number of evaluations. It is 0.4352 when we use the more strict definition.

According to column 1 of Table 2, the average score in the teaching evaluations is 6.89. For tenured professors, column 2 shows that the score is 6.96. In both tables we can see that scores are lower for professors in technical fields such as Engineering and higher in Arts and Humanities. Table 3 presents the evolution of teaching scores over time. Regardless of the field, there is an upward trend in the average score of the teaching evaluations. Table 4 presents the distribution of average teaching scores across professors' contracts. This table shows that there are large differences depending on the requirements to hold each type of tenured or non-tenured contract. Among the professors holding permanent contracts, those holding positions for which a Ph.D. is not required obtain lower teaching scores (e.g. *Titular de Escuela* and *Colaborador* obtain lower results than *Catedrático and Titular* and also lower results than *Contratado Doctor*). Among the tenured Ph.D. contracts, *Contratados Doctores* obtain better teaching scores than *Titulares* and *Catedráticos*. While this could be due to differences in their research productivities we cannot infer any causal differences from these numbers, given that the two groups are hardly comparable due to differences in age and other demographics such as their fields. Finally, among non-tenured professors, those for which a Ph.D is required (*Ayudante Doctor*) obtain slightly better results than people who are in the process of obtaining the Ph.D. (*Ayudantes*) and both of them obtain better results than adjunct instructors (*Asociado*).

Table 5 shows the distribution of teaching scores by research intensity. We classify reserachers in three groups depending on whether their research productivity is lower than 1/3, between 1/3 and 2/3, or higher than 2/3. Regardless of the definition of research intensity that we use (including people right around the thresholds in the groups above or below), people of medium or high research intensity obtain better teaching evaluations than those of low research intensity. This is irrespective of the field, although the differences across groups, for some groups, are not statistically significant according to t-test results.

The mean comparisons of table 5 do not allow us to infer any relationship between research intensity and teaching performance because there may be large differences in observable or unobservable characteristics between active researchers and professors with low research activity. In table 6 we show the results of the models of equations 1 and 2, in which some of these differences are accounted for. Columns 1 and 2 use the more lenient definition of research intensity. The OLS results of column 1 show that the

coefficient of this variable is statistically significant and has a value of 0.27, which would be the marginal effect on teaching scores of moving from not doing any research to being an active researcher. The RE specifications yields a similar result, with the coefficient being 0.23. To interpret these coefficients correctly it is worth putting them in the context of a specific example. According to the results researchers with say research productivity of 2/3, have teaching 0.09 points higher than researchers with a research productivity of 1/3, or approximately 1.30%. While this result may seem quantitatively small, it is worth noting that the standard deviation for the teaching score variable is only 1.6 (see descriptive statistics of Table 2) which means that small quantitative changes in teaching scores do imply significant increases in teaching quality. In particular, a 0.09 increase in teaching scores represents approximately 5.6% of the standard deviation. In columns 3 and 4 we use the more restrictive definition of research intensity and we obtain coefficient results that confirm the results of the first two columns but yield larger coefficient estimates (although the one in column 4 is slightly below the 10% significance level). According to these two columns, moving from a research intensity of 1/3 to a research intensity of 2/3 is associated with an increase in teaching scores of 0.11 points, or 6.5% of the standard deviation. These results are generally confirmed when research intensity is entered non-linearly (not shown in the table but available from authors).

7. Discussion, policy implications and concluding remarks

This paper finds that there is a positive correlation between research productivity and teaching scores. This finding provides support to theories that argue that research and teaching are complementary activities.

The results have, in addition, interesting policy implications. Selecting professors that will be active in research will improve teaching quality compared to selecting professors with low research productivities. This implication is derived from our models of equations 1 and 2, which should be seen as suggestive correlations. The causal mechanism through which the effect happens is not well identified in those models because the effect that we find could be due to either selection or to the effect of research activities on teaching. Regardless of the mechanism the results are interesting. If the effect was due to selection, so that active researchers do teach better due to the fact that they have abilities that allow them to do better both activities (e.g. motivation),

our results show that offering tenure to professors only after they have shown some potential for research will select individuals with abilities that will lead to an improvements in teaching quality. If the result is due to research itself, so that being active in research helps professors in being up to date with their field and in preparing their classes, this also has clear policy implications: promotions based on research will encourage research, which will, according to our estimates, result in improvements in teaching quality.

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Table 1. Professors Contracts in the Spanish University System

	Tenured					Non- Tenured		
		Civil Servant		Labor contract				
		Ph.D	Non Ph.D	Ph.D	Non Ph.D	Ph.D	Non Ph.D	
Title	**Catedrático**	**Profesor Titular**	**Titular de Escuela**	**Contratado Doctor**	**Colaborador**	**Ayudante Doctor**	**Ayudante**	**Asociados**
Description	Highest contract in the Spanish System. It is equivalent to Full Professor. An external evaluation is needed to be able to apply for a promotion from Profesor Titular to Full Professor.	It is equivalent to Associate Professor. An external evaluation is needed to be able to apply for promotion to this contract.	It is essentially a permanent full-time teaching contract. This contract is no longer available for new hires.	An external evaluation is required to apply for a promotion from Ayudante Doctor to this contract. The requirements are lower than those to be promoted to Profesor Titular. Professors can first apply for this contract if and then for a Profesor Titular.	It is essentially a permanent full-time teaching contract. This contract is no longer available for new hires. It is similar to Titular de Escuela but has lower benefits.	It is a standard five-year tenure track contract. At the end of the fifth year, professors under this contract are usuallly promoted to either Contratado Doctor or Titular de Universidad, or in the past and under especial circumstances to Colaborador or Titular de Escuela. Promotion to either of these contracts is subject to funds and depends on a positive external tenure evaluation, and on a department tenure evaluation.	This is a standard teaching assistant contract to support Ph.D. students while completing their dissertation.	This is a standard Adjunct instructor contract. It is inteded for people with full-time jobs outside academia.

Table 2. Summary Statistics		
	Full Sample	**Sample of Civil Servant Tenured Professors**
Teaching Evaluations	6.8904	6.9651
	(1.6245)	(1.5960)
Research intensity		0.5992
		0.4412
Research Low		0.3135
		(0.4639)
Research Medium		0.1963
		(0.3972)
Research High		0.4903
		(0.4999)
Research Low 2		0.4377
		(0.4961)
Research Medium 2		0.3877
		(0.4873)
Research High 2		0.1745
		(0.3796)
		(1.4242)
Age	50.7199	51.9558
	(9.5717)	(8.1504)
Health	0.1770	0.1998
	(0.3817)	(0.3999)
Ciencias	0.2102	0.2899
	(0.4075)	(0.4538)
Ciencias Sociales	0.3565	0.2366
	(0.4790)	(0.4251)
Artes y Humanidades	0.1271	0.1839
	(0.3331)	(0.3874)
Ingeniería y Arquitectura	0.1292	0.0897
	(0.3354)	(0.2858)
Full Professors (Catedrático)		0.2057
		(0.4042)
Associates (Profesor Titular)		0.7943
		(0.4042)
Observaciones	5380	13118

Table 3. Teaching scores by year						
	All	**Health Sciences**	**Experimental Sciences**	**Social Sciences**	**Arts and Humanities**	**Architechture and Engineering**
2002-03	6.42398	6.48097	6.59457	6.27366	6.97706	5.93628
2003-04	6.60179	6.34	6.406	6.84	7.81	6.77
2004-05	6.75579	7.16564	6.3005	6.52674	7.03792	6.0878
2005-06	6.72599	6.68247	6.89983	6.65011	7.42615	6.30429
2006-07	6.80036	7.5	6.34733	8.15	7.095	7.15125
2007-08	6.8944	7.04581	6.39031	6.57252	7.35107	6.94484
2008-09	7.08582	6.95614	7.22568	7.03887	7.789	6.89862
2009-10	6.79091	8.06	6.09059	7.5	8.59667	6.87
2010-11	7.23654	7.58507	7.08821	6.86417	7.44024	6.96325
2011-12	7.28363	7.51759	7.218	7.09158	7.48238	7.0457

Table 4. Professors Contracts in the Spanish University System

	Tenured				Non- Tenured		
	Civil Servant				Labor contract		
	Ph.D	Non Ph.D	Ph.D	Non Ph.D	Ph.D	Non Ph.D	
All	Catadrático and Titular	Titular de Escuela	Contratado	Colaborador	Ayudante Doctor	Ayudante	Asociados
6.8904	6.9594	6.5955	7.2259	6.8419	7.0705	6.9567	6.7881
1.6245	1.6068	1.6399	1.5669	1.4611	1.6390	1.5748	1.7406

Table 5. Teaching scores by research intensity						
	All fields	**Health Sciences**	**Experimental Sciences**	**Social Sciences**	**Arts and Humanities**	**Engineering and Architecture**
		1	2	3	4	5
Low intensity 1	6.63988	6.11549	6.71266	6.59946	7.11805	6.18434
Medium intensity 1	7.13152	7.4071	7.03486	7.02118	7.54607	6.49201
High intensity 1	7.06426	7.2791	6.93775	6.842	7.28784	6.79952

Table 6. Regressions Results. Dependent variable: Teaching Scores				
	OLS	**RE**	**OLS**	**RE**
Research intensity	0.2714*	0.2396*	0.3681*	0.321
	[0.145]	[0.140]	[0.207]	[0.197]
Age	-0.0400**	-0.0405**	-0.0395**	-0.0401**
	[0.016]	[0.017]	[0.016]	[0.017]
Profesor Titular	-0.0118	-0.0793	-0.0012	-0.0717
	[0.140]	[0.135]	[0.1432]	[0.1385]
Linear trend	0.0946***	0.1132***	0.0950***	0.1131***
	[0.018]	[0.012]	[0.018]	[0.012]
Year dummies	Yes	Yes	Yes	Yes
Degree dummies	Yes	Yes	Yes	Yes
Experience dummies (trienios)	Yes	Yes	Yes	Yes
Observations	5387	5387	5387	5387
Notes: Clustered (at the professor level) robust standard errors in brackets				
*** p<0.01, ** p<0.05, * p<0.1				