Does sector-specific experience matter? The case of European higher education ministers

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Abstract

This paper looks at the relationship between higher education ministers and the performance of the sector that they govern. Using an original panel dataset with the characteristics of European higher education ministers, we find that having a past experience in the sector leads to a higher level of performance, as measured by ranking data. Making a parallel with the literature about the impact of education on the educated, we discuss potential explanations behind the impact of this on-the-job learning experience. As we find that this characteristic has no impact on the spendings of the sector, we argue that this academic experience makes them more prone to introduce adequate reforms that makes the sector more attractive for top-researchers. Furthermore, we find that this result is driven by ministers with both this sector-specific and an electoral experience, the latter measured by a succesful election at the regional or national level. This tends to show that political credibility should not be overshadowed by the importance of the sector-specific experience of ministers.

Keywords: Research performance, Higher education minister, leadership, Political economy.

JEL codes: D7,H11, I23,

1 Introduction

Higher education is an unusual sector to administer. It houses peculiar institutions such as shared governance, academic freedom or tenure. It is composed of workers pursuing multiple activities which can hardly be measured or compared. Universities and colleges are accountable to their local and national government but play in an increasingly international playground. In this context private and public motives are not always going in the same direction, such that it leads to an unconventional blend of market forces and regulations. Due to these peculiarities, it is important, in order to improve the functioning of the higher education system, to have these institutional constraints in mind or to try to make them further evolve in the desired direction. Having experienced them from the inside may prove to be an asset once in charge of the administration of the sector. Having been a stakeholder teaches you their specific role and foundations.

The main point of our paper is that experience in higher education facilitates the implementation of reforms that can then improve the functioning of the system. In this respect, we analyze the link between the characteristics of higher education ministers and the sector they govern. This work is at the crossroad of two streams of the literature. The first relates to the works done by political economists on the important role played by political leaders. Following Jones and Olken [2005], according to which leaders matter for growth, Besley et al. [2011] show that their level of education plays a key role in this relationship. Dreher et al. [2009] explain this further by the tendency of educated leaders to be more reform oriented. Focusing, as we do, on ministers rather than on country leaders, Moessinger [2014] and Jochimse and Thomasius [2014] find that the professional background of public finance ministers can help him solve the state budget's common pool problem for which he is appointed.

The second is linked to the economics of education literature that tries to explain performance in the education sector. Using cross-country data in the context of compulsory education, previous works (see Hanushek and Woessmann [2011] for a survey) claim that resources and, most importantly, institutions matter. Due to the absence of standardized test scores, Aghion et al. [2008] have used ranking data to make a similar statement for the higher education level. Closer to this study, Goodall [2009] and Goodall et al. [2014] have looked at the role of higher education leaders in determining the performance of their own institution. These works find that being headed by

an accomplished scholar (as measured by the number of citations) can influence positively the research productivity of the institution. Arguments such that they are credible leaders, experts in the work done by the institution they now manage and standard bearers are presented. To our knowledge this work is the first that tries to understand the role of political leaders, and more precisely their background, in the higher education sector.

Using an original panel dataset with the characteristics of European leaders, we test if having been active in academia influences the performance of the higher education system, as measured by ranking data. Controlling for economic and political institutions as well as for the characteristics of the sector, we observe a robust correlation between the higher education performance and the academic experience of the minister. We discuss potential explanations behind this result, each related to the impact of education on the educated, as previously discussed in the literature, applied in the context of on-the-job learning experience. Being active in the sector as a professor, a dean or a rector can improve their general and sector specific human capital. The links and relationships accumulated throughout their careers can impact the sort of decisions they make when becoming a minister. This past experience can also make their preferences evolve, such that they have a more public oriented behavior. Finally, in the beginning of their mandate, when the information about their ability to govern the higher education system is imperfect, this previous experience sends a credible signal to the electoral base and the people directly impacted by the changes to be implemented.

Furthermore we find that this relationship is conditional on the political experience of the higher education leader, as measured by a succesfull election at the regional or national level. Hence, our result is driven by leaders with both political and sector-specific experience. Next, we find that having an experience in the higher education sector does not lead to an increase in the funding received by the higher education sector. Assuming that money and institutions are both important ingredients to have a well-performing higher education system, as aknowledged in the literature, this finding makes us claim that experienced ministers are more prone to implement reforms that improve the sector's performance. Finally, we analyze the link between the minister's experience and each of the 6 indicators used to compute the ranking. In agreement with all these results, we discuss how reforms related with the academic job market and the architecture of the higher education system corroborates with our findings. However, we are only able to show the short run impact of ministers (up to 4 years) but cannot conclude about their influence in the

longer run.

The paper is organized as follows. Section 2 discusses the main theoretical explanations behind the link between experience in the higher education sector of ministers and the performance of the system. Section 3 presents the data that was collected for this empirical study while Section 4 discusses our empirical strategy. The main results are derived in Section 5. Robustness checks related with different dependent variables, samples and estimators are exposed in Section 6, where we also discuss the issue of endogeneity. Finally Section 7 concludes.

2   Hypotheses

Past experiences shape ministers and how they govern. The case of higher education ministers is of particular interest, as they control a well-defined sector in which many of them have been previously active, as a student, a lecturer, a dean or even as a rector. Even if imperfect, cross-country comparisons of the sector performance can be made and are a much discussed topic among higher education circles, the press and the political arena. To explain the impact of this on-the-job learning experience on the performance of the higher education sector, we draw a parallel with the works that have studied the impact of education on students. We classify each of these potential explanations under four categories.

The first argument is directly related to the theory of human capital. The on-the-job experience acquired in the higher education sector should improve their (cognitive and non-cognitive) skills and their knowledge. Some of these are general and others are limited to the higher education sector. One of the key skill acquired through trainings and on-the-job teaching experiences is pedagogy. It gives them the ability to convey in an understandable manner complex informations. This can be useful when communicating about a reform to a wide and a specialized audience. Another key skill relates to the managerial experiences gained from being dean or rector. Finally, they have acquired a wide knowledge of their sector. Institutions such as tenure, academic freedom, the publication process or shared governance might be perceived as awkward to an outsider of the system (Gordon [1999]). Being an insider of the system gives them the possibility to grasp their key roles and foundations. It can help them to develop a perspective on the policies to implement keeping these constraints in mind or to make these institutions

evolve. Hence, these skills and knowledge should lead to a better-functioning ministry and an improvement of the higher education system.

The second explanation relates to the theory of social capital, as pionnered by the work of Pierre Bourdieu. Throughout their career, ministers have accumulated links and relationships. This social capital defines their socioeconomic status. This status should impact the decisions of the minister as it creates a form of personal loyalty towards some of the key stakeholder of the sector. As argued by Hayo and Neumeier [2012, 2014], a minister with a greater experience in the higher education system would spend more in this sector, as a way to please people with the same social background as him. However, this could also lead to a form of regulatory capture (see DalBo [2006] for a review). By being too close to the interests of the sector that they are governing, a minister with an experience in higher education might be reluctant to reform the system in the general public interest. Overall, it is unclear in which direction this explanation will impact the link between sector-specific experience and performance of higher education.

The third argument relates to the preferences of people with an experience in the higher education sector. A number of empirical evidences (see for example Milligan et al. [2004] or Dee [2004]) have shown that education improves citizenship and lead to a more public oriented behavior. This argument, used by Besley et al. [2011] to explain the better economic performances of countries governed by educated leaders, can also be considered with on-the-job learning in the higher education sector.

The fourth class of argument relates to the signaling theory, in the sense that the ministers background conveys information about them. Their past education and experiences have not only an impact on their performances, it also sends a message about some of their characteristics (related to their ability and preferences) that are not perfectly observed by the stakeolders of the sector. As this signal is costly to acquire, it seems accurate to state that people with relatively superior characteristics will be more inclined to invest in it. Hence, this signal can be seen as credible. The legitimacy derived from it should facilitate the implementations of reforms by building a trusting relationship between the minister and the people with a stake in these reforms. It sends a signal about their ability but also about their preferences, as it shows that they share similar values (Goodall [2009]). This signaling can help diminish information asymmetries which are especially present when ministers have no previous experience heading a cabinet or in the begining of their mandate. Overall, this should facilitate the implementation of reforms and have

an impact on the performance of the sector.

3   Data

To test the links between the experience of the minister and the performance of the sector, we have collected an original panel dataset. The characteristics of our database are dictated by the availability of our dependent and independent variables. We focus on European countries, as they tend to have more comparable higher education systems since the implementation of the Bologna reform. Unfortunately, starting from the EU25 countries, we had to drop some countries due to lack of data. We have dropped Belgium, as there are no higher education ministers at the national level. Also some countries were withdrawn because some variables were not available at the same period as the others. Finally we obtained a balanced panel data of 160 observations from 2003 to 2011 for 20 countries: Austria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lituania, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and the U.K.. This corresponds to the record of 77 different ministers that were in charge for 2.5 years on average (see Table 1 below).

Our main explaining variables are related with the characteristics of the minister in charge of higher education. For the purpose, we have assembled informations coming from diverse sources such as parliamentary websites, wikipedia or personal websites.[1] We have tried, to the extent possible, to have the informations confirmed by two different sources. A leader is allocated to a year if he or she is the one who has stayed the longest in power during that time. Our key variable of concern is *experience in tertiary education*. It is a dummy variable which is equal to one if the leader has ever been a lecturer, a dean or a rector before holding the minister's position. We keep in consideration whether he has had a previous *electoral experience*, as measured by whether or not he has ever been elected at regional or national elections, and *experience in private sector*, which is a dummy equal to one if he has worked in the private sector before becoming minister. This way, we control for a wide range of other, non-excludable, work experiences the higher education ministers might have had. In addition to this, we also consider his *age* and his *tenure at the job* to respectively control for his life experience and his on-the-job experience. These variables showing the level and characteristics of the

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[1]This database is available here. Feel free to contact us if you can help us improve it.

higher education minister should positively influence our dependent variable. The preferences of the ministers are proxied via his political affiliation, as described by a dummy *left* which is equal to one if he is affiliated with a leftist party. The literature tends to find a positive link between a leftish affiliation and spendings but it is unclear how it can influence the performance of the higher education sector.

Other control variables related to the higher education system, the state of the economy and the political context are also included in our model. As for our main explanatory variables, they are in lign with the ones used in the political economics literature. These data are collected from Eurostat, UNESCO and the Database of political institutions (Beck et al. [2001]). We first control how centralized the higher education system is with *% from central gvt*. It measures the share of the education budget which is distributed by the central government.[2] *Spending in % of GDP* is the share of wealth which is invested in the higher education sector. We control for the country's economic and public finance conditions by including *GDP growth* and *debt as a % of GDP*. Finally, we control for the policital context. We introduce an index of political *Fractionalization* which highlights the extent with which the power of the legislature is diluted among different political parties.[3] We also use a dummy of whether or not it is an *election year* at the national level, in line with the political business cycles literature.

Compared with the literature looking at the determinants of the performance of compulsory education which uses standardized test scores such as PISA (see Hanushek and Woessmann [2011] for a survey), there are no consensus among economists nor policy makers on how to measure performance in the higher education context. Previous works looking at country level data have mainly used ranking data at the institution level. Far from being uncontrovertial, they are much talked about in the media, among policy markers and whithin academia. Recent works have shown that they play a key role in the local and international student's decision where to study (see for example Luca and Smith [2013] and Beine et al. [2014]). In line with Aghion et al. [2008], we aggregate information from the Academic Ranking of World Universities (ARWU), also known as the Shanghai ranking, to be able to make

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[2]Note that this information is also available for the higher education sector only but due to missing data we have enlarged it to the education sector. Both are highly correlated.

[3]It is the probability with which two deputies from the legislature chosen randomly are from different political parties. We expect that a more heterogenous legislature in term of preferences makes it more difficult to conduct adequate policies to improve the higher education system.

cross-country comparisons. We take the following steps in order to obtain an indicator of performance at the country level. As there are 500 institutions in the ranking, we give to each institutions a number equal to 500 minus its rank. We then take the sum for the institutions of each countries. This gives us our *sumrank* independent variable.[4]

Before going futher, it is important to detail how this Shanghai ranking is constructed. It is the aggregation of 6 indicators: alumni winning nobel prizes and fields medals (as a proxy of the quality of education), staff winning nobel prizes and fields medals, highly cited researchers in different subject categories (as proxies of the quality of faculties), papers published in Nature and Science, papers indexed in the Science Citation Index-expanded and social science citation index (as proxies of the research output) and per capita academic performance (to normalize to the size of the institution). For each of these criteria, the institution with the highest score has a score of 100 and the score of other institutions is normalized to this score. The final ranking is based on the aggregate indicator obtained from the weighted sum of these 6 indicators (a weight of 10% is given to the first and last, 20% for the others). Note also that, for the two first indicators, a smaller importance is given if the alumni or faculty received an award more than one decade ago, more than two decades ago, etc. Only papers published during the 4 years before the ranking are considered. Hence, the ranking is closer to be a measure of the stock than the flow of the institutional performance. As discussed in David [2013], it is biased towards top level research-oriented institutions, it favors hard sciences and it is unclear whether the indicators are measuring what they are supposed to. However, compared with other rankings[5], it has the advantage of using the same methodology over the years in a transparent manner (which allows to recompute the indicator and to make comparisons across years) and to focus on several countries. Throughout the paper, it is important to have in mind these limitations of what we define as our performance measure. Due

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[4]As a robustness check, we also use *sumindex* the sum of the index used to compute the ranking for the institutions of each country.

[5]The other most buzzed-about international ranking, the Times Higher Education Supplement ranking, faces several issues that make it not a good candidate to build our dependent variables. First, due to changes in the consultancy firm producing the ranking, it is complex to obtain its early versions. Second, apart from frequent changes in the methodology of the ranking and the importance given to expert-based indicators, it did not always rank the same number of institutions. Finally, as shown in Saisana et al. [2011], the Shanghai ranking is less dependent on the aggregation and weighting given to each of the indicators used to compute it. This comparatively higher robustness of the Shanghai ranking, according to Paruolo et al. [2013], is rooted in the high degree of correlation between each of these indicators.

to the focus of the Shanghai ranking, the usual disclaimers prevail in drawing conclusions for the wider, highly heterogenous, higher education system.

Table 1 presents summary statistics of these variables for the all sample and Table A.1 in the appendix presents the same statistics by country. The average performance is not really indicative but we observe big differences between countries with the UK, Germany and France leading the group and Eastern European countries (Estonia, Latvia, Lithuania and Slovakia) lagging far behind. Almost 40% of the ministers in charge were women and the average age is about 51. A large majority (80%) of the ministers have already an electoral experience and only 30% have had an experience in the private sector. The countries in which the probability that a minister has an electoral experience are also those where the experience in the private sector is the lowest. In the sample 50% of the ministers have an experience in tertiary education but in Czech Republic, Denmark, Germany and Italy no one in charge during our period of analysis had such an experience. Those with experience had mainly background in sciences and economics (33% and 16% of those with experience respectively)[6].On average, the tenure as a minister of higher education is 2.5 years.

About the control variables, while we observe on Table 1 that almost 50% of the budget for tertiary education comes from the central government, the figure hides very different realities. We will be back to this in Section 6 but in country like Germany or Spain which are very decentralized we only observe 10 and 12 % respectively of resources allocated from the central government. Big differences are also observed in terms of economics performance and budgetary situation.

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[6]The distribution of disciplines in which the ministers have obtained experience is 9% in economics, 16% in law, 33% in sciences, 12% in political science and 5% in sociology, 4% in philosophy and the rest is a mix of other less represented disciplines.

Table 1: Descriptive statistics

	Mean	Std. dev.	Min	Max
Performance				
sumrank	2168.3	3261.9	0.0	12502.0
sumindex	152.5	227.3	0.0	899.7
Leader's variables				
Female	0.4	0.5	0.0	1.0
Age	51.3	8.5	30.0	72.0
Experience in tertiary education (0/1)	0.5	0.5	0.0	1.0
Electoral experience (0/1)	0.8	0.4	0.0	1.0
Experience in private sector (0/1)	0.3	0.5	0.0	1.0
Tenure at the job	2.5	1.7	1.0	8.0
Left (0/1)	0.3	0.5	0.0	1.0
Control variables				
% from central gvt	47.79	25.57	8.50	94.50
Spending in % of GDP	1.27	0.42	0.68	2.51
GDP growth	2.12	4.49	-17.95	12.23
Debt as a % of GDP	50.29	25.55	3.70	120.70
Fractionalization	0.71	0.10	0.50	0.84
Election year (0/1)	0.28	0.45	0.00	1.00
N	160			

4 Estimation Strategy

Our aim is to estimate the impact of the experience of the minister of higher education on the performance, as measured by our *sumrank* variable coming from the Shanghai ranking. Since the performance is not only influenced by current events but also by past achievements, we include the first lag of the dependent variable to account for persistency and slow adjustments in higher education performance. Thus we estimate the following dynamic panel data model:

$$sumrank_{it} = \beta_0 + \beta_1 sumrank_{it-1} + \beta_2 leader_{it} + \beta_3 X_{it} + \epsilon_{it}$$

Where $sumrank_{it}$ is our higher education performance for country i in year t, $leader_{it}$ is the vector of characteristics associated to the minister in charge of higher education, X_{it} are the contemporaneous control variables presented in the previous section and ϵ_{it} is an error term.

It is likely that the effect of reforms and/or policies implemented by a new leader will take some time before displaying effects. We assume a lag of two years in order to catch the effect of minister's policies before it can be dismissed by a potentially different-minded successor. Hence our work focuses

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on the short run effects of ministers but we cannot judge the bigger trends that there might be[7]. To ensure that we do not confound our variable of interest with country-specific omitted variables that are constant across time or time specific omitted variables that are constant across countries, we include a series of year dummies θ and a series of country fixed dummies ρ. We estimate the following regression:

$$sumrank_{it} = \beta_0 + \beta_1 sumrank_{it-1} + \beta_2 leader_{it-2} + \beta_3 X_{it} + \theta_t + \rho_i + \epsilon_{it}$$

The model can be estimated with a standard two-way fixed effects approach (LSDV)[8]. However, in a dynamic panel data model the lagged dependent variable correlates with the error term, which causes downward bias of the autoregressive coefficient. On the contrary the bias on the coefficient of the independent variables is positive. While it has been shown that the bias is small when the number of period is large (Nickell [1981]), it may be problematic with a small sample as ours. Arellano and Bond [1991] propose an alternative with a Generalized Method of Moments (GMM) approach that incorporates suitable conditions for fixing identification problems related to endogenous covariates by using first-differences. They use all valid lags of the dependent variable as instruments in order to eliminate the correlation with the transformed error term and then to obtain unbiased estimates. However GMM estimators are well suited for large samples but suffer from poor finite sample properties for small N and tend to underestimate the coefficients of the exogenous regressors. Given the low number of observations of our sample, it is necessary to look at alternative estimation methods. Judson and Owen [1999], Kiviet [1999] and Bruno [2005] rely on a standard fixed-effect estimator but use an approximation of its bias to obtain a bias-corrected estimator (LSDVc). Using simulations, Kiviet [1999] show that the bias-corrected estimator generates more accurate estimates and lower standard errors than the GMM

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[7]There is no clear prior determining the number of lags. We applied selection criteria to our LSDV model and both the *Akaike Information Criterion* (AIC) and the *Schwartz Criterion* (BIC) suggest to rely on two lags. A *J-test* for non-nested regression models confirm the choice of two lags. Increasing (or decreasing) the lags by 1 o 2 years does not change our main results anyway. However it reduces the size of our sample and the estimation power (results are available upon request). Let us add that the choice of a lag of two years is not uncommon in the literature on leaders, i.e. Gohlmann and Vaubel [2007] use a lag of two years to assess the effect of central bankers on the inflation rate. Hence, we cannot conclude on the longer run effect of ministers.

[8]A Hausman test reveals that the results of the fixed-effects approach differ significantly from those of a random-effects approach.

estimators, especially with small panels[9]. Given the property of our data set, we then employ this approach. The LSDVc estimator relies on a two-step approach in which a consistent estimator is chosen in the first stage, which can be obtained using various estimators: LSDV, Arellano-bond or Blundell-Bond estimators. We use a LSDV estimator since it has been shown to be more efficient than other alternatives (Bruno [2005]).[10] The simulation study of Kiviet [1999] also shows that the bootstrap procedure for the estimation of the variance-covariance matrix outperforms the analytical ones. We follow their work and apply a bootstrap procedure for the standard errors with 200 repetitions. In order to facilitate comparison between our different specifications and estimation techniques, we provide a goodness of fit measure which is the squared correlation between the predicted level of the performance and the actual value of the performance. This squared correlation between the predicted and the actual variables is equivalent to the standard R^2 for OLS regressions.

5   Results

Table 2 illustrates the regression results. The first column displays our base model. This specification only includes our leaders' variable as explanatory factors of tertiary education performance, that is *experience in tertiary education, electoral experience, experience in the private sector, age, political orientation and tenure at the job*. The results indicate a rather strong path dependency of the performance since the coefficient is positive and significant. This can be explained by the various components of the ranking which are using windows of several years and give a not much smaller weight to older output. Having an experience in tertiary education is positively and significantly correlated with the results obtained in the Shanghai ranking. This support our argument that experience in the sector matters. Electoral experience is negatively but marginally correlated with the performance. Though an experience in the

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[9] In a simple OLS regression, the lagged dependent variable is positively correlated with the error such that its coefficient is biased upward. On the contrary if we introduced fixed effect, the coefficient should be biased downward so that the consistent estimate should lie between the two extreme values. Below and in the appendix we present estimations based on a linear model with and without fixed effects as well as GMM estimations.The results show that the Arrelano-Bond fails to fix the downward bias from linear fixed effect estimations but LSDVc estimations provide bigger coefficients.

[10]In the robustness tests we will present estimation results when we use the GMM Arellano-Bond estimate instead. It does not change the results.

private sector is a positive indicator of good performance. The coefficient of age is negative. This tends to demonstrate that older ministers make less decisions which improve performance. Finally, coefficients associated to leftists and tenured ministers are positive and significant.

Table 2: Drivers of the higher education performance

Dep. var: *Sumrank*	(1)	(2)	(3)	(4)	(5)
Sumrank(t-1)	0.393***	0.380***	0.393***	0.393***	0.365***
	(0.030)	(0.038)	(0.037)	(0.037)	(0.038)
Exp. in tertiary education	100.218***	114.164***	128.048***	128.552***	16.760
	(10.473)	(12.977)	(13.354)	(13.825)	(22.590)
Electoral experience	-11.261	-15.790	-22.270*	-22.363*	-126.948***
	(9.516)	(12.318)	(12.541)	(12.395)	(22.987)
Exp. in private sector	65.995***	68.595***	63.671***	65.661***	79.153***
	(10.405)	(12.733)	(12.836)	(13.396)	(14.309)
Age	-1.178**	-1.456**	-1.586***	-1.521**	-1.585**
	(0.489)	(0.588)	(0.599)	(0.597)	(0.622)
Tenure at the job	7.156***	11.180***	13.520***	13.583***	14.002***
	(2.410)	(3.020)	(3.086)	(3.079)	(3.219)
Left	75.540***	79.656***	85.681***	85.693***	85.053***
	(9.584)	(11.712)	(11.922)	(11.793)	(12.281)
% from central gvt		-8.595***	-11.307***	-11.041***	-10.751***
		(2.378)	(2.486)	(2.456)	(2.551)
Spending in % of GDP		-28.874	109.914**	107.759**	55.370
		(40.492)	(49.136)	(48.787)	(51.780)
GDP growth			-0.023	0.099	-0.542
			(0.853)	(0.843)	(0.881)
Debt as a % GDP			-2.295***	-2.265***	-2.379***
			(0.433)	(0.445)	(0.469)
Fractionalization				26.195	98.285
				(126.071)	(133.082)
Election year				-5.870	0.594
				(7.565)	(7.971)
Political and education experience					154.153***
					(25.003)
Goodness of fit	0.925	0.962	0.934	0.936	0.928
N	160	160	160	160	160

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses
Notes: Corrected-bias estimator with an initial LSDV estimate and 200 bootstrap repetitions. The goodness of fit measure which is the squared correlation between the predicted level of the performance and the actual value of the performance.

We then improve our specification by introducing other important covariates of performance discussed in Section 3. Countries have different higher education landscapes, above all in the extent they distribute their public finances. In specification (2), we include the indicators of the educational landscape: *% from central gvt* and *Spending in % of GDP*. In order to control for differences between economic levels across countries, we include in specifciation (3) *GDP growth* as well as *debt as a % of GDP*. In specification (4) we take into account the political environment by introducing the government *fractionalization* and if it was an *election year*.

Adding other covariates does not change our previous results about the effect of ministers' characteristics. Interestingly, countries that display better performances are those that rely more on decentralization. Countries with the higher level of spending are those with the highest performance. GDP growth appears to be negatively correlated with higher education performance but is not significant. Government debt has a negative effect on performance. Political environment variables appear to be non significant. It may be surprising that over all specifications, the effect of past performance, whereas significant, is rather small, smaller than 0.5. However this can be easily explained by the fixed effects we use in these estimations. If we withdrawn the fixed effects and performed a simple OLS estimation (see Table A.2 in the appendix), the effect of past performance increases much and is close to 1.

Over all specifications minister's experience appears to be an important factor to explain performance. Especially, experience in tertiary education is positive and highly significant[11]. An important aspect of the data is that those with an experience in higher education have, on average, smaller electoral experience than the others, 63% against 83%, and this difference is significant (Wilcoxon-Mann-Whitney test: $z = 3.781, p = 0.0002$). The two experiences appear to have contrary effects in Table 2. When we control for having an electoral experience before the current position, we cannot disentangle the two effects properly. In order to go one step further we include a term of interaction between electoral experience and experience in higher education in specification (5).

The results show that a minister with an experience in tertiary education is indeed an asset, conditional on having an electoral experience. The effect of having been a lecturer or a dean/rector is positive, whatever the electoral experience but it is only significant for those who do have experience. On the contrary, those with an electoral experience but no academic experience are negatively and significantly correlated with performance. These results

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[11]The variable of experience in tertiary education is however restricted to an actual experience in the teaching and/or management of higher education. In order to test its effect deeper, we have also enlarged the definition to take into account those who obtained a PhD but did not continue with an academic career. This to see whether it is the academic experience more than the research experience that explain the effect. In Table A.3 in the appendix we present these results. When we enlarge the definition of experience, we still have a positive and significant effect but much lower than in Table 2. In order to see what are the drivers of this experience effect, we also introduce the experience by dummies for each type of position held. Surprisingly the effect of having a PhD alone is negatively correlated with the performance (although marginaly significant), which explains the lower coefficient of the modified variable of experience in tertiray eduction. This tends to confirm that it is the academic experience that matters more than having been doing research at some point.

show that the negative effect of electoral experience that we observe in the first specifications is driven by those without an experience in academia.[12]

An important aspect of the higher education system that can impair the influence of the minister on the sector is the presence of private institutions. His authoritative control on these institutions is, in some cases, limited to the design of the accreditation system that allows their presence in the market. Using the share of students enrolled in private higher education institutions as an additional control variable, we have also tested how this characteristic influences our results (see Table A.4 in the appendix). We see that it does not change our conclusions. Interestingly, we see that having a higher share of students enrolled in private institutions has a negative impact on the performance of the sector. However, due to missing observations, it further reduces our sample size.

6 Robustness

In order to test the validity of our results, we conduct a series of robustness tests. First we look at subsamples as well as at other dependent variables. Then we look at other estimators than the LSDVc estimator. Finally we discuss the problem of endogeneity of our variables.

6.1 With respect to different dependent variables and sample

Our initial sample is made of very different countries. Especially, some European countries have experienced important changes. Eastern countries may be outliers since they have completely rebuild their institutional landscape since the fall of the iron curtain. Some of them were also not always an EU member state. In Table 3 we test our results when we limit the sample of countries to those of the EU15. We obtain similar results except for the electoral experience variable that is no more negative and significant.

Some countries have a totally different organisation of the higher education sector. Some are highly decentralized with a lot of compentencies at the regional level, and even regional ministers in charge of higher education. Especially this is the case of Germany, Poland and Spain. When we withdraw

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[12]We have also looked at the interaction with experience in the private sector since it appears that those with a higher education experience are also very few to have worked in the private sector (8% compared to 52% for the others). Interestingly, results (available upon request) show that an experience in the private sector is positively correlated with the performance even if one does not have academic background.

these countries from the sample it does not impact our results qualitatively, as shown in column 2 of Table 3.

We also check whether choosing a different measure of performance affects our findings. As mentioned in Section 3, we can compute another performance indicator by taking the sum of the index used to compute the ranking of the institutions in each country: the *sumindex* variable. The results presented in the fourth column of Table 3 show that changing the dependent variable does not affect our conclusion about the minister's past experience. However, except for the past performance, the other control variables are not significant.

It might also be that the channel through which the performance has improved is the means allocated to the sector. In a fourth specification we test for the effect of leader's characteristics on the spending as a % of GDP (which was considered before as an independent variable). Interestingly we find no impact of the leaders experience on the spending. This tends to show that experienced ministers are more prone to implement reforms that improve the sector's performance than increasing the total spending[13]. Note that the sample considered here is larger than the one used in previous regressions (as the availability of data on spending is higher than the Shanghai ranking)[14].

Unfortunately, due to the unavailability of quantitative measures of reforms in the higher education system, we cannot show explicitly which reforms improve the performance of the sector. However, by looking separately at the impact on the 6 indicators used to compute the Shanghai ranking, we can better see the type of policies that are effective in improving the ranking. This also allows us to claim that the change in ranking created by the ministers is not too dependent on the way the ranking is built. For this reason, we have computed country-level indicators which are, for each indicators, the sum of the scores obtained for the institutions of each countries (see Table A.5 in the appendix).

For 2 of the 6 indicators, we find that the minister's experience has a positive impact. The 2 indicators (*HiCi* and *PUB*) are respectively related to the number of highly cited researchers and to papers indexed in the Science and

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[13]One can argue that the use of lagged ministers characteristics is not so appropriate when spending is concerned. Indeed the effect of leaders' decision on education funding is more than likely to be contemporaneous. However regressing spending on contemporaneous variables does not change our results.

[14]The last two regressions of Table 3 display poor significance of other covariates. This is likely related to the use of country and time fixed effects that take most of the information. When we withdraw the fixed effects, some coefficients appear to be significant. These are *% from central government*, *Debt* and *electoral year*

Social Science Citation Index-expanded. For the other indicators, the relationship is not significant. For *Alumni* (alumni winning nobel prizes and fields medals) and *PCP* (per capita academic performance), this can be explained by the short time span between our independent and our dependent variables, as it is unlikely that policies can improve, in the short run, the quality of alumni educated or the average quality of the researchers.

Having this short time span in mind (and given the time needed to produce and publish articles that then transform into citations and then in prizes) , two types of policies can impact the higher education system in a coherent way considering these results. The first relates to the academic job market. Thanks to regulations that changes the functioning of the job market it is possible to retain and recruit better researchers (more particularly as defined by those publishing in the Science and Social Science Citation Index-expanded and highly cited researchers). This explanation echoes McCormack et al. [2014] which aknowledged the importance of introducing the right management practices with respect to staff retention and recruitment in order to explain the performance of university departments in the U.K.. However, in many European countries, the academic job market is still tightly centrally regulated.[15] Hence, higher education institutions have in many cases a limited freedom in determining whom and on which contract/wage to hire their employees. A second type of policies is related to the architecture of the higher education system. One way is through the distribution (rather than the level) of public funds which can be such that it is concentrated on top institutions, which are then able to hire/retain more and better researchers. Two recent examples are the French Idex and the German Excellence Initiative. Another is through the introduction of policies that facilitate the merger of institutions as it has been shown that this has a positive impact on the Shanghai ranking (Docampo et al. [2015]).

Finally, another point of concern is our measure of performance. By construction several countries obtain a zero performance indicator over the sample. These zeros may raise a problem related to censorship. In our case, it is not exactly true since zero is indeed a measure of performance and not the consequence of an arbitrary boundary. In order to test the robustness of our results to the presence of countries with only zeros, we estimate our specifications of Table 1 excluding those countries: Estonia, Latvia, Lituania and Slovakia (see Table A.6 in the appendix). We also find that our results are

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[15]See Estermann et al. [2011] for a detailed description of the heterogeous European context.

robust to this restricted sample.

Table 3: Robustness checks for alternative specifications

Sample:	EU15	EU25 restr.	EU25	EU25
Dep. var.:	*Sumrank*	*Sumrank*	*Sumindex*	*Spending in % of GDP*
Sumrank(t-1)	0.349***	0.382***		
	(0.052)	(0.038)		
Sumindex(t-1)			0.485***	
			(0.065)	
Spending in % of GDP(t-1)				0.707***
				(0.084)
Exp. in tertiary education	254.729***	136.049***	7.100**	0.009
	(30.953)	(13.095)	(2.840)	(0.171)
Electoral experience	-16.197	-11.763	1.408	0.009
	(30.873)	(11.232)	(2.530)	(0.134)
Exp. in private sector	78.018***	54.661***	4.206	0.035
	(24.810)	(12.177)	(2.727)	(0.166)
Age	-1.992	-1.010*	0.066	0.000
	(1.352)	(0.536)	(0.121)	(0.008)
Tenure at the job	22.295***	8.576***	0.372	-0.002
	(5.210)	(3.114)	(0.622)	(0.039)
Left	111.159***	28.063**	3.683	-0.031
	(20.153)	(12.709)	(2.381)	(0.144)
% from central gvt	-21.169***	-9.163***	-0.421	0.003
	(4.203)	(2.159)	(0.494)	(0.009)
Spending in % of GDP	61.801	133.678***	11.263	
	(85.122)	(44.256)	(9.628)	
GDP growth	-6.813**	0.068	0.076	-0.006
	(2.715)	(0.906)	(0.169)	(0.012)
Debt as a % GDP	-3.879***	-1.903***	-0.122	0.001
	(0.784)	(0.391)	(0.094)	(0.005)
Fractionalization	-135.309	0.979	41.543	0.130
	(236.003)	(125.014)	(26.327)	(1.654)
Election year	-1.369	15.172*	-0.438	0.010
	(14.904)	(7.777)	(1.435)	(0.093)
Goodness of fit	0.839	0.972	0.977	0.872
N	96	144	160	200

Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: Corrected-bias estimator with an initial LSDV estimate and 200 bootstrap repetitions. The goodness of fit measure which is the squared correlation between the predicted level of the performance and the actual value of the performance. EU15 corresponds to our initial sample without Czech Republic, Estonia, Hungary, Latvia, Lituania, Poland, Slovakia and Slovenia. EU25 restricted corresponds to our initial sample without Germany, Poland and Spain.

6.2 With respect to other estimators

We also test the robustness of our results with respect to alternative procedures. In Table 4 we present the standard fixed effect (LSDV), the standard Arellano-Bond (AB) estimator and the corrected bias (LSDVc) estimator when the first estimate of the two-step method is the Arellano-Bond estimate. We only present the results for the lagged dependent variable and the experience in tertiary education in Table 4 (complete results are dispalyed in Table A.7 in the appendix). We find that our main results are robust to these alternatives.

Table 4: Robustness checks for alternative estimators

Dep. var: *Sumrank*	LSDV	Arrelano-Bond	LSDVc (Arrelano-Bond)
Sumrank(t-1)	0.361***	0.360***	0.477***
	(0.087)	(0.071)	(0.089)
Exp. in tertiary education	128.787*	154.139***	126.655**
	(73.918)	(49.426)	(59.604)
Goodness of fit	0.914	0.959	0.971
N	160	140	160

Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: Corrected-bias estimator (LSDVc) is performed with an initial arrelano-Bond estimate and 200 bootstrap repetitions. The goodness of fit measure which is the squared correlation between the predicted level of the performance and the actual value of the performance. Each regression include the same covariates as in specification (3) of Table 1.

6.3 With respect to endogeneity

One important question is endogeneity. The transition of education minister need not be "random". It might be that the minister characteristics influence his or her reelection as well as poor results in terms of performance might explain the need for a minister with some characteristics. We could solve this using an instrumental variable that is not correlated with the dependent variable but would explain the leader's characteristic. Unfortunately we did not find such an instrument. However, there are reasons why it might be less of a concern in our setting. A model in which we do estimate contemporaneous relationship would possibly give rise to concerns about endogeneity due to reverse causality. To prove causality, the literature on ministers/presidents has for example used changes of post holders due to exogenous reason (like sudden death or murder). We do not have such observations in our sample.

However when we regress the minister's characteristics, such as the academic experience, on the higher education performance we do not find significant relationships [16]. Furthermore our estimation procedure with lags in the variable of interest (the minister's characteristics) has the advantage of avoiding selection bias since it does not compare contemporaneous variables. Thus it constitutes an acceptable alternative to more sophisticated estimators.

A last concern is the actual portfolio of competencies of the ministry. Higher education can be a part of a general Ministry of education or be in a seperate specific ministry dedicated to research. We could think that if we have a minister only dedicated to research it will be more likely to have a minister with sector-specific experience. We could also have that if there is a separated minister only for research, it means that the government gives priority to reforms in this sector. However when we try to make a difference between general ministry of education and those that are more research dedicated (the difference is based on the name of the ministry), we do not observe significant relationship between having a ministry "more research oriented" and the choice of a minister who has experience in the sector.

7 Conclusion

Using a panel dataset of the individual characteristics of European higher education ministers, we find a positive relationship between having a previous experience in the sector and its performance, as measured by ranking data. We find that this relationship is robust to various specifications. Using the theory of human/social capital, signalling theory and the influence on preferences related with the on-the-job learning experience of having been active in academia before becoming a minister, we have discussed various explanations behind this result.

Based on this finding, we can claim that it is important to consider his past professional background when choosing the cabinet member in charge of higher education. Similar statements were made by Moessinger [2014] and Jochimse and Thomasius [2014] in the context of finance ministers. However, in contrast with these previous results, we find that it is not sufficient to have a past experience in academia to be a successful minister. This claim is conditional on having a past electoral experience. Academic and electoral expe-

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[16]If we add more lags to the higher education performance, we stil find no significant relationship.

riences need to be considered when deciding whom to appoint as a higher education minister. Hence, a cabinet member with an extensive academic experience but lacking of electoral credibility might do more harm than good.

A final point concerns the precise channel through which the higher education has improved. We have shown that ministers with an academic experience do not tend to increase the funding received by the higher education sector. The literature studying the determinants of performance in the education system (see Hanushek and Woessmann [2011] for compulsory education and Aghion et al. [2008] for higher education) argues that both money and institutions matter. By showing that the former is not impacted by the characteristics of leader, this makes us conclude that the latter is changing. In other words, higher education ministers with an academic background tend to implement institutional reforms, all else being equal. Unfortunately we are not able to derive this result explicitly. There is a lack of systematic information about the institutional reforms introduced in each countries such that cross country comparisons are difficult to make. The historical institutional macro data collected by Garrouste [2010] and the scorecards about the autonomy of universities collected by the European University Association (see a.o. Estermann et al. [2011]) are a first step in the collection of this information. Despite the lack of observations available, the issue of how to quantify and to qualify these reforms to make empirical analysis is next on the research agenda. Hence, future works should investigate how leader's characteristics impact the performance by looking at his impact on higher education reforms in the short as well as in the long run. Case studies and other forms of qualitative analysis would also be of great interests to further improve our understanding of the key role played by higher education ministers.

A Appendix

Table A.1: Descriptive statistics by country

	sumrank	sumindex	Age	Experience in tert. educ.	Electoral exp.	Exp. In priv. sector	Tenure at the job	Left	% from cl. gvt	Spending in % of GDP	GDP growth	Debt as a % of GDP	Fractionalization	Election year
Austria	1135.6	85.5	55.9	0.3	0.9	0.0	2.9	0.0	53.3	1.5	1.8	66.3	0.7	0.3
Czech Rep.	230.4	14.0	45.1	0.0	0.6	0.8	1.9	0.6	32.4	1.0	3.4	32.1	0.7	0.3
Denmark	1422.8	91.3	54.0	0.0	0.8	1.0	4.5	0.0	49.4	2.4	0.7	38.2	0.8	0.4
Estonia	0.0	0.0	43.9	1.0	0.9	0.0	3.8	0.0	37.4	1.1	3.3	5.3	0.8	0.3
Finland	822.0	71.0	46.5	0.0	1.0	0.9	1.6	0.5	31.7	2.0	1.8	42.0	0.8	0.3
France	5231.0	358.8	47.6	0.5	1.0	0.4	2.0	0.0	72.8	1.3	1.2	71.9	0.6	0.1
Germany	9806.6	651.6	53.5	0.0	1.0	0.0	4.3	0.3	9.7	1.2	1.5	71.5	0.7	0.3
Hungary	324.5	24.9	52.8	0.8	0.8	0.3	3.3	0.5	35.0	1.0	1.2	71.4	0.5	0.3
Ireland	446.9	33.5	55.9	0.3	1.0	0.1	1.8	0.1	84.2	1.3	1.7	51.3	0.7	0.3
Italy	3761.4	285.5	47.0	0.0	0.8	0.5	2.8	0.3	80.0	0.8	0.3	110.2	0.6	0.3
Latvia	0.0	0.0	50.1	0.8	0.3	0.3	1.5	0.0	29.8	0.9	3.0	23.8	0.8	0.4
Lituania	0.0	0.0	47.4	0.9	0.8	0.5	2.4	0.4	37.4	1.1	3.5	24.1	0.8	0.3
Netherlands	3532.1	222.7	52.4	0.4	0.6	0.0	2.1	0.4	86.5	1.6	1.5	55.7	0.8	0.3
Poland	324.9	24.8	56.1	0.8	0.8	0.0	2.4	0.3	23.3	1.1	4.7	49.3	0.7	0.4
Portugal	53.0	11.7	58.1	1.0	0.8	0.0	2.9	0.8	94.0	1.0	0.5	78.1	0.6	0.4
Slovakia	0.0	0.0	55.4	1.0	0.3	0.6	2.6	0.0	39.3	0.9	4.8	35.5	0.8	0.3
Slovenia	32.0	6.0	51.1	0.5	0.6	0.5	1.9	0.0	82.3	1.3	2.3	30.8	0.8	0.4
Spain	1419.9	115.0	55.5	1.0	0.6	0.0	1.9	0.6	12.4	1.0	1.4	49.0	0.6	0.4
Sweden	3029.6	199.9	48.9	0.3	1.0	0.5	2.0	0.4	28.7	1.9	2.4	43.2	0.8	0.3
UK	11794.1	853.7	48.8	0.1	1.0	0.8	1.4	0.8	36.3	1.0	1.2	56.3	0.6	0.3

Table A.2: OLS estimate the education performance

Dep. var.: *sumrank*	(1)	(2)	(3)	(4)	(5)
Sumrank(t-1)	0.996***	0.997***	0.999***	0.998***	0.997***
	(0.010)	(0.010)	(0.011)	(0.011)	(0.011)
Exp. in tertiary education	61.297**	67.986**	65.987**	61.866**	81.375*
	(31.006)	(31.591)	(31.897)	(30.994)	(45.507)
Electoral experience	34.689	28.123	30.763	18.216	34.974
	(26.315)	(26.974)	(27.769)	(25.548)	(48.224)
Exp. in private sector	27.333	26.417	26.772	18.709	19.050
	(43.437)	(44.857)	(45.494)	(41.606)	(41.791)
Age	0.172	-0.113	0.222	0.207	0.185
	(1.720)	(1.739)	(1.956)	(1.927)	(1.925)
Tenure at the job	-4.678	-4.789	-3.838	-4.293	-4.357
	(10.771)	(10.515)	(10.528)	(10.829)	(10.845)
Left	21.436	26.752	30.718	29.560	29.761
	(30.431)	(28.015)	(29.699)	(30.555)	(30.703)
% from central gvt		0.347	0.591	0.599	0.581
		(0.579)	(0.643)	(0.653)	(0.657)
Spending in % of GDP		25.965	20.965	44.287	42.598
		(28.143)	(30.247)	(37.457)	(38.156)
GDP growth			0.121	0.466	0.577
			(1.740)	(1.985)	(1.978)
Debt as a % GDP			-0.620	-1.081	-1.035
			(0.704)	(0.952)	(0.953)
Fractionalization				-239.110	-244.916
				(240.573)	(240.436)
Election year				-19.768	-20.841
				(41.602)	(41.735)
Politics and education experience					-24.682
					(49.803)
Constant	-65.834	-101.557	-101.799	85.071	76.952
	(101.126)	(97.671)	(104.210)	(177.201)	(180.786)
Goodness of fit	0.997	0.996	0.997	0.997	0.996
N	160	160	160	160	160

Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The goodness of fit measure which is the squared correlation between the predicted level of the performance and the actual value of the performance

Table A.3: Discussion of the experience in tertiary education

Dep. var: *sumrank*	(1)	(2)	(3)
Sumrank(t-1)	0.393***	0.427***	0.386***
	(0.037)	(0.039)	(0.036)
Exp. in tertiary education	128.552***		
	(13.825)		
Exp. in tertiary education (incl. PhD)		58.603***	
		(13.793)	
Rector			213.860***
			(29.344)
Dean			106.903***
			(15.267)
Lecturer			117.977***
			(15.908)
PhD			-29.581*
			(17.008)
Electoral experience	-22.363*	-30.163**	-37.769***
	(12.395)	(12.965)	(12.640)
Exp. in private sector	65.661***	18.797	70.566***
	(13.396)	(12.301)	(13.609)
Age	-1.521**	-1.953***	-1.409**
	(0.597)	(0.622)	(0.581)
Tenure at the job	13.583***	12.480***	14.415***
	(3.079)	(3.255)	(3.087)
Left	85.693***	91.566***	95.604***
	(11.793)	(12.304)	(11.515)
% from central gvt	-11.041***	-10.615***	-12.167***
	(2.456)	(2.598)	(2.431)
Spending in % of GDP	107.759**	137.528***	136.735***
	(48.787)	(51.026)	(48.321)
GDP growth	0.099	0.117	0.317
	(0.843)	(0.888)	(0.831)
Debt as a % GDP	-2.265***	-1.847***	-2.387***
	(0.445)	(0.477)	(0.440)
Fractionalization	26.195	-324.543**	241.334*
	(126.071)	(126.276)	(128.146)
Election year	-5.870	-8.756	-2.226
	(7.565)	(7.934)	(7.307)
Goodness of fit	0.937	0.953	0.959
N	160	160	160

Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Notes: Corrected-bias estimator with an initial LSDV estimate and 200 bootstrap repetitions.
The goodness of fit measure which is the squared correlation between the predicted level
of the performance and the actual value of the performance

Table A.4: Drivers of the education performance: Private education variable included

	(1) sumrank	(2) sumrank	(3) sumrank	(4) sumrank	(5) sumrank
Shanghai(-1)	0.382***	0.370***	0.382***	0.380***	0.355***
	(0.026)	(0.036)	(0.038)	(0.036)	(0.036)
Exp. in tertiary education	105.965***	115.463***	129.327***	134.183***	27.306
	(12.114)	(15.149)	(15.828)	(15.553)	(23.567)
Electoral experience	-15.093	-20.839*	-26.344**	-27.044**	-121.852***
	(9.747)	(12.340)	(12.395)	(11.878)	(21.562)
Exp. in private sector	69.442***	78.649***	73.900***	82.071***	91.830***
	(10.630)	(13.097)	(13.463)	(13.157)	(13.669)
Age	-1.192***	-1.852***	-2.105***	-1.885***	-1.769***
	(0.443)	(0.557)	(0.570)	(0.546)	(0.563)
Tenure at the job	8.906***	12.038***	14.332***	14.683***	15.027***
	(2.249)	(2.991)	(3.049)	(2.940)	(3.022)
Left	79.802***	67.528***	71.768***	71.975***	72.817***
	(10.164)	(12.474)	(12.801)	(12.254)	(12.508)
% from central gvt		-6.593***	-8.689***	-7.599***	-7.575***
		(2.151)	(2.240)	(2.174)	(2.231)
Spending in % of GDP		-36.155	81.952*	71.022	17.274
		(38.422)	(45.699)	(44.222)	(45.093)
% in private education		-6.909***	-7.025***	-6.894***	-5.079***
		(1.734)	(1.800)	(1.722)	(1.788)
GDP growth			-1.064	-0.804	-1.222
			(1.007)	(1.005)	(1.032)
Debt as a % GDP			-2.223***	-2.192***	-2.276***
			(0.429)	(0.431)	(0.446)
Fractionalization				155.838	217.553*
				(123.952)	(128.378)
Election year				-13.581*	-7.975
				(8.106)	(8.377)
Politics and education experience					144.714***
					(25.497)
Goodness of fit	0.944	0.958	0.943	0.947	0.951
N	152	152	152	152	152

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Notes: Corrected-bias estimator with an initial LSDV estimate and 200 bootstrap repetitions.
The goodness of fit measure which is the squared correlation between the predicted level
of the performance and the actual value of the performance

	(1)	(2)	(3)	(4)	(5)	(6)
	Alumni	Awards	HiCi	NS	PUB	PCP
Dependent (t-1)	-0.069***	-0.036	-0.052	0.511***	0.447***	0.072
	(0.018)	(0.065)	(0.071)	(0.084)	(0.061)	(0.045)
Exp. in tertiary education	-1.082	15.495	13.641**	-4.990	12.174**	-1.903
	(3.864)	(12.215)	(5.408)	(4.321)	(4.948)	(18.199)
Electoral experience	-2.076	7.771	-6.364	-3.127	2.767	11.434
	(3.403)	(10.424)	(4.780)	(3.723)	(4.399)	(15.973)
Exp. in private sector	-3.314	15.383	-4.159	-7.553*	10.252**	11.175
	(3.773)	(12.360)	(5.237)	(4.120)	(4.742)	(17.806)
Age	-0.082	-0.233	-0.450*	0.032	0.237	1.064
	(0.167)	(0.537)	(0.234)	(0.183)	(0.211)	(0.783)
Tenure at the job	0.595	-2.718	3.806***	1.241	1.138	-4.001
	(0.852)	(2.718)	(1.192)	(0.934)	(1.091)	(3.984)
Left	1.845	-9.735	10.793**	1.560	14.905***	-5.515
	(3.242)	(11.273)	(4.578)	(3.644)	(4.211)	(15.297)
% from central gvt	-0.249	3.810*	-3.582***	-1.320*	-2.079**	2.598
	(0.672)	(2.088)	(0.951)	(0.746)	(0.875)	(3.137)
Spending in % of GDP	14.163	-94.905**	75.639***	22.994	43.621**	-36.539
	(13.537)	(42.546)	(18.915)	(14.458)	(17.079)	(63.807)
GDP growth	-0.034	-2.206***	1.871***	0.287	0.386	-0.893
	(0.236)	(0.800)	(0.330)	(0.254)	(0.300)	(1.102)
Debt as a % GDP	-0.258**	0.497	-0.623***	-0.060	-0.335**	0.128
	(0.124)	(0.412)	(0.179)	(0.147)	(0.165)	(0.586)
Fractionalization	-62.161*	193.187	-63.211	-26.812	19.113	216.307
	(35.251)	(122.158)	(49.753)	(40.692)	(45.985)	(167.359)
Election year	1.096	-0.705	-2.099	-0.976	5.162**	-1.746
	(2.169)	(7.376)	(2.904)	(2.038)	(2.575)	(10.084)
Goodness of fit	0.301	0.018	0.004	0.895	0.906	0.003
N	160	160	160	160	160	160

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: *Alumni* is the index obtained with the number of alumni winning nobel prizes and fields medals. *Awards* is the index obtained with the staff winning nobel prizes and fields medals. *HiCi* is the index obtained wit the number of highly cited researchers in different subject categories. *NS* is the index obtained with the number of papers published in Nature and Science. *PUB* is the index obtained with the number of papers indexed in the Science Citation Index-expanded and social science citation index. *PCP* is the index obtained with per capita academic performance. Corrected-bias estimator with an initial LSDV estimate and 200 bootstrap repetitions, except *Awards* and *PCP* for which the initial estimate is an Arrelano-bond. The goodness of fit measure which is the squared correlation between the predicted leve of the performance and the actual value of the performance

Table A.6: Drivers of the higher education performance: no zero performance

Dep. var: *sumrank*	(1)	(2)	(3)	(4)	(5)
Sumrank(t-1)	0.385***	0.360***	0.374***	0.374***	0.358***
	(0.034)	(0.045)	(0.044)	(0.044)	(0.044)
Exp. in tertiary education	116.885***	141.459***	159.179***	159.758***	45.630
	(15.816)	(19.403)	(20.086)	(20.644)	(34.119)
Electoral experience	-37.601***	-48.837***	-46.805***	-47.084***	-130.641***
	(12.578)	(16.640)	(16.897)	(16.740)	(25.456)
Exp. in private sector	89.433***	86.415***	77.673***	79.895***	85.683***
	(14.122)	(17.652)	(18.020)	(18.669)	(19.073)
Age	-1.612**	-1.868**	-2.211**	-2.133**	-2.325***
	(0.680)	(0.850)	(0.881)	(0.894)	(0.896)
Tenure at the job	7.503***	12.474***	17.284***	17.293***	17.650***
	(2.737)	(3.571)	(3.801)	(3.785)	(3.825)
Left	86.224***	92.257***	94.274***	94.201***	86.260***
	(11.370)	(14.022)	(14.310)	(14.576)	(14.551)
% from central gvt		-14.181***	-16.862***	-16.584***	-15.374***
		(3.516)	(3.629)	(3.683)	(3.690)
Spending in % of GDP		-53.171	88.154	87.076	59.987
		(54.048)	(66.436)	(65.311)	(65.866)
GDP growth			-4.190**	-4.023**	-4.526**
			(1.847)	(1.862)	(1.875)
Debt as a % GDP			-2.755***	-2.737***	-2.988***
			(0.565)	(0.584)	(0.589)
Fractionalization				33.195	136.963
				(156.106)	(159.420)
Election year				-5.293	2.137
				(10.752)	(11.001)
Politics and education experience					147.267***
					(33.869)
Goodness of fit	0.914	0.924	0.879	0.882	0.902
N	128	128	128	128	128

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses
Notes: Corrected-bias estimator with an initial LSDV estimate and 200 bootstrap repetitions.
The goodness of fit measure which is the squared correlation between the predicted level of
the performance and the actual value of the performance

Table A.7: Robustness checks for alternative estimators

Dep. var: *Sumrank*	LSDV	Arrelano-Bond	LSDVc (Arrelano-Bond)
Sumrank(t-1)	0.361***	0.360***	0.477***
	(0.087)	(0.071)	(0.089)
Exp. in tertiary education	128.787*	154.139***	126.655**
	(73.918)	(49.426)	(59.604)
Electoral experience	-24.014	-5.279	-18.575
	(21.617)	(39.252)	(51.602)
Exp. in private sector	67.459	85.745*	59.187
	(46.893)	(47.016)	(56.312)
Age	-1.562	-0.887	-1.458
	(1.652)	(2.151)	(2.560)
Tenure at the job	13.933*	9.981	12.945
	(7.981)	(10.304)	(13.089)
Left	88.310*	82.054**	80.931
	(46.060)	(38.463)	(49.364)
% from central gvt	-11.471**	-6.340	-10.042
	(4.590)	(8.272)	(10.263)
Spending in % of GDP	105.645	61.922	108.466
	(90.803)	(169.930)	(205.939)
GDP growth	0.094	-4.963	0.241
	(1.897)	(5.366)	(3.552)
Debt as a % GDP	-2.227	-1.729	-2.019
	(2.492)	(1.846)	(1.974)
Fractionalization	25.158	188.975	50.536
	(396.300)	(443.606)	(545.295)
Election year	-6.104	-2.885	-4.805
	(31.891)	(28.673)	(30.636)
Constant	1845.544***		
	(479.799)		
Goodness of fit	0.914	0.959	0.971
N	160	140	160

Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: Corrected-bias estimator (LSDVc) is performed with an initial Arrelano-Bond estimate and 200 bootstrap repetitions. The goodness of fit measure which is the squared correlation between the predicted level of the performance and the actual value of the performance

References

AGHION, P., M. DEWATRIPONT, C. HOXBY, A. MAS-COLELL AND A. SAPIR, "Higher aspirations: An agenda for reforming european universities," Technical Report, Bruegel blueprint, 2008.

ARELLANO, M. AND S. BOND, "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies* 58 (1991), 277–297.

BECK, T., G. GROFF, P. KEEFER AND P. WALSH, "New tools in comparative political economy: The database of politcal institutions," *World Bank Economic Review* 15 (2001), 165–176.

BEINE, M., R. NOEL AND L. RAGOT, "Determinants of the international mobility of students," *Economics of Education review* 41 (2014), 40–54.

BESLEY, T., J. G. MONTALVO AND M. REYNAL-QUEROL, "Do educated leaders matter?," *The Economic Journal* 121 (2011), 205–227.

BRUNO, G. S., "Approximating the bias of the LSDV estimator for dynamic unbalanced panel data models," *Economics Letters* 87 (2005), 361–366.

DALBO, E., "Regulatory Capture: A review," *Oxford Review of Economic Policy* 22 (2006), 203–225.

DAVID, Q., "Determinants of research production at top US universities," *B.E. journal of economic analysis and policy* 13 (2013), 81–109.

DEE, T., "Are there civic returns to education?," *Journal of Public Economics* 88 (2004), 1697–1720.

DOCAMPO, D., D. EGRET AND L. CRAM, "The effect of university mergers on the Shanghai ranking," *Scientometrics* 104 (2015), 175–191.

DREHER, A., M. J. LAMLA, S. M. LEIN AND F. SOMOGYI, "The impact of political leaders' profession and education on reforms," *Journal of comparative economics* 37 (2009), 169–193.

ESTERMANN, T., T. NOKKALA AND M. STEINEL, *University autonomy in Europe II: The scorecard* (European University association, 2011).

GARROUSTE, C., "100 Years of Educational Reforms in Europe: a contextual database," Technical Report EUR 24487, European Commission, Joint Research Centre, 2010.

GOHLMANN, S. AND R. VAUBEL, "The educational and occupational background of central bankers and its effect on inflation: An empirical analysis," *European Economic Review* 51 (2007), 925–941.

GOODALL, A., "Highly cited leaders and the performance of research universities," *Research Policy* 38 (2009), 1079–1092.

GOODALL, A. H., J. M. MCDOWELL AND L. D. SINGELL, "Leadership and the research productivity of university departments," *IZA Discussion paper* 7903 (2014).

GORDON, G. C., "Subsidies, hierarchy and peers: The awkward economics of higher education," *Journal of Economic Perspectives* (1999), 13–36.

HANUSHEK, E. AND L. WOESSMANN, "The economics of international differences in educational achievement," in *Handbook f the economics of education* (elsevier, 2011).

HAYO, B. AND F. NEUMEIER, "Leader's impact on public spending priorities: The case of the German Laender," *Kyklos* 65 (2012), 480–511.

———, "Political leaders' socioeconomic background and fiscal Political leaders' socioeconomic background and fiscal performance in Germany," *European Journal of Political Economy* 34 (2014), 184–205.

JOCHIMSE, B. AND S. THOMASIUS, "The perfect finance minister: whom to appoint as finance minister to balance the budget," *European Journal of Political Economy* 34 (2014), 390–408.

JONES, B. F. AND B. A. OLKEN, "Do leaders matter? National leadership and growth since World war II," *Quaterly Journal of Economics* (2005), 835–864.

JUDSON, R. A. AND A. L. OWEN, "Estimating dynamic panel data models: a guide for macroeconomists," *Economics Letters* 65 (1999), 9–15.

KIVIET, J., "Expectations of expansions for estimators in a dynamic panel data model; some results for weakly exogenous regressors," in C. Hsiao, K. Lahiri, L. Lee and M. Pesaran, eds., *Analysis of Panels and Limited Dependent Variable Models* (Cambridge: Cambridge University Press, 1999).

LUCA, M. AND J. SMITH, "Salience in quality disclosure: Evidence from the US News college rankings," *Journal of Economics and Management Strategy* 22 (2013), 58–77.

MCCORMACK, J., C. PROPPER AND S. SMITH, "Herding cats? management and university performance," *Economic Journal* 124 (2014), 534–564.

MILLIGAN, K., E. MORETTI AND P. OREOPOULOS, "Does education improve citizenship? Evidence from the United States and the United Kingdom," *Journal of Public Economics* 9 (2004).

MOESSINGER, M.-D., "Do the personal characteristics of finance ministers affect changes in public debt?," *Public choice* (2014), 1–25.

NICKELL, S. J., "Biases in Dynamic Models with Fixed Effects," *Econometrica* 49 (November 1981), 1417–26.

PARUOLO, P., M. SAISANA AND A. SALTELLI, "Ratings and rankings: Voodoo or science?," *Journal of Royal Statistical Society A* 176 (2013).

SAISANA, M., B. D'HOMBRES AND A. SALTELLI, "Rickety numbers: Volatility of university rankings and policy implications," *Research Policy* 40 (2011), 165–177.