Publicness and Performance:

The Effects of Governmental Ownership, Funding, and Regulation

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INTRODUCTION

The relationship between publicness and organizational performance has been a central question in the field of public administration (Bozeman 1987; Rainey et al. 1976). Although publicness has been variously conceptualized and measured, a consensus has been built on three dimensions of publicness or policy instruments of organization policy: (government) ownership, funding (from government), and social control (or government regulation). These three criteria may not appear consistently within an organization (Perry and Rainey 1988). And the criteria are also argued to be continuous rather than categorical. For example, some organizations are partially

owned by government, while the extent of public funding that organizations receive may vary. And even private businesses are not completely free from governmental regulations. This implies the necessity of research focused on the impact of the each criterion of publicness in a model with all three dimensions and the interactive impacts between them.

In the special issue of JPART on this subject, Andrews, Boyne, and Walker (2011) analyzed the results of relevant research focused on investigating the relationship between publicness and organizational performance in terms of three performance dimensions-efficiency, effectiveness, equity-as well as three publicness criteria. In their article, they figured out limitations of previous research and presented remarkable findings that should be further investigated. They reported that most studies have measured publicness by only ownership, whereas much fewer studies have used funding and control (or regulation) dimensions of publicness. Also the impact of publicness on performance tends to be insignificant or mixed in most cases. They suggested that the relationship between publicness and its consequences should be further addressed. In particular, they emphasized that the relationship between funding or control (or regulation) dimension and its outcomes should more investigated and also the range of the outcomes should be widened. Furthermore, they presented dynamic models of publicness and organizational performance, and argued that separate and joint effects of public dimensions should be investigated in a single model. In accordance with this research request, we adopted the multi-dimensional approach and investigated dynamics between publicness and performance in this article.

Rainey (2011) also noted challenges (e.g., difficulty to take adequate samples to represent the categories of ″public″ and ″private″ with multiple publicness dimensions) involved in designs for analyzing the public-private distinction in organizational research. Considering the main points raised by the previous literature, we have developed a dataset that may enable us to examine the performance impacts of multiple dimensions of publicness. The construct of publicness in this

study will be measured by three dimensions, that is, ownership (public vs. private), funding (the proportion of financial resources from governments), and social control (the level of government regulation). The measures of organizational performance will include objective indicators of various performance dimensions. And also we will contain multiple measures of the task and other organizational characteristics in our model to control for the performance effects of important variables other than publicness.

This study analyzes four-year-course universities in Korea, and the effects of each dimension of publicness on a variety of performance in the university organization. As will be described later, the university organization is a representative public service organization in the modern nation, and there are significant financial and institutional differences among universities, and it is possible to obtain objective performance data. In this study, we will conduct the following analyses: descriptive analysis, correlation analysis between all explanatory variables, and panel data analyses for direct effects and interactive effects of three publicness dimensions on various performance dimensions. Then we will report results and discuss the implications.

LITERATURE REVIEW

Ownership and Organizational Performance

Among the three dimensions, ownership is most commonly adopted to distinguish public and private organizations in relevant research (Andrews, Boyne, and Walker 2011; Rainey, Backoff, and Levine 1976). The conventional model related to the relationship between publicness and performance has investigated how the type of ownership affects performance. One of the theories underlain this model is property rights theory. It suggests that ownership is the most crucial factor that distinguishes public and private organizations (Perry and Rainey 1988). The transferability of ownership rights in the private sector leads to a connection between managerial decision and reward (Bozeman 1987). The managerial decision is regarded as an input

that enables to make a difference in performance and it can be appropriately evaluated in the market (Perry and Rainey 1988). And the market for ownership and managerial labor (Villalonga 2000) forces private organizations to set a reward and recognition mechanism from which the productive employees benefit more than others in the private sector. In public sector, in contrast, managerial efforts are not able to be properly valued due to the absence of the market for ownership rights and managerial labor. Moreover, in public organizations, managers have lesser expectation that their performance would lead to more rewards because of the reward and recognition system which is rigid by various rules and procedures (Bozeman and Loveless 1987).

Effective reward and recognition system which links closely employee's performance and reward makes them devote their abilities to their work and, ultimately, may lead to the success of the organization (Danish and Usman, 2010; Csikszentmihalyi, 1990). Public choice theorists also argue that the public ownership leads to lower efficiency (Clarkson 1972). Lack of profit motive and the management styles which are believed to be more innovative and productive may lead to a gap in efficiency between private and public organizations. However, supporting evidence for the model which is grounded property rights theory and public choice theory appears to be so weak (Andrews, Boyne, and Walker 2011). In Andrews and his colleagues' paper (2011), while ownership appears to have a positive impact on equity (75% unweighted and 60% weighted), the impacts of ownership on other performance criteria-efficiency and effectiveness-were inconsistent.

Financial Publicness and Organizational Performance

According to public choice theory, while publicly funded organizations are likely to be more responsive to political sponsors who appropriate funds, privately funded organizations tend to be more responsive to individual service users (Andrews, Boyne, and Walker 2011; Niskanen 1971). Furthermore, one of the theorists argued that effectiveness and customer satisfaction of an

organization also gets lower when the ratio of the government funding[1] to an organization's total finance resources gets higher (Niskanen, 1971). However, there is rarely explicit and systematic empirical evidence for the effect of the dependency on government funds, even though negative effects of state dependency seems to be taken as fact in the previous literature (Anheier et al., 1997).

Public-funded organizations have portrayed to be conferred the stability, predictability and continuity. Reiner (1989) found that most community development organizations have continued to survive and have been funded continuously, and only a few which had committed gross misconduct have left from the program. It was not a crucial factor to achieve self-sufficiency, to adhere to funding cap or to leverage successfully other funds to decide whether to support a unit financially or to withdraw it from the program, and continuing financial support was virtually assured to most organizations (Reiner 1989). He pointed out that community pressure to continuing provision of public services and the absence of appropriate indicators to measure organizational effectiveness in the public service field give powerful incentives to maintain organizations that are already supported (Reiner 1989). Further evidence of predictability and continuity of public funds was found in other studies as well (Gronbjerg, 1993; Kramer, 1981). Financial stability, predictability and continuity reduce the properties which constitutes uncertainty that managers confront with (Pandey 2010). In these circumstances, organizational tasks become relatively more predictable and analytical, and it easier to let the managers make appropriate decisions and behaviors. (Ferris 1977; Karimi et al. 2004; Huber and McDaniel 1986).

[1] Government funds might be both directly (grants and contracts for specific activities or programs) and indirectly (assistance to individuals who purchase services) administrated (Salamon, 1987). Funding dimension of publicness, that is financial publicness, represents the ratio of government funds (Chun and Rainey 2005). It includes different types of public funds, but direct form of public funds away from selling goods or services in the market is more appropriate to represent the definition of publicness – "the extent the organization is influenced by political authority (Bozeman and Bretschneider 1987)." This is because individual client still retains a choice of provider associated with indirect form of government funds, so the service providers only can acquire public funds on behalf of clients who purchase their services (Anheier et al. 1997). Therefore, we focus on the features of direct forms of government funds in this article.

In these circumstances, it is likely to make organizations improve their performance.

Although there is conflicting theoretical prediction of the relationship between financial publicness and organizational performance like above, the results of the meta-analysis by Andrews et al. (2011) did not consistently support either. They reported that the evidence on the relationship between funding publicness and efficiency is evenly spread across positive and negative, while those on the impact of funding publicness on efficiency are almost all insignificant.

Control (or Regulation) Dimension[2] and Organizational Performance

On the basis of the previous literature, the types or forms of political control are a sort of instruments for political authorities to supervise or regulate activities of the agent (organizations), thereby to assure the compliance (Bozeman, 1987; Mccubbins et al., 1987; Andrews et al., 2011).

Previous research has never been sufficiently detailed to account for the relationship between control (or regulation) dimension and organizational performance. It is mainly because most research have been conducted for the for-profit organization and focused on the financial performance of the organization. Yet, despite all the logical shortcomings, some have provided meaningful implications on this subject.

The neoclassical theorists have argued that regulation by political authorities increases costs and lowers financial performance (Palmer et al., 1995). The corporate governance and public

[2] Control (or regulation) dimension of publicness has been conceptualized the most broadly and vaguely among three dimensions, such as "external influence (e.g., Bozeman and Kingsley 1998; D'Aunno and Vaughn 1992; Heinrich and Fournier 2004)." Moreover, it has been measured in a variety of ways without the consensus among scholars compared to other dimensions. This situation prompts the concern for the need to develop more elaborated concept and better measures of control dimension of publicness. However, we will not deal with the concept problem further in this study. Instead, we will continue to discuss based on Andrews and his colleagues' study (2011). They, who have reviewed empirical evidence concerning publicness and performance, mentioned political control as the extent which an organization set and changed priorities by political influence and which its outcomes were monitored and managerial behaviors were regulated. This meaning of political control is more specific and substantive than the previous literature. And it also provides clues to measure the control (regulation) dimension of publicness.

choice theorists also noted that political control is detrimental to the financial performance because firms are used to achieve the political and social goals instead of their own goals – maximizing profits (Shleifer and Vishny, 1998). On the other hand, there is a view that regulation or external control could have positive effects on organizational performance. Considering the literature on agency theory, which suggests that there is a possibility that managers maximize their own interest than profits (Williamson, 1963; Jensen and Meckling, 1976), political control over managers may improve financial performance by mitigating these incentive problems. The literature on corporate governance has warned of activities of controlling shareholders which could detract from the firm's performance, such as selling outputs at the below-market price, stealing their firm's profits, and even turning investment opportunities to any other companies owned by themselves (La Porta et al., 2000). In this case, external control over them would mitigate these negative effects. With respect to environmental regulations, some researchers also claim that well-designed environmental regulation could give rise to innovations and increase net benefits of firms as well as social welfare (Porter and van der Linde, 1995). In addition, there are third line of thought that proposes the non-linear relationship between the regulation and performance (Wagner, 2001). The results on the relations between environmental regulation and performance still seem to be inconclusive (Konar and Cohen, 2001, Wagner, 2001).

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The Interactive Effects of Publicness Dimensions

Although it is important to investigate whether each dimension of publicness has a distinct impact on organizational performance, the interactive impacts of those dimensions are another issues in terms of policy realities. In general, public ownership is regarded to induce higher political control than private ownership, while the higher proportions of public funding is believed to tighten the political control over the organization (Rainey, 2014). Bozeman (1987) has argued,

political control is the essence of publicness and it is likely to affect the effects of ownership and funding on the consequences of publicness. Andrew and his colleagues (2011) also were interested in the interacting effect of political control (or government regulation) on the relationship between publicness and performance. They argued that it is more reasonable to think that the extent of political control could moderate (or mediate) the impacts of the other dimensions of publicness, while emphasizing that it was necessary to discuss joint impact of publicness dimensions as well as separate impact of them. However, it is barely studied that the effect of political control is also likely to moderate or mediate the effects of the other dimensions of publicness on organizational performance. This study, therefore, attempts to test the potential interacting effect of political control between publicness and performance.

DATA

The Research Setting and Data Sources

The research setting of this study is multiple publicness dimensions in universities of South Korea and their association with organizational performance. The higher-educational institutions in South Korea can serve as a great setting to examine the impacts of multiple publicness dimensions on organizational performance, because the institutions vary significantly along all of the three publicness dimensions discussed above, that is, ownership, funding, and control (regulation). Furthermore, higher-education is one of the most important public services in many advanced countries with great international variations in the way of service delivery, which makes the findings of this study more valuable in the literature of public management.

Our data on publicness dimensions and performance comes from multiple sources. With the support of the Research Center for Organizational Diagnosis and Evaluation (CODE) in the Graduate School of Public Administration of Seoul National University, we conducted the survey with face-to-face interview in both 2014 and 2016. This survey gathered a variety of information

about organizational and behavioral characteristics of Korean higher-educational institutions. Non-survey data used in this study were from an official government website with the name of Daehakalimi (www.academyinfo.go.kr) and various information system including accounting information of universities.

Measures

Performance measures

Dependent variables for this article are related to the performance of a university. The performance of university could be generally divided into research achievement and educational achievement. Research performances were measured by the number of total articles per full-time professor (TA) and the number of prominent articles per a full-time one (PA). TA is the total sum of the number of domestic articles per a professor and the number of foreign articles per a professor and PA is made by aggregating the number of articles published in the journal to be registered or will be registered by National Research Foundation of Korea (NRFK) per full-time professor and the number of the SCI or SCOPUS articles per a full-time professor. On the other hand, as the indicators to measure educational performance, graduate employment rate (ER) and student retention rate (RR) are used. All the data to measure the performance were from the official government website, *Daehakalimi*.

Publicness Measures

In consistent with the previous literature on publicness in the field of public management (Andrews et al., 2011), we focus on three dimensions of publicness: ownership, funding, and control (or regulation). Ownership dimension of publicness was measured by a binary variable; if owned by governments, it was coded as 1 and if owned privately, then coded as 0. There were no cases with partial government ownership. The information about ownership structure was

collected from the *Daehakalimi* website aforementioned.

The measure of funding dimension was developed, drawing upon the measure of financial publicness (Chun and Rainey, 2005) or resource publicness (Rainey et al., 1995), as the percentage of the university's annual revenue obtained from governmental sources. Although this process seems simple, the difference of accounting systems between government-owned and privately-owned ones makes it complex. While total financial funds are calculated by total revenues in general accounts, support accounts, and development fund accounts in the public universities, in the private ones, they are measured by total revenues in the aggregated statement of cash flows. In the public ones, amount of government funds is measured by subtracting private donation, admission fee, tuition and supporting fee from total revenues. On the other hand, in private ones, it is measured as governmental subsidies in the aggregated statement of cash flows.

It has been proved difficult to measure the extent of control dimension, as demonstrated by the fact that very few previous research has developed such measures (See the results of meta-analysis in Andrews et al., 2011). One of the reasons is that political control or government regulation over an organization encompasses a variety of areas or activities conducted by the organization. As a result, the construct of political control or government regulation has a higher level of conceptual complexity as compared to that of government ownership or funding. Taking such complexity and the presence of various sub-dimensions into consideration, we measured this dimension by using four survey questions which were designed to tap the levels of governmental influences in multiple organizational activities including personnel management, financial management, reorganization, and purchasing management.[3] After standardizing response values

3 The four questions to measure the extent of control or regulation by government are as follows: 1) How much do you need to consider what the government intends to do when making a decision related to *personnel management*? 2) How much do you need to consider what the government intends to do when making a decision related to *financial management*? 3) How much do you need to consider what the government intends to do when making a decision related to *reorganization*? 4) How much do you need to consider what the government intends to do when making a decision related to *purchasing management*?

for each question, the factor analysis was conducted to make a single factor (Cronbach's alpha = .79).

Control Variables

To capture other influences that are related to organizational performance, our regressions included a variety of control variables. We controlled for organizational size, age, resource, location, task difficulty, functional characteristics, and time effect. To capture the size and scale effects on organizational performance, we included the natural logarithm of the number of total financial resources in the university. We also included the age of the university in years (2017 minus the founding year) to capture maturation and reputation effects. Because the resources and location may influence organizational performance, we included the number of students per a professor as the resource measure and a dummy variable that indicates whether a university is located in Seoul metropolitan area or elsewhere. To capture any functional characteristics, we also included three dummy variables representing whether the university has engineering, medical, or elementary-education college. To measure the task difficulty confronted by universities, the rate of students with education mortgage was included. Lastly, a year dummy variable was added to control the time effect.

METHODS

In this paper, panel analysis method will be used to investigate the effects of three dimension of publicness on organizational performance. To do so, a total of four models were analyzed. Each model tested both the relationships between the publicness dimensions and a dependent variable: model1 (student drop rate as DV); model2 (graduate employment rate as DV); model3 (the number of total articles per full-time professor as DV); and model4 (the number of prominent articles per a full-time one as DV).

We conducted two kinds of test to investigate goodness of fit of the model: likelihood ratio test and Hausman test. The likelihood ratio test is a method to determine whether fixed effects method is more appropriate than the panel ordinary least squares method or not. The null hypothesis is all observed and unobserved fixed effects are equal to all units. As a result of the F-test, the null hypothesis was rejected at 1% significance level for all models, which means that the fixed effects model is more appropriate than the panel ordinary least squares model. To test whether fixed effects model is more valid than random effects model, the Hausman test was conducted. The null hypothesis is that the preferred model is the random effects model. It was rejected at 5% significance level for all models, which means that the fixed effects model is more appropriate than the random effects model.

Finally, we chose the fixed effects model to investigate the relationship between publicness and performance. The fixed effects method has the advantage of eliminating the latent possibilities of controlling the unchanging properties of the unit (Allison, 2005). However, general fixed effects model has two problems. First of all, it does not report the coefficients of time-invariant variables. So, we conducted LSDV (least squares dummy variable) method instead of general fixed effects model. Fixed effects model also have a problem related to the degree of freedom because dummy variables for all units except one are included in the model. So, we also reported the results of random effects model, even though fixed effects model was more appropriate according to Hausman test.

FINDINGS

The population was made up of all universities with four-year bachelor's degree programs in South Korea, a total of 270 institutions. From the population, 68 institutions were excluded because they were 'online education only' institutions, or those with the sole area of education which made them very peculiar as compared to other 'general' universities, or branch schools

which have no independent accounting system. After the sampling phase, the response rates of CODE survey were 85.1% (172 cases) in 2014 and 66.8% (135 cases) in 2016. So we used a panel dataset covering the period 2014 and 2016. In the two periods, the universities that both of managers responded and also have performance-data are 101, while 54 universities only in 2014 and 31 universities only in 2016. Therefore, the dataset provides 287 observations from a total of 186 universities.

Table1 reports the results of the descriptive analysis on panel data set.[4] According to the results, 26.5% of the 287 observations used for our analysis were owned by government. And the average funding from government was 22.74% of the total revenue for the cases. And while 75.3% universities have engineering colleges, only 19.9% universities have medical colleges. 5% of the total is elementary-education school. The average rate of students with education mortgage was 16.4% and 28.9% of cases in our study were located in Seoul. For the all variable used for this study, there are big differences between universities, but relatively small differences over time within universities. And the variables which measure whether government own a university (ownership publicness), whether the university has medical or elementary-education college (organizational function), whether a university locates in the Seoul metropolitan city (location) are time-invariant

[Table1 about here]

Table 2 shows Pearson correlation coefficients about all continuous variables used in this study. High collinearity exists between the number of total articles per full-time professor and

4 In this table, while "overall" line shows summary statistics for the entire dataset, "between" line reports the result for standard deviation, minimum and maximum value of unit-level average. And in "within" line, T-bar tells us that the number of observation per university and standard deviation means conceptually how much a variable varies within units, while ignoring all variation between units.

prominent articles per full-time professor (Pearson correlation = .83). These two variables are included in separate regression models as a dependent variable.

[Table2 about here]

Table 3 indicates the significant positive impacts of the ownership and financial publicness on the number of total articles per full-time professor (TA). And in the case of the number of prominent articles per full-time professor (PA), only government ownership has a strong positive impact on it. This result also is reported in the random effects model. The impact of control dimension was not significant at all. Higher level of financial publicness may increase any possibility of organizational stability and predictability, thus contribute to improve the research performance of professors. Meanwhile, the result that research performance of public universities is superior to that of private ones is not consistent with what property rights and public choice theorists have expected. As ownership was time-invariant unlike the other two publicness dimensions, it is premature to conclude that the result of this study is conclusive. It can be said publicly-owned universities have higher research achievement than privately owned universities in the setting of four-year-course universities in Korea.

[Table3 about here]

Table 4 presents the analysis results for educational performance. The results show that any dimension of publicness has no relationships with graduate employment rate (ER) in both LSDV modal and random effects model. On the other hand, while any of publicness dimension do not have significant impacts on student retention rate (RR) in the LSDV model, publicly-owned universities shows higher retention rate than privately-owned ones in the random effects model.

The influence of control publicness was not statistically significant in all research performance and educational performance model. This finding does not support the scholars′ opinions that higher level of control or regulation result in negative consequences in organizational performance.

[Table4 about here]

Table 5 and Table 6 demonstrates the interactive impacts of publicness dimensions, especially the moderating effect of control (or regulation) dimension on the performance impacts of ownership and financial publicness. We had attempted to investigate the impact of interactive effects in both moderating model and mediating model. However, as shown in Table 3 and Table 4, the coefficients of control dimension were not statistically significant at all. So only moderating effect of control dimension could be examined, except for the mediating effect model. Table 5 presents that any evidence that control (or regulation) dimension could moderate the effect of ownership or financial publicness on research performance was not found. In Table 6, we found the moderating effects of control (or regulation) dimension on the relationships between ownership or financial publicness and employment rate in the random effect model.

only one moderating effect was

However, the statistical power of moderated multiple regression (MMR), however, could be affected by the predictor variable range restriction, sample size, predictor variable inter-correlation and so on (Aguinis and Stone-Romero, 1997). Therefore, further study on the interactive effects of publicness dimensions should be followed.

[Table5 about here]

[Table6 about here]

DISCUSSION AND CONCLUSION

There has been a common belief that sectoral differences will significantly affect the organization. Most previous studies on this notion of the public-private distinction have investigated how such differences affect organizational performance focusing on the single dimension of publicness –ownership - to measure publicness. And interactive effects of publicness dimensions have barely been investigated. Andrews and his colleagues (2001) requested research that could overcome these limitations, so we revisited the relationships between multi-dimension of publicness and a variety of organizational performance and investigated also interactive effects of publicness dimensions.

Most evidence in this study shows that government ownership and financial publicness have positive impacts on organizational performance – especially research performance, but control (or regulation) is not relevant. Property rights theory and public choice theory's assumptions were not supported in this study. Amirkhanyan, et al. (2008) argued public organizations could be more successful than for-profit or non-profit ones when the quantity or quality of services are hard to be evaluated and when there are legal constraints or lack of incentives. In situations when it is ambiguous how one can improve organizational performance, for-profit organizations try more to cut cost rather than improve service quality (Amirkhanyan, et al., 2008). Meanwhile, nonprofit organizations try less to adjust production in response to changes in demand for services, because the distribution of profits to owners or managers is prohibited and they must operate under various legal constraints (Amirkhanyan, et al., 2008). On the other hand, government-owned organizations can adjust production more appropriately and make a variety of performance

criteria clearer than other organizations, because government could impose or loosen legal constraints and refine assessment criteria. And as the financial dependency upon the government increases, more efforts could be made to achieve the goals given by government (Frumkin & Galaskiewicz, 2004). The financial predictability and sustainability based on financial publicness could have a positive effect on organizational performance (Pandey, 2010). Meanwhile, even though either direct or indirect impact of control dimension on performance was not founded, it does not mean results in this study are conclusive. Moreover, universities in South Korea are all subject to similar regulatory requirements in real, even though the managers′ responses vary in the survey data. It is needed to study further related to control dimension in another research settings.

We have tried to overcome substantive and methodological problems to make it possible to have confidence. In sum, this study contributes to the existing literature related to the research on the impact of publicness on performance in two aspects. First, it takes into consideration the multiple dimensions of publicness government ownership, funding, and control (regulation). Very few studies have measured three dimensions of publicness in a single research setting. In addition, this study also provides clearer evidence on the causal relationship between publicness and organizational performance using longitudinal data rather than just cross-sectional one and contains a variety of both internal and external control variables.

Table 1. The results of descriptive analysis

Variable		Mean	Std.Dev.	Min	Max	Observations
Total articles per FTP	overall	0.447	0.183	0	1.093	N=287
	between		0.178	0	1.051	n=186
	within		0.0409	0.220	0.675	T-bar=1.543
Prominent articles per FTP	overall	0.365	0.169	0	0.833	N=287
	between		0.168	0	0.833	n=186
	within		0.0298	0.211	0.520	T-bar=1.543
Graduate employment rate	overall	63.09	16.99	0	94	N=278
	between		17.63	0	91	n=182
	within		2.602	49.74	76.44	T-bar=1.527
Student retention rate	overall	95.25	2.789	82.90	99.90	N=287
	between		2.751	84.80	99.65	n=186
	within		0.544	92.65	97.85	T-bar=1.543
Ownership publicness	overall	0.265	0.442	0	1	N=287
	between		0.429	0	1	n=186
	within		0	0.265	0.265	T-bar=1.543
Financial publicness	overall	22.74	12.24	0	65.26	N=287
	between		12.02	0	65.26	n=186
	within		3.935	3.472	42.01	T-bar=1.543
Control publicness	overall	-6.93e-10	0.998	-3.375	2.400	N=287
	between		0.916	-3.253	2.399	n=186
	within		0.500	-1.860	1.860	T-bar=1.543
Organizational size	overall	18.07	1.232	14.79	21.23	N=287
	between		1.247	14.79	21.23	n=186
	within		0.144	16.69	19.44	T-bar=1.543
Resource	overall	22.90	7.945	1.302	42.03	N=287
	between		8.135	1.302	42.03	n=186
	within		1.424	17.91	27.89	T-bar=1.543
Function_engineering	overall	0.753	0.432	0	1	N=287
	between		0.432	0	1	n=186
	within		0.0935	0.253	1.253	T-bar=1.543
Function_medical	overall	0.199	0.400	0	1	N=287
	between		0.396	0	1	n=186
	within		0	0.199	0.199	T-bar=1.543
Function_elementary education	overall	0.0557	0.230	0	1	N=287
	between		0.215	0	1	n=186
	within		0	0.0557	0.0557	T-bar=1.543
Organizational age	overall	46.90	26.50	6	121	N=287
	between		26.35	6	121	n=186
	within		0.825	38.40	55.40	T-bar=1.543
Task difficulty	overall	16.44	6.863	0	42.20	N=287
	between		7.036	0	42.20	n=186
	within		1.153	13.86	19.02	T-bar=1.543
Location	overall	0.289	0.454	0	1	N=287
	between		0.464	0	1	n=186
	within		0	0.289	0.289	T-bar=1.543

Table 2. The results of Pearson correlation analysis

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Total articles per FTP	(1)	1								
Prominent articles per FTP	(2)	0.8291*	1							
Graduate employment rate	(3)	0.0191	0.2067*	1						
Student retention rate	(4)	0.5400*	0.5470*	0.1518*	1					
Financial publicness	(5)	0.4777*	0.5743*	0.2543*	0.4006*	1				
Control publicness	(6)	0.2155*	0.2466*	0.1820*	0.1730*	0.2763*	1			
Organizational size	(7)	0.2613*	0.5672*	0.1790*	0.3630*	0.2878*	0.1338*	1		
Resource	(8)	-0.1167*	0.00320	0.3252*	-0.0953	-0.0868	0.0582	0.2026*	1	
Organizational age	(9)	0.4316*	0.4726*	0.0482	0.4007*	0.2928*	0.1405*	0.3026*	0.0219	1
Task difficulty	(10)	-0.3372*	-0.4704*	-0.0085	-0.3808*	-0.4987*	-0.1540*	-0.2712*	0.2302*	-0.2360*

Table 3. The separate impact of publicness on research performance

VARIABLES	TA		PA	
	LSDV	RE	LSDV	RE
Ownership_publicness	0.344**	0.114***	0.242**	0.121***
	(0.150)	(0.0366)	(0.116)	(0.0279)
Financial_publicness	0.00200*	0.00173**	0.000290	0.000709
	(0.00103)	(0.000863)	(0.000796)	(0.000665)
Control_publicness	-0.000684	0.00315	-0.00446	0.00108
	(0.00766)	(0.00656)	(0.00590)	(0.00505)
Organizational_size	-0.0419	0.0292**	-0.0210	0.0499***
	(0.0275)	(0.0119)	(0.0212)	(0.00907)
Resource	-0.00135	-0.00227	6.47e-05	-0.000692
	(0.00285)	(0.00139)	(0.00219)	(0.00107)
Function_engineering	-0.0432	0.00573	0.0137	0.0581***
	(0.0410)	(0.0279)	(0.0316)	(0.0214)
Function_medical	-0.403**	-0.0211	-0.243**	-0.00489
	(0.157)	(0.0311)	(0.121)	(0.0237)
Function_elementary_education	-0.555**	0.173***	-0.295*	0.137***
	(0.224)	(0.0598)	(0.172)	(0.0455)
Organizational_age	0.0161***	0.00122**	0.0104***	0.000773**
	(0.00469)	(0.000486)	(0.00361)	(0.000370)
Task_difficulty	-0.00549	0.000566	-0.0103**	-0.00246*
	(0.00594)	(0.00191)	(0.00458)	(0.00145)
Location	-0.645**	0.0473*	-0.437*	0.0481**
	(0.293)	(0.0262)	(0.226)	(0.0199)
year_group	-0.0461***	-0.0277***	-0.0283**	-0.00484
	(0.0158)	(0.00988)	(0.0122)	(0.00762)
Constant	0.403	-0.174	0.325	-0.625***
	(0.582)	(0.206)	(0.448)	(0.157)
Observations	287	287	287	287
Number of OID_N		186		186
Hausman test	Prob>chi2 = 0.0131		Prob>chi2 = 0.0031	

*** p<0.01, ** p<0.05, * p<0.1

Table 4. The separate impact of publicness on educational performance

VARIABLES	ER		RR	
	LSDV	RE	LSDV	RE
Ownership_publicness	21.78	0.0489	0.517	1.461***
	(53.05)	(3.475)	(2.016)	(0.514)
Financial_publicness	-0.0316	0.0879	-0.0196	-0.00782
	(0.0763)	(0.0685)	(0.0138)	(0.0121)
Control_publicness	-0.158	0.340	0.00626	0.0659
	(0.566)	(0.527)	(0.103)	(0.0923)
Organizational_size	1.610	3.095***	-0.0541	1.155***
	(2.003)	(1.121)	(0.369)	(0.167)
Resource	-0.0645	0.349**	-0.139***	-0.0197
	(0.245)	(0.139)	(0.0381)	(0.0196)
Function_engineering	4.366	9.222***	-0.00768	-1.395***
	(3.772)	(2.695)	(0.550)	(0.392)
Function_medical	-23.29	3.146	-1.422	0.203
	(32.07)	(3.163)	(2.102)	(0.437)
Function_elementary_education	18.78	41.52***	-1.156	3.778***
	(28.97)	(6.116)	(2.998)	(0.839)
Organizational_age	-0.267	-0.105**	0.125**	0.00197
	(0.335)	(0.0498)	(0.0628)	(0.00682)
Task_difficulty	0.280	0.563***	-0.0526	-0.0418
	(0.454)	(0.188)	(0.0796)	(0.0268)
Location	16.54	-2.696	-8.966**	1.409***
	(35.74)	(2.669)	(3.925)	(0.367)
year_group	0.355	1.582**	-0.470**	-0.303**
	(1.141)	(0.777)	(0.212)	(0.139)
Constant	41.15	-17.10	94.88***	75.71***
	(33.41)	(19.40)	(7.790)	(2.893)
Observations	287	287	287	287
Number of OID		182		186
Hausman test	Prob>chi2 = 0.0036		Prob>chi2 = 0.0000	

*** p<0.01, ** p<0.05, * p<0.1

Table 5. The moderating impact of publicness on research performance

VARIABLES	TA		PA	
	LSDV	RE	LSDV	RE
Ownership_publicness	0.0858	0.112***	0.106	0.111***
	(0.149)	(0.0380)	(0.114)	(0.0289)
Financial_publicness	0.00184	0.00178*	-0.000127	0.00101
	(0.00126)	(0.000912)	(0.000966)	(0.000699)
Control_publicness	-0.00124	0.00682	-0.0198	0.0175
	(0.0255)	(0.0168)	(0.0196)	(0.0128)
Ownership publicness * Control_publicness	-0.0123	0.00404	-0.0147	0.0221
	(0.0318)	(0.0239)	(0.0244)	(0.0183)
Financial publicness * Control_publicness	0.000200	-0.000204	0.000802	-0.000968
	(0.00130)	(0.000861)	(0.000998)	(0.000658)
Organizational_size	-0.0406	0.0291**	-0.0219	0.0487***
	(0.0279)	(0.0120)	(0.0215)	(0.00912)
Resource	-0.00137	-0.00230	0.000194	-0.000771
	(0.00288)	(0.00140)	(0.00221)	(0.00107)
Function_engineering	-0.0417	0.00547	0.0134	0.0556***
	(0.0415)	(0.0282)	(0.0319)	(0.0215)
Function_medical	-0.875**	-0.0213	-0.544*	-0.00448
	(0.397)	(0.0311)	(0.305)	(0.0236)
Function_elementary_education	-1.027**	0.171***	-0.612*	0.129***
	(0.456)	(0.0602)	(0.350)	(0.0457)
Organizational_age	0.0162***	0.00122**	0.0102***	0.000807**
	(0.00474)	(0.000487)	(0.00365)	(0.000369)
Task_difficulty	-0.00543	0.000519	-0.0108**	-0.00273*
	(0.00606)	(0.00193)	(0.00465)	(0.00146)
Location	0.255**	0.0475*	0.243***	0.0485**
	(0.108)	(0.0262)	(0.0827)	(0.0198)
year_group	-0.0459***	-0.0283***	-0.0275**	-0.00742
	(0.0160)	(0.0103)	(0.0123)	(0.00790)
Constant	1.108**	-0.170	0.820**	-0.599***
	(0.482)	(0.208)	(0.370)	(0.159)
Observations	287	287	287	287
Number of OID		186		186

*** p<0.01, ** p<0.05, * p<0.1

Table 6. The moderating impact of publicness on educational performance

VARIABLES	ER		RR	
	LSDV	RE	LSDV	RE
Ownership_publicness	-13.91	-1.832	-1.760	1.455***
	(19.88)	(3.525)	(1.995)	(0.534)
Financial_publicness	-0.0121	0.172**	-0.0145	-0.00722
	(0.0944)	(0.0743)	(0.0168)	(0.0128)
Control_publicness	0.574	4.809***	0.178	0.128
	(1.958)	(1.446)	(0.341)	(0.236)
Ownership publicness * Control_publicness	0.631	3.840**	0.197	0.0101
	(2.314)	(1.908)	(0.426)	(0.336)
Financial publicness * Control_publicness	-0.0377	-0.236***	-0.00943	-0.00271
	(0.0995)	(0.0743)	(0.0174)	(0.0121)
Organizational_size	1.630	2.807**	-0.0478	1.152***
	(2.032)	(1.108)	(0.374)	(0.168)
Resource	-0.0570	0.347**	-0.141***	-0.0200
	(0.249)	(0.137)	(0.0386)	(0.0197)
Function_engineering	4.298	8.237***	-0.00779	-1.405***
	(3.822)	(2.686)	(0.556)	(0.396)
Function_medical	47.73	3.262	5.387	0.201
	(36.74)	(3.092)	(5.312)	(0.438)
Function_elementary_education	90.39***	39.28***	5.827	3.751***
	(33.11)	(6.019)	(6.110)	(0.847)
Organizational_age	-0.256	-0.0985**	0.127**	0.00204
	(0.340)	(0.0487)	(0.0636)	(0.00684)
Task_difficulty	0.305	0.498***	-0.0471	-0.0429
	(0.464)	(0.185)	(0.0811)	(0.0271)
Location	-8.919	-2.579	-2.171	1.416***
	(7.847)	(2.607)	(1.441)	(0.368)
year_group	0.335	0.968	-0.479**	-0.314**
	(1.155)	(0.795)	(0.214)	(0.144)
Constant	3.353	-11.26	89.79***	75.79***
	(52.98)	(19.17)	(6.456)	(2.929)
Observations	278	278	287	287
Number of OID		182		186

*** p<0.01, ** p<0.05, * p<0.1

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