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The Effect of Tuition Fee Constraints on Financial Management: Evidence from Korean Private Universities

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Abstract: This study examined the effect of tuition fee control policy on universities' financial management. Using data from 93 private universities in Korea from 2006 to 2015, we investigated the effect of tuition fees and government subsidies on labor cost, operating expenses, research expenses, and so on. Based on principal and agency theory, we used the analysis of average percentage change in expenditure and panel data analysis with the help of a Least Squares Dummy Variable (LSDV) model and polynomial regression. The results show that the increase rate of tuition fees decreased after 2011, with government subsidies increasing. The LSDV analysis indicates that universities increase labor costs, operating expenses, and student support fees, while there are no differences in research expenses, laboratory fees, and expenditures from investments and other assets. Polynomial regression reveals that, based on resources, universities behave differently in their spending. With these results, this study suggests a method to lessen information asymmetry and goal conflict, such as a performance-based research system and an incentive-based budget system in universities.

Keywords: tuition fee control policy; financial management; principal–agency model

1. Introduction

As tuition fees have increased over the years, they have become a cause for concern for students and families [1]. These concerns have led to a call for attention on government policy to address tuition fee escalation. Recently, tuition fees have become one of the most pressing issues in higher education [2]. Multiple studies have explained the driving factors of tuition fee increase, such as the reduction of state appropriations and the increase of institutional spending on services, facilities, and compensation [3]. Among these, the reduction of government appropriations has been recognized as a major contributing factor of tuition fee increase [4,5].

In South Korea (hereafter Korea), the situation is different from in other countries. University tuition fees have increased by more than the inflation rate from 2000 to 2010. Similar to other countries, the fee increase has led to parents and students being concerned and becoming the targets of political and social controversy. Finally, in 2011, the Higher Education Act of Korea was amended to restrict the increase rate of tuition fees to be below a certain level. Since 2011, a few universities reduced their tuition fees by about 5–10%. While the government began controlling the increase of tuition fees, it also increased its financial support to universities through government subsidies using formula funding, which has since been reinforced. As Kim and Ko [2] indicate, tuition control policy is most

effective when it is linked with financial aid and provides incentives to limit tuition fee increase; Korean universities tend to follow tuition control policy in order to receive government financial aid.

However, as the expectations placed on universities are on the rise [6], the demands for financial expenditure have also increased. This coupling of tuition fee control and the increased demands presents a significant challenge to higher education institutions in Korea. This challenge is particularly problematic for Korean universities, for which tuition fees form the vast majority of institutional operating budgets, and which have limited the options to create other revenues. In particular, the decline of school-age populations has become a serious burden to universities, whose finances significantly depend on tuition fees. Although universities are making an effort to diversify their sources of financing, in reality, it is not easy for universities to create new sources of revenue. In this situation, it is desirable for universities to set their financial priority on student performance, which is important for formula funding to receive government financial support and for reserved students. As part of their efforts to attract reserved students, universities have to allot their expenditure on student services and education. However, under such financial constraints, this can lead to cuts in spending on student education. This approach is frequently undertaken in the name of cost reduction by decreasing course and program offerings and by reducing library and student services [7]. It has been argued that cuts in these areas negatively impact the quality of education and the university's reputation, and impair the core mission of research, teaching, and service [8]. It is necessary to empirically analyze the impact of tuition fee control policy on internal financial management. Thus far, numerous studies have investigated the factors of tuition fee increase [4,9], the impact of tuition control policy [2], and the effect of tuition fees on university attendance [10]. However, there is limited knowledge about the effects of tuition fee policy on university financial management.

This study examines the characteristics of income and expenditure in university finances with respect to tuition fee control policy. Specifically, this study explores which expenditures have been reduced and which are being maintained or have increased, and how the characteristics of financial management in universities have changed after tuition fee control. In analyzing these issues, this study uses the principal–agency theory, which is an appropriate framework for analyzing the relationship between government and universities [11]. Using this theory, this study examines whether there are opportunistic behaviors or moral hazard from the agent.

To enhance a university's competitiveness, provide high-quality education, and increase financial sustainability [12,13], it is necessary to efficiently and stably manage the university's finances. Financial management in universities, as a key area of university management, can be defined as a series of economic activities by universities in order to secure, distribute, spend, and evaluate finances necessary for producing and supplying higher education services to fulfill educational purposes. This study investigates the link between tuition fee control and the financial management of universities. By analyzing the impact of tuition fee control policy on the university's financial management, the study shows how universities respond strategically to fiscal constraints. In doing so, it will enhance our understanding of financial management in universities as well as universities' behavioral characteristics. In addition, it is expected to provide a new perspective on the universities' strategic behaviors.

The rest of this study is organized as follows: Section two reviews prior literature about tuition fee policy and its effect on universities. Section three discusses Korean tuition fee policy and the theoretical framework. Section four describes the data. The estimation method is presented in the fifth section, while the sixth section presents the results and identifies the main policy implications. The final section provides the conclusions.

2. Literature Review

As tuition price increase has accelerated beyond inflation and family incomes, tuition policy has become a pressing policy issue in higher education [2]. College prices and costs have become a major political issue at the national level [14]. Along with policy concerns about tuition, the academic community has made various efforts to address this issue. Focusing on tuition setting is a complex

and ambiguous process, and numerous studies have explored the factors that influence the level of tuition fees. For example, Mumper [3] investigated the driving factors of tuition fee increase, such as reduced state appropriation and increased institutional spending on services, facilities, and compensation. Haptman [4] explained tuition fee increases as being caused by consumer prices, the use of expanded and improved services, and so on. While these studies focused on the factors of tuition fee increase, other studies examined the effects of state policies on tuition fee control, such as curbs, caps, and freezes [15], as well as financial aid and incentives [16]. For example, Kim and Ko [2] analyzed the impacts of state control policies on college tuition fee increase using data from 50 states and 540 public four-year universities and colleges. Using hierarchical multiple regression analysis, they examined the effects of state policy on tuition change and concluded that linking tuition to financial aid and providing incentives to limit the tuition fee increase are effective in controlling tuition fees. Interestingly, this study provides the evidence that the state's tuition cap policy can adversely affect tuition.

Several studies investigated the effects of tuition fees on university attendance [10,17], enrollment [18], intentions of degree [19], and quality [20]. Dearden et al. [10] studied participation rates with respect to the level of tuition fees in the UK. Using fixed effects regression, they found that fees have a significant adverse effect on university participation. Yoo [21] reported that introducing the half-price tuition policy in Korea is against the benefit principle and creates the contradiction of high school graduates supporting college graduates. He stated that this regulation causes side effects, such as increased youth unemployment due to academic inflation, delays in the restructuring of insolvent colleges, an increase in repeaters due to excess demand for college education, and an increase in private education expenses. Görden et al. [18] investigated the effect of the introduction of tuition fees on university student enrollment behavior. In order to identify potentially relevant factors and control in a short time frame, this study used the Lasso technique and used spatial cross-effects in a fixed effects panel model for the enrollment analysis. Using this methodology, this study presented significant negative effects of tuition fees, inducing an up to 4.5% percentage point reduction in enrollment rates. Bahrs and Siedler [19] analyzed the effect of tuition fees on the intention to acquire a university degree. Using data from Youth Questionnaire of the German Socio-Economic Panel, they analyzed the different effects of the introduction and elimination of university tuition fees in Germany with difference-in-difference settings. The result showed that tuition fees have a negative effect on the intention of 17-year-olds to acquire a higher educational degree. Gawellek et al. [20] examined the impact of the introduction of modest tuition fees on perceived instructional quality. To analyze the effect of tuition fees on instructional evaluation ratings, they adopted the difference-in-difference method and found that the introduction of fees in a publicly financed system has a significantly positive impact on faculty evaluation.

If these studies focused on the effects of tuition fee policy, others investigated financial management in universities under fiscal constraints. Government pressure and control of tuition fees combined with decreased government funding have led universities into an unprecedented situation [22]. Responding to this situation, universities have been motivated to seek alternative revenues from research funding [23], donations, and financial investment [24]. In addition to these efforts, universities have modified their budget systems from incremental budget systems to decentralized budget models. A number of universities have adopted responsibility center management (RCM), which devolves both budget responsibility and decision-making authority in ways that motivate lower-level actors to meet larger organizational goals [7]. Using RCM, universities aim to increase the responsibilities of organizational subunits by devolving ownership of revenues and costs to encourage revenue generation and cost effectiveness, as well as enhance transparency about budget allocation and financial flexibility [25]. Accordingly, numerous studies have examined the implementation challenges of RCM [7,26], its benefits and drawbacks [27,28], and its effect on revenue and student satisfaction [25,29]. For example, Ozan et al. [29] analyzed the effect of RCM adoption on tuition revenue at four public universities, namely Iowa State University, Kent State University, the University of Cincinnati, and the

3.2. Korean University Tuition Policy, Government Subsidy Mechanism

In Korea, the fundamental philosophy and policy direction of university tuition fees have been affected by the government's university education policy in 2003. At the time, the Korean government liberalized the tuition fees of all national universities. Accordingly, university tuition fee increase rates were remarkably high in the early 2000s.

Beginning in 2009, the government began controlling the increase of university tuition fees, and thus, the rates of increase have been slowing down. One of the biggest complaints of education consumers regarding university tuition fee policy is that the portion of tuition fees takes up too much of a university's finances and that there is an unequal financial burden between the university's founders and beneficiaries. Moreover, due to the lack of persuasive tuition fee appropriation methods, the grounds for appropriation are vague, and education consumers have many complaints about the unclear appropriation and operation process due to supplier-led tuition fee policy management [33].

Finally, considering the effect on prices, the government put a ceiling on tuition fee increases and revised the Higher Education Act. According to the Higher Education Act: "No school shall set the rate of increase in tuition fees at a level exceeding 1.5 times the average consumer price inflation for the three preceding years". Furthermore, the Ministry of Education has implemented a tuition fee control policy through state scholarships and a financial support project. To receive a state scholarship, it is necessary to freeze tuition fees at the least. Students can receive more state scholarships only if universities make constant efforts to reduce tuition fees or increase scholarships [34].

In addition, the government uses financial support as a tool for university control. Around 2010, the government increased the amount of financial support to universities and changed the way to distribute financial support. "Formula funding" and "block grant" schemes were implemented, and the rate of tuition increase rate was used as the key indicator in the selection process for support recipients. In this situation, universities may not be able to raise tuition fees and may be requested to lower their tuition fees. Combined with tuition fee control, universities face an unprecedented situation—a decline in school-age population. Due to the dramatic decline of the school-age population, the school-age population saw an 11.3% decrease in 2018 compared to 2013, and the increase rate of student numbers in private universities is lower than in public universities (Figure 2).

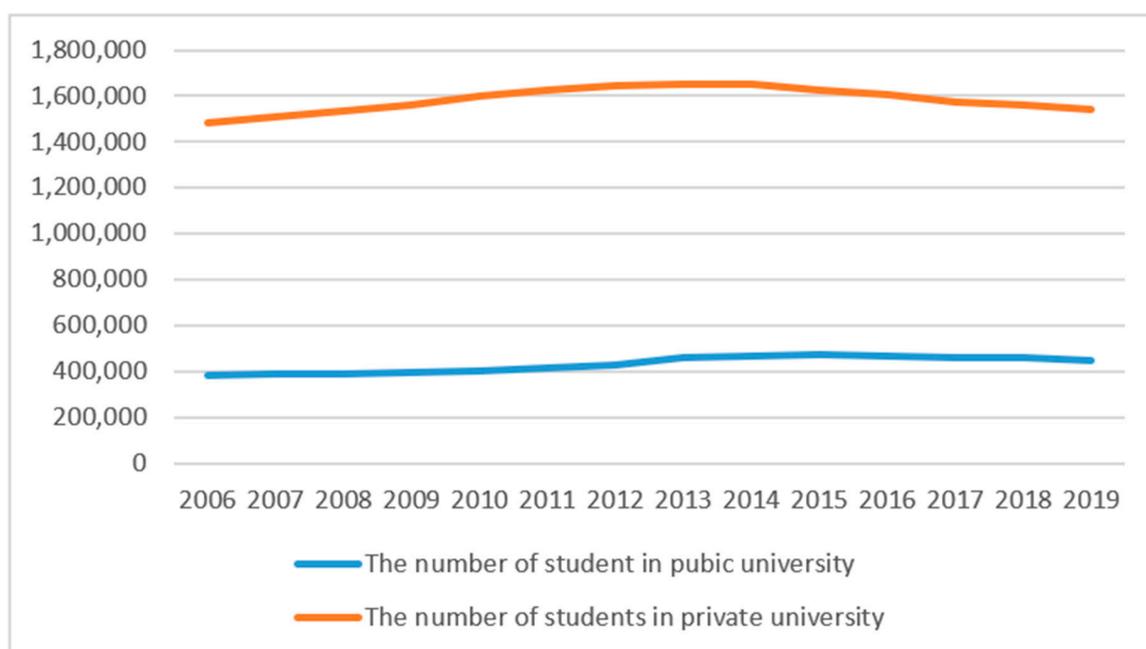


Figure 2. The number of students in private and public universities in Korea. Source: Korean Education statistic service, <https://kess.kedi.re.kr/eng/index>.

These trends will be a burden to universities because most of a university's income depends on tuition fees. This decrease will translate into a financial burden to universities. Attaining government projects has thus emerged as a major goal for universities to secure; government subsidies have become a major factor for the survival and sustainability of universities.

The financial structure of Korean universities is highly dependent on tuition fee income, while the ratio of government income has been increasing in recent years. In 2006, the tuition fee income from all private universities was 11,042,157 million KRW, which accounted for 68.8% of all income. In 2006, transfer and endowment income was 1,696,934 million KRW, which was 10.6%. However, in 2015, tuition fee income was 13,657,620 million KRW (56.9%), while transfer and endowment income was 5,712,058 million KRW (23.8%). The ratio of transfer and endowment income seems to have increased due to the increase of government subsidies (Table 1).

Table 1. Annual income of private universities (Unit: million KRW).

Category	2006	2007	2008	2009	2010
Tuition fee income	11,042,157	11,740,739	12,670,596	13,160,818	13,735,532
Government transfer and endowment income	1,696,934	1,872,182	2,001,802	2,531,757	2,619,801
Education-related administrative fee income	423,100	479,569	536,024	625,224	718,247
Non-education income	637,659	756,620	832,873	878,081	806,131
Income from investments and other assets	773,985	993,405	744,290	895,250	980,278
Income from sale of fixed assets	94,701	89,610	41,390	28,896	36,678
Receipts for current liabilities	2057	2090	3043	644	2644
Receipts for fixed liabilities	102,857	98,865	186,425	150,581	203,458
Unused balance carried forward from the previous term	1,256,314	1,241,322	1,450,637	1,744,106	1,864,169
Category	2011	2012	2013	2014	2015
Tuition fee income	13,724,007	13,781,492	13,725,653	13,395,827	13,657,620
Transfer and endowment income	2,704,543	3,994,669	4,686,934	5,168,779	5,712,058
Education-related administrative fee income	766,296	924,573	990,304	1,004,594	1,079,303
Non-education income	803,171	739,496	578,832	547,841	425,648
Income from investments and other assets	1,629,779	1,230,731	1,082,146	1,348,758	1,404,353
Income from sale of fixed assets	25,073	65,699	59,364	156,265	155,745
Receipts for current liabilities	635,149	345,378	2865	1466	1538
Receipts for fixed liabilities	239,273	137,209	220,868	180,160	169,693
Unused balance carried forward from the previous term	1,852,146	2,144,458	1,950,733	1,448,032	1,335,294

Source: Private School Financial Data System.

Regarding expenditure, in 2006, remuneration was 6,078,237 million KRW, which accounted for 37.9% of all expenditures, and management and operating expenses were 1,683,451 million KRW, which was 10.5%. Expenditure on research and students was 2,846,651 million KRW (17.7%) in 2006. However, in 2015, remuneration was 9,299,141 million KRW (38.8%), management and operating expense was 2,532,611 million KRW (10.5%), and expenditure on research and students was 7,527,429 million KRW (31.4%). This rapid increase in expenditure on research and students may have been due to the increase in state scholarships (Table 2).

Table 2. Annual expenditures of private universities (Unit: million KRW).

Category	2006	2007	2008	2009	2010
Remuneration	6,078,237	6,326,260	6,818,692	7,273,686	7,735,373
Management and operating expenses	1,683,451	1,830,510	1,998,206	2,131,326	2,304,174
Expenditure on research and students	2,846,651	3,141,699	3,476,399	4,017,846	4,270,347
Non-education expenses	147,816	152,705	169,697	205,459	176,330
Transfer expenses	23,793	17,436	14,682	31,671	29,612
Expenditure from investments and other assets	1,464,843	1,755,249	1,770,188	1,895,335	1,761,906
Fixed asset purchase expenses	2,345,657	2,465,258	2,458,940	2,483,390	2,603,733
Repayments for current liabilities	11,512	10,968	14,302	12,282	17,301
Repayments for fixed liabilities	101,982	133,637	118,034	114,185	112,007
Unused balance carried forward to the following term	1,325,820	1,440,680	1,627,939	1,850,177	1,974,108
Category	2011	2012	2013	2014	2015
Remuneration	7,966,689	8,590,134	8,895,711	8,865,079	9,299,141
Management and operating expenses	2,420,198	2,536,298	2,531,540	2,477,145	2,532,611
Expenditure for research and students	4,570,886	5,851,675	6,607,738	7,039,274	7,527,429
Non-education expenses	160,657	125,146	111,182	100,329	93,943
Transfer expenses	16,061	4413	5188	6001	6485
Expenditure from investments and other assets	1,884,229	1,294,934	1,224,080	1,354,988	1,417,681
Fixed asset purchase expenses	2,568,536	2,528,381	2,208,582	2,097,255	1,799,602
Repayments for current liabilities	8244	8570	10,091	14,829	23,231
Repayments for fixed liabilities	168,805	150,449	142,292	227,812	144,819
Unused balance carried forward to the following term	1,997,045	1,950,127	1,562,814	1,272,696	1,119,711

Source: Private School Financial Data System.

3.3. Conceptual Framework

This study aims to examine the characteristics of financial management in universities with regard to constraints on tuition fees and increase of government subsidies using the agency theory, which originates from studies by Ross [35] and Jensen and Meckling [36]. Traditionally, the principal-agent relationship is regarded as a contractual relationship [36]. In a comprehensive sense, the agency problem is caused when a certain agent depends on the action of another person in a principal-agent relationship [37]. The principal-agent relationship is a general phenomenon and “a pervasive fact of economic life” [38]. Jensen and Meckling [36] indicated that the principal-agent relationship exists in all organizations and cooperative activities, such as corporate management, universities, conferences, and government agencies.

In the relationship between state and university, states are considered to be the principal because the governments delegate the state’s educational goals to universities [39]. Universities were formed and funded by the government to fulfill the need of society to create, preserve, and transmit knowledge. The agent problem arises when (a) the principal and the agent have conflicting goals and/or (b) there is information asymmetry between them. Universities perform diverse functions, and the organizational goals of universities are complicated, ambiguous, and dynamic. Moreover, universities with multiple groups that have different interests [40] reinforce goal conflict within universities. Information asymmetry arises when the principal lacks information about the agent’s work. Universities use diverse and complicated mechanisms in their production [41], and use intensive technology that requires various skills. Universities have the characteristics of joint production, in which various outputs are produced at once [42]. Due to these characteristics, the process through which professors produce and provide knowledge is difficult to monitor and control [30]. These factors lead to information asymmetry.

Goal conflict and information asymmetry activate the possibility of agent problems, such as adverse selection and moral hazard. These problems can be illustrated using the model of revenue theory of cost [43] and the utility-maximizing models [44]. For example, the revenue theory of cost model assumes that universities raise as much money as they can and then spend it all.

In the context of the government–university relationship, the principal–agent theory could provide a useful and applicable framework for analyzing the effects of tuition fee policy on university financial management. Agency problems that may occur in the relationship between government and university or management staff and students in universities include shirking, budget maximization, and cross-subsidization [10]. Shirking is classified into passive shirking, in which the school does not achieve the objective pursued by the government and students, and aggressive shirking, in which the school acts contrary to the objective desired by the government and students [45]. Some examples include professors doing personal consulting rather than focusing on education and research for students, or the university excessively using the budget on publicity and events rather than investing in education and research. There are many accounts related to shirking in the expenditure accounts of universities in Korea. First, operating expenses include welfare benefits, training costs for faculty and staff, general service costs, business operating expenses, publicity costs, meeting costs, event costs, missionary work costs, and other operating expenses, which are costs related to the management of the university rather than costs invested to meet the purposes desired by the government and students, and thus, excessive spending on these items can be regarded as a form of shirking. Expenditure from investments and other assets is also an account to increase the financial income activities of universities rather than investment in education and research. The pursuit of a greater budget involves the act of making efforts to constantly increase the budget and to spend it. This can be determined by the variation of unused balance carried forward to the following term. In cross-subsidization, the budget that must be used for students' education is, in fact, used for the university's management or operations. This includes spending the budget that must be invested in education and research on constructing or buying a new school building, implementing a computer system to reduce the workload of administrative staff, or increasing labor costs [22]. Accordingly, the analysis in this study will be conducted by setting the following research question and hypotheses. Research Question: What are the characteristics of university financial management with regard to tuition control policy? Do universities act with moral hazard in their financial management? To analyze this research question, this study constructs the following hypotheses.

Hypothesis 1. *Universities will display shirking behavior despite tuition fee constraints.*

Hypothesis 2. *Universities will display budget maximization behavior despite tuition fee constraints.*

Hypothesis 3. *Universities will display cross-subsidization behavior despite tuition fee constraints.*

4. Research Design

4.1. Data

This study analyzed private universities in Korea because private universities account for 80% of higher education in Korea, and are under relatively tighter constraints on financial management than national universities. The period of analysis is from 2006 to 2015, because the regulations on tuition fee increase rates in the Higher Education Act were amended in September 2011, and there is a difference in tuition fee increase rates before and after 2011. Although the number of universities slightly varied by year, there were around 93 universities.

This study analyzed the characteristics of financial management in universities based on the account of university expenditure. Information on the account of university expenditure was obtained from the financial statements of universities. The financial statement of a university includes balance sheets, statements of revenues and expenses, and statements of funds flow. This study analyzed the financial characteristics using the statements of funds flow because this statement presents a university's fund income and spending for a certain period. Data regarding the funds flow were collected from the Private School Financial Data System.

In analyzing the effect of tuition fee control, this study uses tuition fees and government subsidies as the explanatory variables because the government started controlling tuition fees with the increase of financial support to universities. As the dependent variables, this study uses expenditure from investments and other assets, fixed asset purchase expenses, and labor costs, among others. Through these variables, we can explore the characteristics of universities' financial management under the tuition fee control policy. For example, operating expenses include welfare benefits, training costs for faculty and staff, general service costs, business operating expenses, publicity costs, meeting costs, event costs, missionary work costs, and other operating expenses related to the management of the university, rather than the costs invested to meet the purposes desired by students; therefore, excessive spending on these items can be regarded as a form of moral hazard. In addition, expenditure from investments and other assets also results in increasing the financial income activities of universities rather than investment in education and research. The pursuit of a greater budget involves making efforts to constantly increase the budget and expenditure. This can be determined by the variation of unused balance carried forward to the following term. Table 3 provides a list of the control variables, independent variables, and dependent variables used in this study.

Table 3. Variables and contents of analysis.

Category	Variable	Note
Control variables	Fiscal year: 2006–2015 Size: Fewer than 5000 students = 1, 5000 to fewer than 10,000 students = 2, 10,000 students and more = 3 Finance size: Fewer than 10 billion KRW = 1, 10 billion KRW to fewer than 50 billion KRW = 2, 50 billion to 100 billion KRW = 3, 100 billion KRW to 200 billion KRW = 4, 200 billion KRW and more = 5 University establishment year	
Independent variables	Tuition fee	
	Government subsidies	
Dependent variables	Operating expenses	shirking
	Expenditure from investments and other assets	shirking
	Fixed asset purchase expenses	shirking
	Unused balance carried forward to the following term	budget maximization
	Labor costs	cross-subsidization
	Research expenses	cross-subsidization
	Laboratory fees	cross-subsidization
	Student support fees	cross-subsidization

The mean value of tuition fees is 93,513,167 KRW (one US dollar is equivalent to 1180 Korean won) and the mean value of government subsidies is 9,853,121 KRW. Among the expenditures, labor costs make up the largest portion (see Table 4).

Table 4. Descriptive statistics. (Unit: 1000 KWR).

	Mean	Min.	Max.
Tuition fees	93,513,167	7,366,817	383,330,038
Government subsidies	9,853,121	1	66,359,084
Labor costs	60,953,790	4,532,384	482,828,806
Operating expenses	16,242,164	1,443,113	123,557,121
Research expenses	4,221,199	1	79,950,857
Laboratory fees	1,801,100	56,887	9,283,436
Student support fees	2,658,183	5029	22,782,981
Expenditure from investments and other assets	12,704,207	1	180,521,886
Fixed asset purchase expenses	17,184,608	220,055	142,486,789
Unused balance carried forward to the following term	8,764,900	1	120,581,735

4.2. Method of Analysis

To analyze the effects of tuition fee control policy on university financial operation, this study used panel data. Before using the panel data regression model, this study tests the stationarity of the data. The results of the LLC (Levin, Lin and Chu [46]) panel unit root test and Fisher stationary test indicate that all variables satisfy data stationarity at the level of trans-log variables (see Table 5).

Table 5. Results of unit root test.

	Variable	LLC	Fisher
Label variables	Tuition fees	−5.0838 ***	4.5162 ***
	Government subsidies	5.5706	7.8925 ***
	Labor costs	−1.4675 *	0.2549 ***
	Operating expenses	−4.0846 ***	1.7872 **
	Research expenses	−10.3454 ***	3.9814 ***
	Laboratory fees	−5.2519 ***	6.2017
	Student support fees	−2.5769 **	2.5867 **
	Expenditure from investments and other assets	−23.0822 ***	6.4828 ***
	Fixed asset purchase expenses	−9.0398 ***	9.3314 ***
	Unused balance carried forward to the following term	−8.3428 ***	2.9690 **
Log-trans variables	Tuition fee	−5.8952 ***	8.9989 ***
	Government subsidies	−26.1368 ***	14.2754 ***
	Labor costs	−3.6059 ***	3.4120 ***
	Operating expenses	−9.0974 ***	1.8012 **
	Research expenses	−5.3402 ***	2.0106 ***
	Laboratory fees	−6.4330 ***	8.4936 ***
	Student support fees	−5.2303 ***	1.3841 **
	Expenditure from investments and other assets	−12.3069 ***	10.6963 ***
	Fixed asset purchase expenses	−9.8209 ***	8.6506 ***
	Unused balance carried forward to the following term	−16.2357 ***	7.5542 **

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

As the stationary test results indicate, we use logged variables in model specification. Because logged variables minimize the influence of outliers, they are appropriate when the distribution of a variable is skewed. Using logged specification, the pooled Ordinary Least Square (OLS) model can be considered. This model can be presented in the following form:

$$\ln y_{it} = \alpha + \beta_i \ln x_{it} + \varepsilon_{it}, \quad i = 1, \dots, n; t = 1, \dots, t$$

where y_{it} = university expenditure vectors, α = constant, and x_{it} = tuition and government fund.

In the pooled OLS model, it is presumed as $\varepsilon_{it} = \delta_i + e_{it}$. However, as the data used in this research are panel data, we can consider the panel data regression model. To use the panel data regression model, it is necessary to consider whether δ_i is 0 for all panel entities. This can be done using the Breush Pagan Lagrangian (BPL) Multiplier test. The BPL test shows that panel data analysis is suitable in all variables. Therefore, we decided to use the panel data model, which can be written as follows:

$$\ln y_{it} = \alpha + \beta \ln x_{it} + u_i + e_{it} \quad i = 1, \dots, n; t = 1, \dots, t$$

where y_{it} = university expenditure vectors, α = constant, and x_{it} = tuition and government fund.

To use the panel data regression model, the Hausman test was conducted to select either the fixed or random effects model. The Hausman test results (Table 6) show that laboratory and fixed asset variable models are more suitable than the random effects model. Except for the two dependent variables, all models indicate that the fixed effect is suitable.

Table 6. Results of the Hausman test.

Labor Costs	Operating Expenses	Research Expenses	Laboratory Fees	Student Support Fees	Expenditure from Investments and Other Assets	Fixed Asset Purchase Expenses	Unused Balance Carried Forward to the Following Term
0.5	0.18	0.28	5.18 *	4.16	0.72	6.37 *	1.27

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

For research consistency, this research uses the fixed effect model. To analyze the effects of individual characteristics, the time characteristic effect is used as a dummy variable. The model can be presented as follows:

$$\ln y_{it} = \alpha + u_i + \beta \ln x_{it} + e_{it} \quad i = 1, \dots, n; t = 1, \dots, t \quad (1)$$

where y_{it} = university expenditure vectors, α = constant, x_{it} = tuition and government fund, and u_i = year dummy from 2006 to 2015.

To investigate the response and behavior of universities to tuition, we estimate the marginal effects of tuition fees and government subsidies. Using polynomial regression, the marginal effects of tuition fees and government subsidies can be presented as follows:

$$\ln y_{it} = \alpha + \beta_1 \ln \pi_{it} + \beta_2 \ln \pi_{it}^2 + \gamma_1 \ln \varphi_{it} + \gamma_2 \ln \varphi_{it}^2 + \delta \ln x_{it} + u_i + \varepsilon_{it}, \quad (2)$$

where y_{it} = university expenditure vectors, α = constant, β_1 = tuition fees, β_2 = tuition fee square, γ_1 = government subsidies, and γ_2 = government subsidy square.

5. Results

As a preliminary analysis, this study first examines the rate of change in variables. Tuition fees increased by 2.54% on average compared to 2007, but government subsidies increased by 38.65%. The percentage of government subsidies is higher than that of any other variables. This implies that the government provides a monetary incentive to minimize tuition fee increases. Student support fees showed a relatively significant increase compared to other variables, and a decrease after 2012.

The average rate of research expenses and fixed asset purchase expenses was negative. Labor costs increased by 0.711% on average, but the rate decreased from 2011 onward. The same pattern was observed in research expenses, fixed asset purchase expenses (Table 7).

Table 7. Change rate of variables (Unit: Percentage).

	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
Tuition fee	9.092	7.794	1.304	3.883	3.386	-2.284	-0.135	0.890	-0.995	2.548
Government subsidies	8.570	36.428	100.466	19.575	7.403	107.680	39.059	20.077	8.675	38.659
Labor costs	6.505	8.107	4.458	6.322	5.941	4.715	3.357	2.310	2.461	4.908
Operating expenses	11.252	9.158	3.802	7.533	6.180	1.036	0.628	2.441	-0.980	4561
Research expenses	14.125	-5.551	1.927	1.509	2.516	-1.755	-3.494	-6.026	-4.796	-0.172
Laboratory fees	4.033	6.036	8.768	6.212	8.435	-3.512	0.278	-1.520	-3.624	2.790
Student support fees	13.043	13.765	19.309	15.078	12.918	11.496	-0.341	-0.655	1.671	9.587
Expenditure from investments and other assets	30.744	-4.078	5.594	-4.745	11.735	-32.190	-2.244	5.537	-2.232	0.902
Fixed asset purchase expenses	8.164	-4.974	-5.409	9.149	0.230	-5.029	-9.313	-4.372	-9640	-2.355
Unused balance carried forward to the following term	9.675	18.619	11.833	7.212	10.941	-7.980	-22.097	-13.076	-8.729	0.711

To analyze the effects of tuition fees on financial management, a fixed model was conducted first. The control variables show different values according to each model. For example, universities with large-scale finances would spend more money on labor, operation, and laboratory costs along with student support fees, whereas there was no difference in research costs, expenditure from investments, and other assets. Relating to the year of establishment, if universities were recently established, they tend to spend less money on labor costs, research costs, laboratory fees, and expenditure from investments and other assets. It is plausible to assume that older universities invest more money on labor and research costs as well as laboratory fees than recently established universities.

Turning to the present study's core focus, the impact of tuition fees turned out to be significant at a level of 0.001 for all dependent variables, except unused balance carried forward to the following term. This result indicates that tuition increase is positively and significantly associated with university financial expenditure. However, the government subsidies variable shows different behaviors, as it is only significant for variables such as labor costs, operating expenses, laboratory fees, and student support fees (Table 8).

We estimated the effect of tuition fee control policy in universities by including a Least Squares Dummy Variable (LSDV) model. We found that universities increased labor costs, operating expenses, and student support fees even after 2011. However, other models, such as research expenses, laboratory fees, and expenditure from investments and other assets, did not show significant differences from 2006. This finding indicates that universities would be more likely to increase their labor costs, operating expenses, and student support fees rather than increasing their research expenses, laboratory fees, and expenditure from investments and other assets. This implies that universities show the tendency to not invest their expenditure in long-term development. With such results, it is logical to assume that spending cuts as a method of financial constraint are a popular strategy [7], but decreases in expenditure are undertaken differently in terms of items.

In addition to the LSDV model, we can test whether the relationship between tuition fees and each expenditure is nonlinear by examining the squared tuition fee variable (Table 9). Holding all other variables constant, if tuition fee proves to be positive and tuition fee square proves to be negative, the average expenditure will first increase as tuition fee increases, but at a diminishing rate.

Table 8. Results of the fixed model.

Variables	Labor Costs	Operating Expenses	Research Expenses	Laboratory Fees	Student Support Fees	Expenditure from Investments and Other Assets	Fixed Asset Purchase Expenses	Unused Balance Carried forward to the Following Term
	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
2007	-0.01476 (0.02828)	0.02942 (0.03829)	-0.29437 (0.21530)	-0.03216 (0.05692)	0.07339 (0.08135)	0.19713 (0.27129)	-0.0895 (0.10077)	0.06827 (0.33895)
2008	-0.00123 (0.02891)	0.05373 (0.03914)	-0.37764 (0.22010)	-0.04957 (0.05819)	0.08899 (0.08316)	0.26373 (0.27734)	-0.03832 (0.10302)	0.32757 (0.34651)
2009	0.02181 (0.03016)	0.06809 (0.04084)	-0.19920 (0.22962)	-0.00080 (0.06070)	0.17710 (0.08676)	0.22303 (0.28933)	-0.05294 (0.10747)	0.78988 * (0.36149)
2010	0.04474 (0.03096)	0.10817 * (0.04192)	-0.34752 (0.23570)	0.02670 (0.06231)	0.25682 * (0.08905)	0.45069 (0.29699)	-0.06073 (0.11032)	1.04254 ** (0.37107)
2011	0.08719 ** (0.03137)	0.16186 *** (0.04247)	-0.13834 (0.23882)	0.09393 (0.06314)	0.33886 *** (0.09023)	0.29161 (0.30092)	-0.06897 (0.11178)	1.18069 ** (0.37598)
2012	0.14862 *** (0.03314)	0.17923 *** (0.04487)	-0.23124 (0.25233)	0.03539 (0.06671)	0.34256 *** (0.09534)	0.01490 (0.31794)	-0.10851 (0.11810)	1.10039 ** (0.39724)
2013	0.17934 *** (0.03404)	0.16132 *** (0.04609)	-0.36277 (0.25916)	0.02197 (0.06851)	0.31807 ** (0.09792)	-0.22887 (0.32655)	-0.29921 * (0.12130)	0.74546 * (0.40800)
2014	0.19776 *** (0.03460)	0.16181 *** (0.04685)	-0.33982 (0.26341)	0.01604 (0.06964)	0.29624 ** (0.09953)	-0.19081 (0.33191)	-0.37022 ** (0.12329)	0.57306 (0.41470)
2015	0.22787 *** (0.03478)	0.15175 *** (0.04709)	-0.40713 (0.26478)	0.00869 (0.07000)	0.30619 ** (0.10004)	0.19899 (0.33363)	-0.55517 *** (0.12393)	0.40590 (0.41684)
Size 2	0.00568 (0.03377)	-0.16353 *** (0.04573)	1.07321 *** (0.25712)	-0.39731 *** (0.06797)	0.12522 (0.09715)	0.02251 (0.32399)	-0.30039 * (0.12035)	0.49460 (0.40480)
Size 3	0.20578 *** (0.04993)	-0.19757 ** (0.06761)	0.84919 * (0.38016)	-0.46930 *** (0.10050)	0.16738 (0.14364)	-0.57829 (0.47902)	-0.24054 (0.17794)	1.27007 * (0.59850)
Finance size 2	-0.08645 (0.07106)	-0.04505 (0.09622)	-1.26558 * (0.54104)	-0.12601 (0.14303)	0.25969 (0.20442)	-1.34524 * (0.68173)	-0.89541 *** (0.25324)	-3.43467 *** (0.85177)
Finance size 3	0.11619 * (0.06669)	0.24477 ** (0.09031)	-0.50636 (0.50778)	0.48793 *** (0.13424)	0.54865 ** (0.19186)	-0.34339 (0.63983)	-0.08124 (0.23767)	-1.35397 * (0.79941)
Finance size 4	0.56976 *** (0.07855)	0.37265 *** (0.10636)	-0.14532 (0.59806)	0.64218 *** (0.15811)	0.60163 ** (0.22597)	0.52592 (0.75359)	-0.06373 (0.27993)	-2.31693 * (0.94155)
Finance size 5	0.62062 *** (0.07778)	0.82258 *** (0.10531)	-0.41478 (0.59218)	0.51976 *** (0.15655)	0.83239 *** (0.22374)	0.47565 (0.74617)	0.63097 * (0.27717)	0.31588 (0.93228)
Year	-0.00084 * (0.00042)	0.00003 (0.00057)	-0.0065 * (0.00322)	-0.00450 *** (0.00085)	0.00235 (0.00122)	-0.01328 *** (0.00406)	-0.00436 ** (0.00151)	-0.0033 (0.00507)
tuition fee	0.71858 *** (0.02958)	0.739 *** (0.04006)	1.31021 *** (0.22523)	0.91076 *** (0.05954)	0.72633 *** (0.08510)	1.57892 *** (0.28380)	0.65774 *** (0.10542)	-0.32858 (0.35459)
government subsidies	0.01338 *** (0.00506)	0.02026 *** (0.00685)	0.01060 (0.03851)	0.02347 * (0.01018)	0.07606 *** (0.01455)	-0.07408 (0.04852)	0.00344 (0.01802)	-0.02347 (0.06062)

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The results of polynomial regression for labor costs indicate that tuition fee proves negative, whereas tuition fee square proves positive. This implies that labor costs will increase as the tuition fees increase, but at an increasing rate. We found similar results in the operating expenses and student support fee models. However, the negative tuition fee squared coefficient in research expenses, expenditure from investments and other assets, and unused balance carried forward to the following term models indicate that the effect of tuition fees diminishes as tuition fees increase. Government subsidies provide different results compared to tuition fees. It is important to note that the research cost, expenditure from investments and other assets, and unused balance carried forward to the following term models show different signs between tuition fees and government subsidies.

Table 9. Results of the polynomial regression model.

	Labor Costs	Operating Expenses	Research Expenses	Laboratory Fees	Student Support Fees	Expenditure from Investments and Other Assets	Fixed Asset Purchase Expenses	Unused Balance Carried Forward to the Following Term
	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
Size 2	0.10932 ** (−0.03547)	−0.0755 (−0.04949)	0.90783 ** (−0.28127)	−0.36045 *** (−0.07475)	0.35643 ** (−0.10414)	−0.33384 (−0.35398)	−0.31036 ** (−0.1323)	−0.18047 (−0.44232)
Size 3	0.28677 *** (−0.04893)	−0.12888 * (−0.06826)	0.74141 * (−0.38799)	−0.44008 *** (−0.10311)	0.34773 ** (−0.14366)	−0.82654 * (−0.4883)	−0.24356 (−0.1825)	0.76844 (−0.61015)
Finance size 2	−0.02854 (−0.06824)	0.00312 (−0.09521)	−1.11739 ** (−0.54119)	−0.10065 (−0.14382)	0.38524 * (−0.20038)	−1.20538 * (−0.6811)	−0.84749 ** (−0.25456)	−3.52164 *** (−0.85106)
Finance size 3	0.15811 ** (−0.06394)	0.28038 ** (−0.08922)	−0.57538 (−0.50708)	0.50281 ** (−0.13475)	0.6422 ** (−0.18776)	−0.49051 (−0.63818)	−0.08574 (−0.23852)	−1.62956 ** (−0.79744)
Finance size 4	0.55514 *** (−0.07513)	0.35987 ** (−0.10482)	−0.03909 (−0.59578)	0.63863 *** (−0.15833)	0.56775 ** (−0.2206)	0.69299 (−0.74981)	−0.0439 (−0.28024)	−2.12168 ** (−0.93692)
Finance size 5	0.52856 *** (−0.07529)	0.7445 *** (−0.10504)	−0.29402 (−0.59706)	0.4865 ** (−0.15866)	0.62742 ** (−0.22107)	0.75534 (−0.75142)	0.63401 ** (−0.28083)	0.88397 (−0.93893)
Year	−0.00055 (−0.00041)	0.00029 (−0.00058)	−0.00848 ** (−0.00328)	−0.00442 *** (−0.00087)	0.00305 ** (−0.00121)	−0.01638 *** (−0.00413)	−0.00472 ** (−0.00154)	−0.00705 (−0.00516)
tuition fee	−2.79458 *** (−0.6576)	−2.26815 ** (−0.91749)	12.46893 ** (−5.21486)	−0.2286 (−1.38582)	−7.1948 ** (−1.93091)	21.48103 ** (−6.56308)	2.23008 (−2.45289)	29.25179 ** (−8.20085)
tuition fee square	0.09578 *** (−0.01818)	0.08202 ** (−0.02537)	−0.31302 ** (−0.1442)	0.03089 (−0.03832)	0.21609 *** (−0.05339)	−0.55498 ** (−0.18149)	−0.04482 (−0.06783)	−0.81707 ** (−0.22678)
government subsidies	−0.07617 *** (−0.01381)	−0.05399 ** (−0.01927)	−0.2761 ** (−0.10951)	−0.01689 (−0.0291)	−0.11722 ** (−0.04055)	−0.37141 ** (−0.13782)	−0.08345 (−0.05151)	0.04165 (−0.17221)
government subsidies square	0.00556 *** (−0.00082)	0.00461 *** (−0.00115)	0.01864 ** (−0.00654)	0.00252 (−0.00174)	0.01198 *** (−0.00242)	0.01965 ** (−0.00823)	0.00558 (−0.00307)	−0.00302 (−0.01028)

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

6. Discussion

Tuition fee increase has become an important issue in Korea since the early 2000s. Along with public concerns about tuition fees, the government made efforts to address these problems with the amendment of the Higher Education Act. Using data from the financial statements of private universities, this study aimed to provide important insight into higher education policies while examining the impact of the tuition fee policy on university financial management. This study briefly examines the average tuition increase in percentage change by year. The findings revealed that government tuition fee policies have been effective in controlling tuition fees after 2011. While the tuition fee increase rate slowed down after 2011, government subsidies showed a critical increase rate. The tuition fee control policy has major implications for universities in Korea because tuition is the largest source of revenue for most universities, comprising 65% of their total revenue. With this background, this study analyzed the effects of tuition fee control on university expenditures, such as labor costs, operating expenses, research expenses, laboratory fees, and student support fees. The effect of tuition fee control was examined using the LSDV model. The results indicate that universities increase their spending in some items, such as labor costs, operating expenses, and student support fees, while there is no difference in research expenses, laboratory fees, and expenditure from investments and other assets. Based on the principal–agency theory, the findings regarding labor costs and operating expenses are intuitive, but those pertaining to student support fee increases are not. These results can be explained by considering government subsidies. As mentioned above, the Korean government has increased their subsidies to enhance university capability in a competitive situation. Most government subsidies include student capability enhancement projects, and these subsidies flow into universities through the university matching the fund. In addition, government subsidies increased through scholarships for students, and thus expenditure on students also increased. In this context, it is plausible to understand that the increase in student support fees after 2011 arose from government subsidies. However, there is no significant increase in research expenses, laboratory costs, and expenditure from investments and other assets. In the case of fixed asset purchase expenses, we found that expenditure decreased after 2011. These results prove the existence of a moral hazard in university expenditure under financial constraints. The labor costs of faculty and staff are essential for education and research,

and increasing these costs does not necessarily mean that education and research were neglected. It is natural for universities to use selective reinvestment because comprehensive coverage is considered unviable for universities in a financial constraint situation. These differences may result from the differences in universities' priorities and organizations' purposes. However, it is important to note the universities' behaviors and responses. When universities face financial constraints, it is said that some initiatives, such as decreasing the number of full-time faculty members, decreased course and program offerings, and reduced library and student services are undertaken in the name of cost reduction [7]. However, this study provides different results, namely that universities seek other methods to avoid financial constraints. The results indicate that universities cut their spending in specific areas; however, in certain areas, universities tended to pursue benefits such as labor and operating costs.

These findings added to our understanding about universities' characteristics. One perspective on universities' characteristics considers the university as an academic community that shares the same values and norms and makes consensual decisions [47]. Universities are operated as per the norms and values of learning that are shared among not only the professors, but also other members of the university [48]. Another perspective views universities as complex organizations with an official hierarchy and a series of regulations. In these perspectives, all universities have official communication channels and bureaucratic stages of authority [49]. However, universities have multiple members in their organizational structures, such as the president, chairman, board of directors, professors, students, and staff, and have complicated decision-making and execution processes that reflect their education and research capabilities. In addition, as Liefner [30] notes, there are numerous principals and agents in higher education institutions. Furthermore, we find that professors themselves have different goals because they increase their labor cost while decreasing research expenditure. This study provides the evidence that members of a university have different goals and preferences [45], and there may be conflicts in their preferences and priorities.

In addition to the LSDV model, the polynomial regression model provides the result that universities behave differently according to resources, whether they are tuition fees or government subsidies. The labor costs, operating expenses, and student support fees show an increase as the tuition fees increase with an increasing rate for both tuition fees and government subsidies. Research expenses and expenditures from investments and other assets increase as tuition fees increase with a diminishing rate. In contrast, research expenses and expenditure from investments and other assets increase as government subsidies increase with an increasing rate. It is important to note that these results are relevant to principal–agency theory. There is the relationship between the government as principal and the university as agent [50]. Principal–agency theory can be used to understand motivations and the impact of competing demands on the decision-making of universities [51]. Applying the principal and agent model, this study provides the evidence that universities have different organizational interests according to resources. In a situation where the introduction of tuition fee control policy could be seen as a threat to universities [2], this study reveals the pattern that universities raise as much money as they can and spend all the money from government subsidies: The so-called revenue theory of cost [43]. However, with tuition fees, universities show different patterns in specific expenditures, such as research expenses and expenditure from investments and other assets. This result provides the evidence that the attempt to integrate the perspective of principal and agency theory into the sphere of financial management between government and university is successful [51]. It is important to note some of the key perceptions and insights that principal and agency theory could offer for university financial management.

In this context, it is necessary to adapt the performance-based research funding system. In Korea, the government employs a performance-based system in the area of university education, while there is no systematic performance-based system for university research [52]. The performance-based funding system reduces the risk of adverse selection and moral hazard problems. This system makes universities more autonomous and increases productivity along with more strategic university management [53].

At the university level, it is necessary to rethink universities' planning and management practices from a general fund approach and centralized, incremental budgeting to an incentive-based budget system or Responsibility Center Management [25]. Until now, most Korean universities have used centralized and incremental budgeting. Given that goal conflicts and information asymmetries are relevant in the university context, it is necessary to improve decision-making through better information and an incentive mechanism. An incentive-based budget system provides better information for the unit level to increase planning capacity [54]. In addition, an incentive-based system devolves budget responsibility to academic units to create the incentive for academic units to generate revenues and decrease costs [29].

7. Conclusions

The rapid growth of higher education tuition fees has led to greater interest in higher education policy and scholarship. The Korean government amended the Higher Education Act to strengthen control over tuition fee increase and set a limit on the increase, and it has also been implementing policies to control tuition fee increase through various financial projects. In this situation, this study investigated the effect of the tuition fee control policy and examined the characteristics of financial management in universities under tuition fee constraints.

An analysis was conducted on the income and expenditure structure of university finance. The results showed that the increase rate of tuition fees decreased after 2011, but that on government subsidies increased significantly. Government policy to increase subsidies tends to be suppressing tuition increase. In addition, this study further examined the characteristics of financial management in universities using the principal–agent model. This study examined the effects of tuition fees and government subsidies on dependent variables such as labor cost, operating expenses, and so on. Using an LSDV model, this study investigated the effects of tuition fees on individual models. The LSDV results indicate that universities increase labor costs, operating expenses, and student support fees. Relating to student support fee increase, this study explains that this increases through government subsidies and scholarships. In the case of research expenses, laboratory fees, and expenditure from investment and other assets, we found no difference from 2006. Using polynomial regression, this study found that universities tend to behave differently according to source, whether it is from government or tuition. Applying the principal and agent theory, this study suggested the necessity of a performance-based research system in research at government levels and an incentive-based budget system in universities.

Despite such significance, this study has some limitations. While it analyzed the characteristics of financial management under tuition fee constraints, it failed to examine the changes in financial structure that may have been caused by tuition fee constraints. It is necessary to examine how financial structures, such as financial stability, growth, and soundness, have changed due to tuition fee constraints. Furthermore, while this study examined the characteristics of financial management under tuition fee constraints, it did not review financial expenditure related to university performance. It is thus necessary to review whether the increase or decrease of expenditure relates to university performance.

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