

Chapter 4: Empirical Results

4.1 Descriptive statistics analysis

With testifying the model, I can prove what the information selected variables is revealed. In this section, the OLS analysis is used to test the expected results by the statistical software package. Operating performance has long been the focal variable in higher education.

First of all, descriptive statistics were computed and an OLS model for all relevant variables that the samples are applied separately. Table 4-1 shows descriptive statistics analysis as follow.

Table 4-1 Descriptive statistics of selected variables

Variable	Mean	Std. Dev.	Minimum	Maximum
SUR	424584838.	364048098.	.000000000	.357039112E+10
ROL	10.7383346	9.79460468	.541567999	48.2728011
FIXO	33.3068124	11.4973054	1.21437301	82.2864569
FIXAD	353841202.	316804565.	.000000000	.257026259E+10
TA	61469036400	31051548800	13992735100	191296822000
CR	718.080393	761.249014	13.5104048	3902.40114
SUB	315588492	323534347	1062000.00	29490109400
TUITR	62.8757257	19.1641302	4.34993886	87.2358111
SUBTR	22.6582401	16.0954968	.299510968	93.4772799
AUDTR	3.55348843	5.06379848	.000000000	47.8792987
PE	431938920	368683356	44829347.0	34636462800
ME	100384436	74031889.2	.000000000	768283933
CETR	78.7038344	22.0901090	18.2759921	259.383947
MELIS	18802.8849	20066.4308	.000000000	181879.073
EXPS	212623.841	220180.389	77943.6224	2454390.95
STR	24.0295136	7.06528609	5.92912268	38.7276879
UTS	7.72699434	5.37491405	.000000000	27.2940388
UTEA	21.6494725	8.47924073	5.16666667	48.1402715
GTEA	1.85453058	1.09339135	.000000000	5.46354167
TUIS	95485.0689	14664.4258	9250.74013	186275.605

Source: this study Unit: NT.dollars.

Our 264 samples consist of 24 private universities from 1995 to 2005. Descriptive statistics are presented by mean, standard deviations, minimum, and maximum. Also, analyses of variance are used to detect significant difference among variables. Finally, this regressions analysis is done to determine whether there are significant relationships between surplus and independent variables as a whole.

The correlation analysis of each variable in order to understand whether there is highly correlated relation or not. The results show a clear and strong relationship between ratios of student-teacher and performance. Table 4-2 shows correlation matrix for listed variables as follow. As you can see it, surplus, with other independent variables in order to see the correlation between each of variables in this correlation analysis. I testify the correlation coefficients between surplus and other independent variables. The correlation results of all listed variables presented in Table 4-2.

Table 4-2 shows that surplus is at its significant level with some of the variables. The highest significant level with positive significance is between surplus and TA and the correlation coefficient is 0.52. ROL and UTS have the highest level with negative significance. The coefficient is -0.35. ROL and UTEA have the highest level with positive significance and the coefficient is 0.42. After all, in this analysis, UTEA and STR have the highest level with positive significance and the coefficient is 0.84. That proves both of the variable have a highly positive relationship. As you can see the next page that Table 4-2 shows correlation matrix for listed variables.

	SUR	ROL	FIXO	FIXAD	TA	CR	SUB	TUITR	SUBTR	ADUTR	PE	ME	CETR	MELIS	EXPS	STR	UTS	UTEA	GTEA	TUIS
SUR	1.00																			
ROL	-0.18	1.00																		
FIXO	0.16	0.08	1.00																	
FIXAD	0.50	-0.02	0.08	1.00																
TA	0.52	-0.23	-0.07	0.39	1.00															
CR	-0.06	-0.13	0.20	-0.12	-0.08	1.00														
SUB	-0.53	-0.20	-0.29	0.40	0.43	-0.49	1.00													
TUITR	-0.35	0.23	0.34	-0.16	-0.33	0.09	-0.58	1.00												
SUBTR	0.27	-0.14	-0.16	0.08	0.02	-0.07	0.63	-0.68	1.00											
ADUTR	0.04	-0.06	0.23	0.12	0.06	-0.09	0.03	-0.03	-0.10	1.00										
PE	0.47	-0.12	0.15	0.75	0.48	-0.09	0.58	-0.14	0.04	0.21	1.00									
ME	0.36	-0.21	0.13	0.35	0.62	0.03	0.66	-0.05	-0.14	0.25	-0.03	1.00								
CETR	-0.29	0.02	-0.12	-0.22	-0.04	-0.04	-0.36	0.40	-0.13	-0.10	-0.19	-0.03	1.00							
MELIS	0.23	-0.19	-0.32	0.09	0.11	-0.04	0.32	-0.68	0.54	0.30	0.07	0.17	-0.31	1.00						
EXPS	0.49	-0.14	-0.28	0.29	0.14	-0.06	0.46	-0.72	0.62	0.12	0.26	-0.03	-0.37	0.71	1.00					
STR	-0.12	0.08	0.33	0.06	-0.13	0.03	-0.29	0.70	-0.61	0.13	0.10	0.15	0.15	-0.59	-0.56	1.00				
UTS	0.18	-0.35	-0.34	0.08	0.35	-0.19	0.37	-0.52	0.34	-0.14	0.07	0.17	0.01	0.36	0.30	-0.31	1.00			
UTEA	-0.08	0.02	0.42	0.06	-0.12	0.13	-0.28	0.67	-0.54	0.18	0.13	0.14	0.07	-0.56	-0.52	0.84	-0.55	1.00		
GTEA	0.06	-0.33	0.05	0.04	0.24	-0.09	0.12	0.00	-0.11	0.06	0.08	0.26	0.13	-0.10	-0.13	0.32	0.64	0.09	1.00	
TUIS	0.09	-0.03	-0.27	-0.06	0.28	-0.16	0.05	-0.28	0.02	-0.10	-0.00	0.11	-0.23	0.30	0.18	-0.33	0.45	-0.43	0.24	1.00

4.2 Results of simple regressions analysis

In this section, I will describe and explain empirical results of each regression equation. The association between dependent and independent variables is going to be investigated completely. To determine what the association is between surplus and related variables, I obtain the data for demonstrating the operating performance. In this paper we exploit a uniquely rich data set to answer the questions. The testified processes are recognized and described, and the regression results are presented.

Table 4-3 The results of simple regressions analysis

Variable	Coefficient (t-ratio)	Relationship with surplus
ROL	-6.78296076 (-3.004)***	Negative significance
FIXO	4.97054982 (2.573)**	Positive significance
FIXAD	.58460001 (9.565)***	Positive significance
TA	.06060213 (9.774)***	Positive significance
CR	-0.29084.81 (-.986)	No significance
SUB	.59713537 (10.135)***	Positive significance
TUITR	-6.62421024 (-6.022)***	Negative significance
SUBTR	6.11584681 (4.546)***	Positive significance
ADUTR	2.86683939 (.646)	No significance
PE	.46118464 (8.550)***	Positive significance
ME	1.79248403 (6.336)***	Positive significance
CETR	-4.70591465 (-4.823)***	Negative significance
MELIS	4.13222903 (3.786)***	Positive significance
EXPS	0.81346071 (9.147)***	Positive significance
STR	-6.31579822 (-1.999)**	Negative significance
UTS	12.1721888 (2.957)***	Positive significance
UTEA	-3.51288871 (-1.329)	No significance
GTEA	19.9121555 (.970)	No significance
TUIS	2.24338032 (1.469)	No significance

Data Source: this study, Sample Size n=264. P<0.01***, P<0.05**, P<0.1*

Table 4-3 displays the statistical results: of the 19 variables, 14 of them have a P-value extremely smaller than 0.05. That also indicates that there are significant performance variation between surplus and 12 independent variables, including ROL, FIXO, FIXAD, TA, SUB, TUITR, SUBTR, PE, ME, CETR, MELIS, EXPS, STR, and UTS. Also, the rest of the independent variables, LO, ADUTR, UTEA, GTEA, TUIS are not related to surplus (SUR) significantly, all at a significant level of 0.05. The empirical results of the OLS regression show in Table 4-4 in mean of other way.

**Table 4-4 Relationships between dependent variable
and independent variables**

Positive Significance (10)	Negative Significance (4)	No significance (5)
FIXO	ROL	CR
FIXAD	TUITR	ADUTR
TA	CETR	UTEA
SUBTR	STR	GTEA
MELIS		TUIS
EXPS		
UTS		
SUB		
ME		
PE		

Notes: (1) * is the number of variables. Source: this study

As you can see, eight of all measures were strongly positive correlated. Of the 18 correlations, it can be seen that 8 are positive and 4 are negative significance.

For further consideration, I explain the results of conducting separately. The work summarizes the salient features of the analysis, several findings are of interest. According to Table 4-3, the impact of the independent variables on surplus is partially supported. All correlations were significant at <0.05 , unless otherwise indicated. Let's talk about the relationship between surplus and independent variables in details as follow.

(1) ROL

Firstly, if debt ratio is too high, we can say, the private university is short of equity capital and will have some kinds of difficulties in facing uncertainty. ROL has a negative significance on surplus. Therefore, the result fits the intuitive thinking: it is more difficult to generate income when the schools have more total liabilities. It reduces the rate of integrating the revenue.

Ratio of total liabilities to total assets is necessary to decrease while requesting better operating performance for the private schools. In table 4-3 we can see that the level of surplus is negative significantly related to ROL (t-ratio>1.96, P-value< 0.05). The result in this case is a high but negative coefficient of $-.678296D+07$.

(2) FIXO

It has a positive significance on SUR. And the coefficient of $.497055D+07$ is found to be statistically significant at 0.05. As a result, we can say that the permanent assets variable is curial factor related to surplus. The result shows that this variable has accumulated at a faster rate while surplus increased.

(3) FIXAD

As shown in Table 4-3, FIXAD and surplus have been shown to be positively correlated with one another. The coefficient is 0.58460001. Therefore, we can determine that there is a positive relationship between them. In terms of the relationships between surplus and FIXAD variables, the results were what we expected.

(4) TA

Total assets variable seems to be closely connected to surplus. Total assets variable is the sum of fixed assets and current assets. As the intuitive thinking, the result of the relationship between total assets and surplus is positive significance. The coefficient is .06060213; it seems that the relationship is weak a little.

But it does not affect the final analysis at all. With the operating assets approach, the results shown in Table 4-3 revealed that surplus not only have significantly beneficial influences on FIXO, but also have strong positive impact on FIXAD and TA.

(5) CR

Current ratio means the access of the institutions to capital. While current ratio is high, the institution performs well financially. However, current ratio and surplus are shown not to be significantly related. The coefficient is -29084.8110.

(6) SUB

Apparently, SUB has a positive significance on surplus. The coefficient is .59713537. Such this school, CGU with much revenue from subsidies and donations has much surplus.

(7) TUITR

The significantly negative relationship between surplus and TUITR showed in Table 4-3. The coefficient between them is $-.662421D+07$. The proven result shows not encourage the schools to enroll students as possible as they can.

Because the schools cannot afford the additional expenditure of students, they have to adopt the methods of funding source more efficiently. And the problem,

TUITR is a negative significance on surplus, would be solved eventually. It is not necessary for the universities to ask high tuition to support them. Also, it shows that it is not necessary to increase the tuition and fees in recent years.

(8) SUBTR

There is a strongly positive significance between SUBTR and surplus. The coefficient is 0.611585D+07. What important is, this result means that the private university needs the supports from the government notwithstanding. However, the items is the sum of subsidies and donation, we cannot testify the relevance among the variables. The donation to the private universities is not very popular in Taiwan.

(9) ADUTR

The data summarized indicate no strong relationship between ADUTR and surplus. The coefficient is .286684D+07. As a consequence, we can say that a private university does not intent to make money from adult education program. Lifelong learning benefit the society, as a result, for the private university, this revenue is not necessary to be the main source of funding.

(10) PE

The coefficient is .46118464. As you can see Table 4-3 shows that PE and surplus have a positive significance relationship.

(11) ME

The coefficient is 1.79248403. Based on the data, there is a positive significance relationship between surplus and ME.

(12) CETR

CETR is negative significantly associated with surplus variables. The coefficient is -4.70591×10^7 . According to the financial data, it presents that when the higher ratio of current expenditure, the less the surplus of a private university.

It is an intuitive result for the relationship between expenditure method and income method. If a university spends money more, it is nature that the school has fewer surpluses. However, we can see that there is a negative relationship between them. So, the president of a private university does not have to reduce the current expenditure anytime. The heavy expenditure does not affect surplus negatively a lot.

(13) MELIS

But, in these items, it is said to see that the result is not associated with the above one. MELIS variable is significantly moderately positively related to surplus. Apparently, the coefficient is 4132.22903 highly. The resulting coefficient turned out to be a very high number. This result can encourage the schools to spend money on students by buying machinery applications and public books more.

(14) EXPS

Expenditure per student has a positive significance on surplus. The coefficient is 813.460707. That means all the selected universities do not have to reduce the annual expenditure in order to obtain surplus more. We can summarize MELIS and EXPS variables to conclude that the private university does spend money on all kinds of expenditure, and this result brings a wonderful influence on the operating performance.

(15) STR

Intuitively, the more students mean more tuition, and can benefit the schools. The coefficient is $-0.631580D+07$. STR has a negative significance on surplus. Higher student-teacher ratio shows the fact that we can earn much tuition to pay the salaries for fewer teachers. However, the result presents contrary direction of explains.

We have organized the rest of this paper in the following way: the results show a striking effect of student-teacher ratio on surplus of a private university. The results revealed that student-teacher ratio appears to be an important variable in the operating performance of a private university.

It seems likely that universities would respond to financial crises by not cutting back in this area- to employ full-time teachers more.⁷⁹”Zoghi, Cindy (2003) proved it. There are many papers talking about the relationship between teachers’ salaries and teaching-quality, but we do not have to investigate it here.

(16) UTS

UTS has a positive significance on surplus, the coefficient is $0.121722D+08$. Some universities that allocate much of their resources to graduate programs,⁸⁰ as Estelle James (1989) argued. According to this result, we can encourage a private university to increase the graduate programs in accordance with the number of graduate students.

⁷⁹ See [21] Zoghi, Cindy (2003). “Why Have Public University Professors Done So Badly?” *Economics of Education Review*. Vol. 22(1) p. 45-57.

⁸⁰ See [7] Estelle James, (1989) “College Quality and Future Earnings: Where Should You Send Your Child to College?” *The American Economic Review*, Vol. 79, No. 2, 247-252. May, 1989.

(17) UTEA, GTEA

UTEA and GTEA were neither positively nor negatively related to surplus. The coefficients are $-0.351289D+07$ and $0.199122D+08$. Probably, there is no connection between those variables. Or, those variables that I conduct are not being observed in the statistical progress. However, the result is still helpful for the issues. At least, we can prove that the teaching-quality is not associated with the surplus.

(18) TUIS

Not surprisingly, the findings of such studies were not conclusive, no significant correlation is showed. There is no significant relationship between surplus and TUIS. The coefficient is 2243.38032. Therefore, we can prove that the private university does not have to increase tuition per student in order to have higher surplus. However, according to previous literature, William O. Brown (2001) pointed out; this is not surprising in that higher tuition is generally associated with higher teaching expenditures.⁸¹ Maybe we can testify this result for further study.

As the analysis show above, the result of this study could be useful to the authorities responsible for planning and operating the performance of private universities.

4.3 Results of multiple regressions analysis

Multiple regressions analysis is regarded as the relationship between a dependent variable and independent variables. Also, it is has suggested multiple regressions should be adopted for an assessment of a private university's operating

⁸¹ See [4] this paper has a similar result. William O. Brown (2001) "Sources of Funds and Quality Effects in Higher Education." *Economics of education review* 20(2001)289-295

performance.

The information and summary of the sample will be exposed, such as characteristics of the sample, student-teacher ratio, and so on. When using multiple regressions analysis to identify the relationships between dependent variable and independent variables, the results are more meaningful and specific.

The author testifies the multiple regressions based on the financial and non-financial indicators that classified into four approaches: the operating assets approach, the revenue approach, the expenditure approach, and the teaching-quality approach. These approaches are indicated as earlier section. As you can see the results from Table 4-5 to Table 4-8.

Table 4-5 the multiple regressions (1)

Variable	Regression
Constant	-164.981314 (-2.516)
FIXO	4.95472476 (3.239)***
FIXAD	.39545993 (6.588)***
TA	.04630137 (7.567)***

Note: P<0.01***, P<0.05**, P<0.1* Source: this study

As the apparent result as above, the operating assets approach has a positive significance on surplus.

Table 4-6 the multiple regressions (2)

Variable	Regression
Constant	503.564831 (4.111)
SUB	.63171205 (8.046)***
TUITR	-2.88279995 (-2.045)**
SUBTR	-4.24874750 (-2.379)**
AUDTR	-.22900488 (-.060)

Note: P<0.01***, P<0.05**, P<0.1* Source: this study

Therefore, the revenue approach has a significant relationship on surplus, except AUDTR.

Table 4-7 the multiple regressions (3)

Variable	Regression
Constant	247.976639 (2.888)
PE	1.81936940 (1.917) *
ME	.62208945 (2.149)**
CETR	-1.60943636 (-1.848) *
MELIS	-3.28611274 (-2.572) **
EXPS	.87094256 (7.032) ***

Note: P<0.01***, P<0.05**, P<0.1* Source: this study

As Table 4-7 shows, the expenditure approach has a significant relationship with surplus.

Table4-8 the multiple regressions (4)

Variable	Regression
Constant	246.044659 (1.123)
STR	-13.7902733 (-2.107)**
UTS	24.7630700 (2.854) ***
UTEA	15.6676281 (2.634) ***
GTEA	-41.5818097 (-1.078)
TUIS	.59159502 (.339)

Note: P<0.01***, P<0.05**, P<0.1* Source: this study

In Table 4-8, we can know that STR, UTS, and UTEA have significant

relationship with surplus.

After deleting five variables, CR, ADUTR, UTEA, GTEA, TUIS that have no significance relationship with surplus, we pick up the significant variables to testify multiple regressions. There are 14 variables, FIXO, FIXAD, TA, SUB, SUBTR, PE, ME, MELIS, EXPS, UTS that have positive significance relationships with surplus, and ROL, TUITR, CETR, STR that have negative significance relationships with surplus notwithstanding. For more consideration, we have to testify the OLS model with the same progress as simple regressions analysis.

The relationships between surplus, FIXO, FIXAD, TA, SUBTR, CETR, and so on, are going to be investigated in this section. It is going to find out what the relationship is between dependent and independent variables and how much they weighted in deciding surplus standard. The following parts are the multiple regressions results by different types. And the correlation analysis of each variable is showed in order to understand whether there are highly correlated relationships or not. It is bound to check the degree and direction of association among those variables. The approach is divided into ten groups to check the significant relationships to verify how the difference among them.

Based on the research classification and variable definition, I design the ten groups to explain their relationship with surplus. Also, I try to describe the context of the regression results. The research follows a statistics process structure constructed in chapter three for each of regressions.

As the above tables, surplus and FIXO, FIXAD, TA, and SUBTR have positively significant relationships. Also, surplus and CETR have negatively significant relationship. FIXO and surplus have a positive significance relationship at a level of 0.01 significance. The result shows that FIXO has accumulated at a faster rate while surplus increased. The permanent assets variable is curial factor related to

surplus.

FIXAD and surplus have been shown to be positively correlated with one another. As FIXO variable, we can say that the fixed assets are beneficial to surplus. We suggest that the private universities should emphasize on the fixed assets more.

Total assets variable seems to be closely connected to surplus. As the intuitive thinking, the result of the relationship between total assets and surplus is positive significance. The coefficient is 0.04806944. We suggest that the schools can increase the assets by funding more.

There is a strongly positive significance between SUBTR and surplus. What important is, this result means that the private university needs the supports from the government notwithstanding. However, the items is the sum of subsidies and donation, we cannot testify the relevance among the variables. The donation to the private universities is not very popular in Taiwan. We suggest the schools to develop the specific teaching and unique research programs that attract subsidies and donations more.

CETR is negative significantly associated with surplus variables. According to the financial data, it presents that when the higher ratio of current expenditure, the less the surplus of a private university.

We do not explain the variable that shows above. It means that all the variables are explained once in this section even the variable is applied over one time. The significantly negative relationship between surplus and TUITR at a level of 0.05 significance showed above. The proven result shows not encourage the schools to enroll students as possible as they can. Because the schools can not afford the additional expenditure of students, they have to adopt the methods of funding source more efficiently. And the problem, TUITR is a negative significance on surplus, would be solved eventually. It is not necessary for the universities to ask high tuition

to support them. Also, it shows that it is not necessary to increase the tuition and fees in recent years. We suggest that the schools to look for the funds from other ways.

Expenditure per student has a positive significance on surplus. The coefficient is 748.982953. That means all the selected universities do not have to reduce the annual expenditure in order to obtain surplus more. We suggest that the schools spend money on all kinds of attracting external funds and not afraid of spending too much.

STR has a negative significance on surplus at a level 0.01 significance. Intuitively, the more students mean more tuition, and can benefit the schools. Higher student-teacher ration shows the fact that we can earn much tuition to pay the salaries for fewer teachers. However, the result presents contrary direction of explains. It means that the tuition from more students is not enough to pay the salaries of more teachers. We suggest the school not just enlarge the amount of students. Take CGU and TCU for examples, they are not huge schools comparing to other private universities. They do not have much tuition from the students, but they have huge surplus annual year.

ROL has a negative significance on surplus at a level of 0.05 significance. As a result, it is more difficult to generate income when the schools have more total liabilities. It reduces the rate of integrating the revenue. Ratio of total liabilities to total assets is necessary to decrease while requesting better operating performance for the private schools. Of course, we suggest the schools to reduce the liabilities.

MELIS variable is significantly moderately positively related to surplus at a level of 0.01 significance. Apparently, the coefficient is 4193.90059 highly. The resulting coefficient turned out to be a very high number. This result can encourage the schools to spend money on students by buying machinery applications and public books more. Book is the main asset and knowledge for the university students.

UTS has a positive significance on surplus at a level of 0.01 significance. As a consequence, we suggest that the schools can enroll more graduate students instead of undergraduate students when expanding the scale of a private university. Meanwhile, we can encourage a private university to increase the graduate programs in accordance with the number of graduate students.

In addition, the diploma of graduate school is increasingly of importance when there are too many undergraduate students accumulated at an amazing rate. As a consequence, for the competitiveness in the employment market and research interests, there are more undergraduate want to enter graduate schools than before. Probably, it is the niche for the private universities to develop the graduate schools. Meanwhile, the program can obtain more grants from the government's agreements.

The regression shows SUB has a positive significance on surplus at a level of 0.01 significance. The coefficient is 0.27751911. Such this school, CGU with much revenue from subsidies and donations has much surplus, as I mentioned it earlier. We suggest that the schools have to strive for the grants by means of developing great teaching-quality or something else.

PE and surplus have a positive significance relationship at a level of 0.01 significance. The coefficient is 0.23151941. Although capital expenditure and surplus have contrary directions for financial statements, it is suitable to enlarge capital expenditure for the school's operating performance.

Finally, it shows that there is a positive significance relationship between ME and surplus at a level of 0.01 significance. The coefficient is 0.62208945.as PE variable; the schools can expand their application for teaching and research.

4.4 Discussions and advanced explanations

The paper discusses some important theoretical and empirical issues relating to private higher education. This study yielded limited information about the operating performances of higher education. The empirical findings as described in pervious section led to the following conclusions. In addition, taking into account the fact that the statistical analysis was carried out under limited conditions, the results are reasonably reliable. The findings of this study highlight the need for research to investigate many of the above issues, and in particular, methods for improving

In view of the literature on the conclusions of higher education system as above sections, some of the results can match that. When the determinations of operating performance of private universities in Taiwan are carried out, it will enlarge the quality of higher education.

The objective of this research is to seek and find out the explanatory power of the independent variables for financial performance indicators. In addition, the issue is primarily concerned with the sufficiency and flexibility of financial resources in universities.

With summaries on empirical results from the application of our methodology on higher education, we have to make a conclusion carefully. These studies need to be treated circumspectly, as the results may reflect in part the way in which the data were collected. Apparently, we intend in the thesis to find out ways to enhance the quality of higher education by integrating educational resources and testifying the statistical methods.

In addition, the quality and reliability of these financial statements are increasingly expected to improve in near future. We do not deny the limitations of the present study. In order to obtain more reliable and objective data, future research that aims at finding evidence for the operating performance of those samples.