

Chapter 3: Research Methodology

3.1 Data source and sample selection

The study based on the disclosed financial information of the listed private universities. The research covers the period from 1995 to 2005 academic year. As I mention it earlier in this paper, there are 163 universities in Taiwan.

However, I want to pick up 24 private universities among them to compare the integration of their operating performances. What the most important reason is that the 24 private universities have the similar developed background and competitiveness in higher educational system. Therefore, it is more necessary and compatible to choose the 24 private universities.

After deleting 11 newly private schools with incomplete information and financial statements, 24 schools were discussed in this thesis. With 264 observations, 1 dependent variable and 20 independent variables, the model is analyzed step by step. Data sources are provided by the Ministry of Education and the accounting officials at private universities. Comprehensive and reliable financial statements from 1995 to 2005 academic year are available for all selected private universities on the MOE's webs. Those are included on the Internet and anyone can browse the open information anytime.

For further considerations, to ensure the homogeneity of social background, all samples are selected from the definition of characteristic schools. Our data consisted of 24 private universities, which have different classifications as follows.

Table 3-1 24 Universities based on the category

(1)Related to social science (11)*	(2)Related to natural science(7)*	(3)Related to medical science (6)*
Tunghai University	Chung-Yuan-Christian University	Kaohsiung-Medical University
Fu Jen Catholic University	Feng Chia University	China Medical university
Soochow University	Tatung University	Taipei Medical University
Tamkang University	Yuan Ze University	Chung-Shan-Medical University
Chinese Culture University	Chung-Hua University	Chang Gung University
Providence University	Da-Yeh University	Tzu Chi University
Huafan University	I-Shou University	
Ming Chuan University		
Shih Hsin University		
Shih Chien University		
Aletheia University		

Data source: the MOE, Higher Education Department.

Notes: (1) * means the number of the school in the fields.

(2) Chinese of these schools are listed as Appendix 1

Repeat it again, this study focus on the private universities, which have well-informed financial statements. Based on the research classification, it includes three main types of schools as above.

No doubt, the accuracy and quality of this data are better than any other sources of open information due to the strict limitation and regulation from the MOE. I choose the three classified types of the private universities, the first one are the private universities whose most departments related field of social science, on the contrary, the second one are the private universities whose most departments related field of natural science, and the third one are the medical schools in private educational system. The newly established universities will not in our discussion because of lacking of adequate financial statements and information.

Also, I draw a table to show the abbreviation of the 24 selected universities.

It can us understand the following explains more convenient. Take a look at Table 3-2.

Table 3-2 The abbreviation of the 24 selected universities

Abbreviation	Private university
THU	Tunghai University
FJU	Fu Jen Catholic University
SHU	Soochow University
TKU	Tamkang University
CCU	Chinese Culture University
PU	Providence University
HFU	Huafan University
MCU	Ming Chuan University
SHSU	Shih Hsin University
SCU	Shih Chien University
AU	Aletheia University
CYU	Chung Yuan Christian University
FCU	Feng Chia University
TU	Tatung University
YZU	Yuan Ze University
CHU	Chung-Hua University
DYU	Da-Yeh University
ISU	I-Shou University
KMU	Kaohsiung Medical University
CMU	China Medical university
TMU	Taipei Medical University
CSMU	Chung Shan Medical University
CGU	Chang Gung University
TCU	Tzu Chi University

Data source: (1) Higher Education Department, and this study.

Clearly, the total number of university in Taiwan is too big to compare the operating performance and funds-efficiency of them. The amounts of population are 163 universities in Taiwan, and the sample numbers are the 24 private universities. We can explain and describe the study more efficient and correct results at large. The study I present in the present paper is an attempt to supplement the findings of these earlier studies. It is similar to the previous studies discussed above; in that the focus is the variables few researches discussed them. We use financial and non-financial ratios as conducting variables. It differs from previous studies, however, in the way different variables never have been investigated before in Taiwan.

As this review has shown, most university-based research on the extent to which the operating performance of a university has been taken. Therefore, I want to investigate the research more details and try the specific variables by the statistic analysis. The thesis involves an in depth investigation of the operating performances being faced by most private schools of higher education due primarily to the shrinking number of private university expansion.

With empirical approach, I discuss the operating circumstances of private universities in Taiwan. Compare with different variables, and then make a conclusion that the variables how to affect those schools' surplus in details. Moreover, the thesis uses the simple statistic method to prove the final conclusions. The private universities are enforced to show their financial statements and checked that open on the Internet.

To conclude, data were collected primarily by means of financial statements. The data of the private universities' financial statements from 1995 to 2005 were used in the empirical and adopted from the webs of MOE, Higher Education Department conducted by each of the private universities' accounting offices. The study adopts the qualitative research method, also collects all aspects of papers in many countries and observes directly situations in higher education, especially underlines the situation of a private university. The author attempts to synthesize the information produced by the minister of education statistics have been based on the use of statistical methods such as regressions analysis.

The evidence accumulated in this study by means of literature examination, inquiry analysis, library research, and personal professional knowledge of the financial statements is sufficient to affirm the general validity of the assumptions. On the basis of the study's findings, recommendations intended to provide an effective base for the research are synthesized and presented as an empirical model. In addition,

specific measurement procedures are recommended to be controllable resource allocation.

3.2 Variable definitions and regression model

3.2.1 Definition of variables

The conducted variables used to test the relation can be divided into four categories: the operating assets approach, the revenue approach, the expenditure approach, and the teaching-quality approach.

The formulas are financial ratio and non-financial independent variables selected for consideration in this field. There are 19 explained variables in details, and current surplus (SUR) is the only dependent variable as a whole. The selection of variables and measurement for the study is shown in Table 3-2 as follows. The following are SUR, ROL, FIXO, FIXAD, TA, CR, SUB, TUITR, SUBTR, ADUTR, PE, ME, CETR, MELIS, EXPS, STR, UTS, UTEA, GTEA, and TUIS. Let's go on next page.

Table 3-3 The definition of all selected variables

Selected variables	Abbr.	Definition [Unit]
Surplus	SUR	Dependent variable [NT. million dollars]
Debt ratio	ROL	(Total liabilities/Total assets)*100 [%]
Fixed assets ratio	FIXO	(Fixed assets/Total assets)*100 [%]
Fixed assets growth rate	FIXAD	(This year fixed assets-last year fixed assets)/this year fixed assets [%]
Total Assets	TA	The sum of current assets and fixed assets [NT. Million dollars]
Current Ratio	CR	(Current assets/current liabilities)*100 [%]
Revenue of subsidies and donation	SUB	Sum of subsidies and donation [NT. Million dollars]
Ratio of tuition to revenue	TUITR	(Tuition revenue/total revenue)*100 [%]
Ratio of Subsidies and donation to revenue	SUBTR	(Total revenue on subsidies and donation/total revenue)*100 [%]
Ratio of adult revenue to revenue	ADUTR	(Adult education revenue/total revenue)*100 [%]
Capital expenditure	PE	Capital expenditure [NT. Million dollar]
Expenditure of machinery application	ME	Expenditure of machinery application [NT. Million dollars]
Ratio of current expenditure to revenue	CETR	(Current expenditure/total revenue)*100 [%]
Specific expenditure per student	MELIS	See (1)
Expenditure per student	EXPS	(Total expenditure/Total number of students) [NT. Million dollar]
Student-teacher ratio	STR	See (2)
Grad. students ratio	UTS	(Total graduate students/Total number of students) [%]
Ratio of undergrad. students to teacher	UTEA	(Undergraduate students/Full-time teachers) [%]
Ratio of grad. students to teachers	GTEA	(Graduate students/Full-time teachers)[%]
<i>Tuition per student</i>	TUIS	(Tuition/total number of students) students) [NT. Million dollars]

Notes: (1) (the total expenditure of machinery applications and library-purchasing) /total number of students. Unit is NT. Million dollars.

(2) The formula of student-teacher ratio= {[the number of doctoral students*3) + (the number of master students*2) + the number of undergraduate students)}/ [full-time teachers+ full-time specialists+ (part-time teachers*0.25)], based on the definition that the MOE regulated.

The financial and non-financial indicators are testified for the study. First of all, the

four approaches are listed as follow:

(1)The operating assets approach

---the indicators of operating assets performance and profitability

There are five indicators, Surplus (SUR), Debt ratio (ROL), Fixed assets ratio (FIXO), Fixed assets growth rate (FIXAD), Total assets (TA), and Current ratio (CR), conducting the operating assets performance. Take the only dependent variable for example; surplus is equal to the total amount of income minus the total amount of expenditure. As you can see in Table 3-3, the definitions of all variables are described in details. Meanwhile, the formulas are listed, some of them are based on the GAAP (Generally Accepted Accounting Principles), and some of them are designed by the author. Surplus is the dependent variable, before we testify the simple and multiple regressions, we have to compare average surplus among different universities.

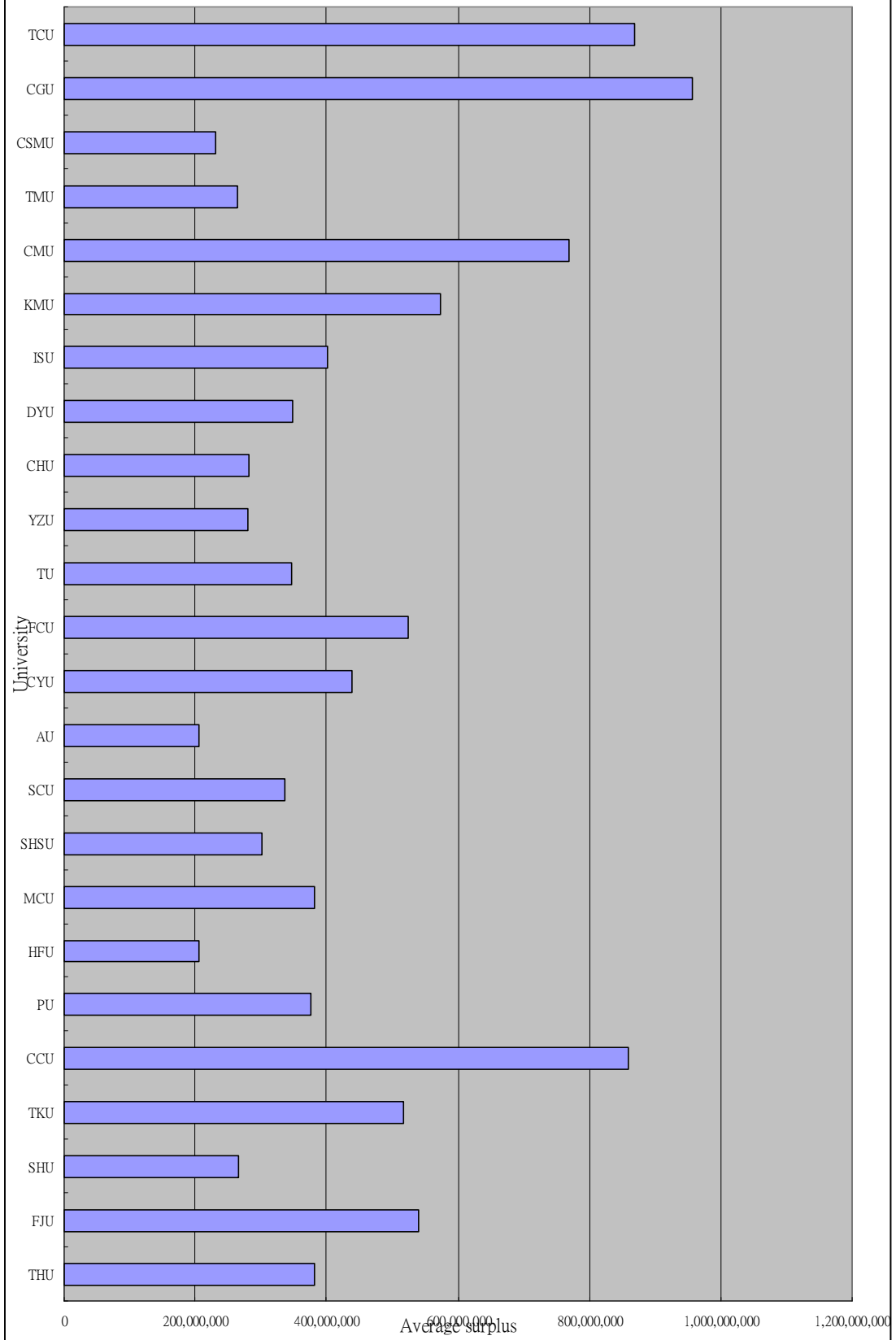
Table 3-4 Average surpluses of selected 24 universities

University	Average surplus
THU	382,305,407
FJU	539,420,746
SHU	266,936,698
TKU	516,896,365
CCU*	858,548,040
PU	375,190,560
HFU	205,675,708
MCU	381,915,040
SHSU	301,526,494
SCU	335,754,552
AU	205,105,840
CYU	437,911,068
FCU	524,820,974
TU	347,387,914
YZU	279,525,606
CHU	282,528,473
DYU	348,855,939
ISU	400,842,772
KMU	574,395,227
CMU	770,276,648
TMU	263,453,703
CSMU	231,749,955
CGU*	957,912,879
TCU*	868,361,702

Data source: this study based on Higher Education Department
Unit: Million New Taiwan dollars

Figure 3-1 Average surpluses of the 24 universities

Average surplus of the 24 universities



In table 3-4 and following Figure 3-1, it shows that the university who has the first-highest average surplus is CGU, the second-highest one is TCU, and the third-highest one is CCU.

(2)The revenue approach

--- The indicators of income-gathering and source-funding

There are four indicators related to annual revenue that I choose from the financial information, including the sum of subsidies and donations (SUB), ratio of tuition to total revenue (TUITR), ratio of Subsidies/donation to total revenue (SUBTR), and ratio of adult revenue to total revenue (ADUTR). As I mentioned earlier, the sources of revenue is very important for the institutions. As a result, the revenue approach is adopted inevitably. I summarize the three main sources of income: tuition and fees, sum of grants and donation, and the total income from adult education program. Basically, the sum of them is the total income of most schools. Table 3-5 shows CGU has the most subsidies and donations on average.

Table 3-5 Average subsidies and donation revenue of selected universities

University	Average SUB
THU	351,857,736
FJU	432,525,571
SHU	278,472,667
TKU	354,014,218
CCU	406,083,467
PU	234,511,523
HFU	212,943,806
MCU	201,864,296
SHSU	196,187,184
SCU	130,166,499
AU	123,169,555
CYU	309,930,908
FCU	389,885,416
TU	369,343,583
YZU	256,170,026
CHU	132,132,196
DYU	201,139,576
ISU	193,438,991
KMU	284,879,473
CMU	193,558,610
TMU	192,776,337
CSMU	229,479,141
CGU	1,270,106,310
TCU	629,486,728

Data source: this study based on Higher Education Department
Unit: Million New Taiwan dollars

Table 3-6 Average ratio of tuition to total revenue

University	Average TUITR
THU	65
FJU	69
SHU	73
TKU	76
CCU	68
PU	73
HFU	44
MCU	82
SHSU	69
SCU	80
AU	77
CYU	70
FCU	73
TU*	54
YZU	64
CHU	73
DYU	71
ISU	73
KMU	50
CMU	58
TMU	58
CSMU	57
CGU	18
TCU	14

Data source: this study based on Higher Education Department
Unit: Percentages

Average value of TUITR among 24 selected universities

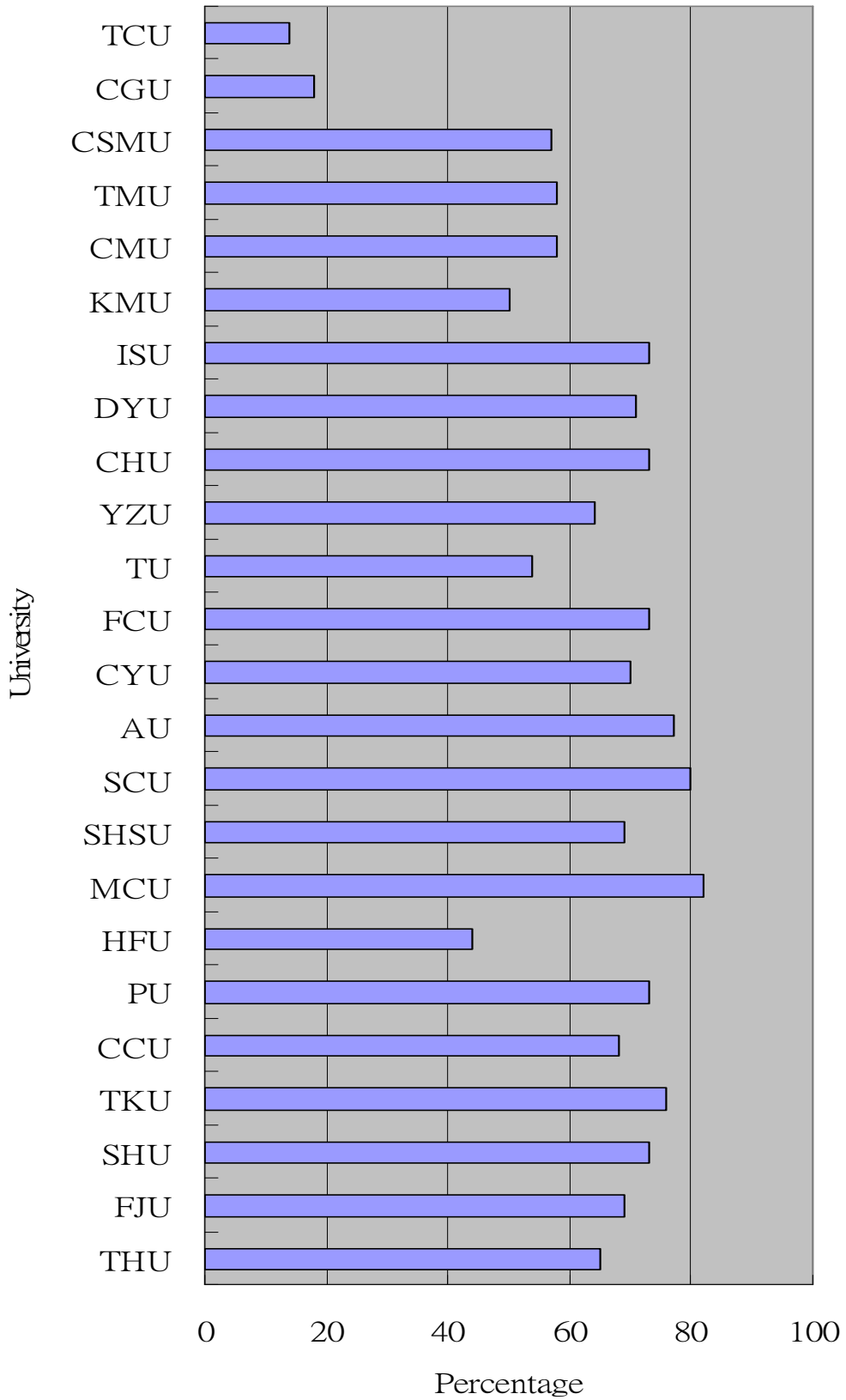


Figure 3-2 Average value of TUITR among 24 selected universities (above page)

As you can see Table 3-6 or Figure 3-2, TCU is the school has the lowest ratio of tuition to total revenue (14%), CGU is the school has the second-lowest ratio of tuition to total revenue (18%), and HFU is the school has the third –lowest ration of tuition to total revenue (44%) among the 24 schools.

According to Table 3-6 and Figure 3-2, we can say that, TCU, CGU, HFU are the most independent of tuition revenue, they can control their sources of funding partially. As we mention earlier, rely on tuition revenue too much will lead a terrible situation for a university and be restricted by the funds.

On the contrary, Figure 3-2 shows there is several schools rely on the source of tuition revenue very much. SHU, TKU, MCU, SCU, AU, CYU, FCU, CHU, DYU, ISU, those schools have an average ratio of tuition to total revenue over 70%. Especially MCU (82%) and SCU (80%) have an average ratio of tuition to total revenue over 80%. Therefore, we have to recognize that there is many private universities rely on tuition too much.

(3)The expenditure approach

--- The indicators of cost-controlling

As you can see Table 3-3, there are three indicators related to the expenditure approach. They are capital expenditure (PE), expenditure of machinery application (ME), ratio of current expenditure to revenue (CETR), specific expenditure per student (MELIS), and expenditure per student (EXPS). Based on the limitation of disclosed financial statements, the goals for a well-operated university to purchase lands, building will be presented as following results. And then expand the operating assets scale, so they have to debt the funds properly. Therefore, the objective of the indicators is to measure the abilities of paying back the debts.

EXPS means how much total expenditure the schools spend on each of the students. Let's discuss the variable by Table 3-7 and Figure 3-3.

Table 3-7 Average expenditure per student of selected 24 universities

University	Average value of EXPS
THU	136,745
FJU	128,506
SHU	119,543
TKU	129,606
CCU	145,757
PU	127,379
HFU	208,638
MCU	131,558
SHSU	159,391
SCU	112,229
AU	127,652
CYU	163,080
FCU	136,635
TU*	289,041
YZU	183,267
CHU	136,337
DYU	151,380
ISU	135,145
KMU	268,981
CMU	198,350
TMU	243,337
CSMU	176,462
CGU	541,284
TCU	952,669

Data source: this study based on Higher Education Department
Unit: Million New Taiwan dollars

Average EXPS of 24 universities

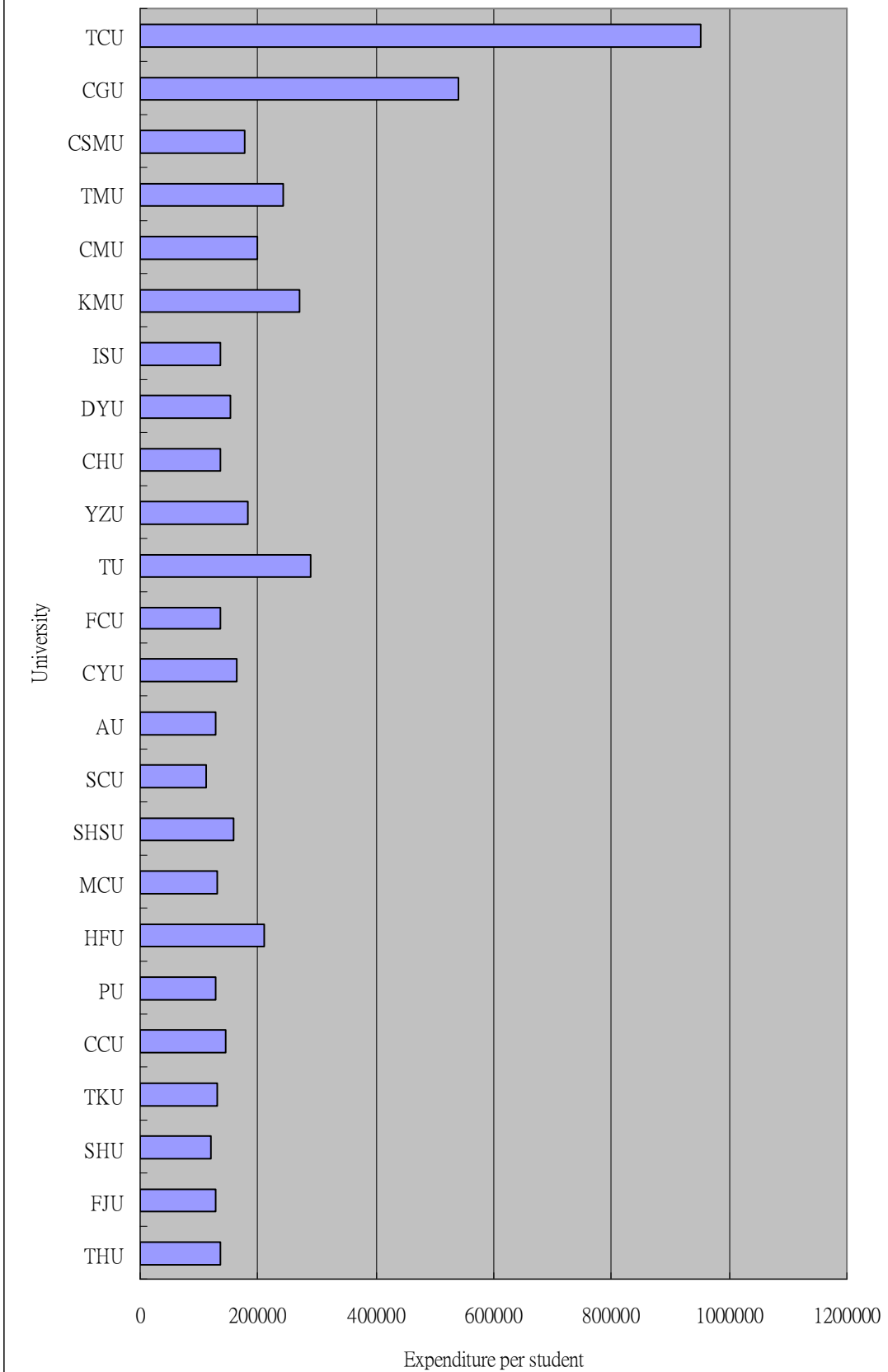


Figure 3-3 Average EXPS of 24 universities (above page)

It is said to see that TCU (NT\$952,669) spend money on each of the students the most based on Table 3-7 and Figure 3-3. CGU (NT\$541,284) is the school has the second-highest expenditure per student. It seems that the two schools would like to invest on their students the most. Both of them emphasize the teaching-quality, educational resources of the students the most. Probably, we can encourage other universities to learn the ways from CGU and TCU for this financial indicator.

(4)The teaching-quality approach

---the indicators of teaching-oriented and research-oriented

This approach is different from the prior three approaches. The previous approaches are measured and showed by the quantitative methods. However, the teaching-quality approach is measured by the quantitative methods, and showed by qualitative methods. I mean, it can explain the qualitative measurements. The five indicators are student-teacher ratio (STR), graduate students per student (UTS), ratio of undergraduate students to teachers (UTEA), and ratio of graduate students to teachers (GTEA), tuition per student (TUIS). Also, TUIS reports, on average, the expense that each of students has to pay.

Student-teacher ratio is an important independent variable in the study. Apparently, I have to compare the student-teacher ratios of the selected universities more clearly. Therefore, you can comprehend that most of the universities have a smooth change rate. CGU has an increasingly stable change rate within 11 years at large.

Table 3-8 Average student-teacher ratios

University	Average student-teacher ratio
THU	24.60
FJU	25.48
SHU	24.65
TKU	30.72
CCU	29.61
PU	27.29
HFU	19.01
MCU	28.87
SHSU	25.06
SCU	30.72
AU	31.97
CYU	29.79
FCU	27.21
TU	20.00
YZU	32.39
CHU	28.18
DYU	27.00
ISU	28.28
KMU	14.63
CMU	15.88
TMU	14.61
CSMU	18.48
CGU	11.71
TCU	10.55

Data source: this study based on Higher Education Department, unit: percentages.

As you can see in Table 3-8, YZU is the school has the first-highest student-teacher ratio (32.39%), and AU is the school has the second-highest student-teacher ratio (31.97%). TKU and SCU are the schools have the third-highest student-teacher ratio (30.72%). On the contrary, TCU is the school has the first-lowest student-teacher ratio (10.55%). CGU is the school has the second-lowest student-teacher ratio (11.71%). And TMU is the school has the third –lowest student-teacher ratio (14.61%).

Table 3-9 Average UTS of selected universities

University	Average UTS
THU	9.53
FJU	6.41
SHU	7.14
TKU	6.72
CCU	5.62
PU	4.05
HFU	8.28
MCU	3.25
SHSU	3.01
SCU	1.15
AU	0.59
CYU	10.13
FCU	6.27
TU	21.75
YZU	12.82
CHU	8.07
DYU	7.76
ISU	3.86
KMU	10.88
CMU	5.84
TMU	8.29
CSMU	5.14
CGU	17.28
TCU	11.60

Data source: this study based on Higher Education Department
Unit: percentage

The school has higher graduate student ration represents more emphasizes on the research-oriented. Based on Table 3-8, TU is the school has the first-highest graduate student ratio (21.75%). CGU is the school has the second-highest graduate student ratio (17.28%). YZU is the school has the third-highest graduate student ratio (12.82%). Also, AU is the school has the first-lowest graduate student ratio (0.59%). SCU is the school has the second-lowest graduate student ratio (1.15%). SHSU is the school has the third-lowest student ratio (3.01%).

Tuition and fees is a heavy burden for the students and their family, especially the private universities. I list the average tuition per student among the 24 universities from 1995 to 2005. It is clear to show the levels of paying tuition annual

year for a student.

Table 3-10 Average tuition per student of selected universities

University	Average tuition per student
THU	87,054
FJU	88,462
SHU	83,389
TKU	88,258
CCU	88,526
PU	88,729
HFU	100,510
MCU	92,641
SHSU	90,152
SCU	81,706
AU	78,240
CYU	97,860
FCU	97,375
TU*	111,205
YZU	103,358
CHU	93,966
DYU	98,369
ISU	93,843
KMU	108,148
CMU	110,722
TMU	108,469
CSMU	110,673
CGU	89,252
TCU	100,736

Data source: this study based on Higher Education Department

Unit: Million New Taiwan dollars

In above table, TU's average tuition is the first-highest (NT\$111,205). CMU's average tuition is the second-highest (NT\$110,722). CSMU's average tuition is the third-highest (NT\$110,673) among the 24 private universities. In addition, all the medical schools' average tuition are over NT\$100,000 except CGU (NT\$89,252). It is very reasonable for the situation because the medical school usually spend much money on teaching applications than other schools.

Table 3-11 Return on assets from 2003 to 2005

School	2003	2004	2005	Average
1.THU	6.91	5.68	5.86	6.15
2.FJU	5.56	6.00	5.40	5.65
3.SHU	4.24	5.09	6.08	5.14
4.TKU	4.69	4.17	2.23	3.70
5.CCU	7.35	5.39	4.68	5.81
6.PU	4.70	2.31	2.38	3.13
7.HFU	5.98	4.23	3.58	4.60
8.MCU	7.77	6.17	5.19	6.38
9.SHU	1.42	0.78	2.67	1.62
10.SCU	1.78	0.99	3.34	2.04
11.AU	5.68	5.01	4.81	5.17
12.CYU	5.17	4.33	4.67	4.72
13.FCU	4.14	4.47	4.33	4.31
14.TU	2.56	38.93	1.28	14.26
15.YZU	3.99	11.58	5.36	6.98
16.CHU	6.28	6.18	5.25	5.90
17.DYU	8.13	4.97	4.55	5.88
18.ISU	9.62	6.49	5.84	7.32
19.KMU	7.04	4.69	2.20	4.64
20.CMU	7.24	8.29	8.33	7.95
21.TMU	7.05	6.94	7.51	7.17
22.CSMU	1.86	2.29	3.29	2.48
23.CGU	6.74	11.77	10.16	9.56
24.TCU	4.57	1.79	3.03	3.13

Data source: the MOE, and this study

Unit: percentage

In table 3-10, TU is the school has the first-highest average ROA (14.26%). CGU is the school has the second-highest average ROA (9.56%). CMU is the school has the third-highest average ROA (7.95%). Meanwhile, SHU is the school has the first-lowest average ROA (1.62%). SCU is the school has the second-lowest average ROA (2.04). CSMU is the school has the third-lowest average ROA (2.48%).

By the way, there is a very important financial indicator- return on total assets (ROA). It is equal to the ratio of surplus to total assets. In general, Returns on total assets (ROA) is the most popular indicator for organization performance. Also, ROA is the percentage institution return on assets, or, the ratio of earning before

interests and taxes to total assets for the previous fiscal year. And then, we can understand the profitability.

The profit-related variables are surplus and total assets, also, there must have a positive relationship between ROA and surplus. Therefore, we delete this independent variable, ROA.

The four approaches help us clarify the problem in this study.

3.3 Measurements

The research centers on an empirical study involving in the schools' finance information. I found out the independent variables to testify the operating performance. The income statement shows the operating result for a period of time and whether this results in a surplus or a deficit indicates whether the organization has lived within its means or not.

The evaluation of operating performance is used and explored in many previous papers. I adopt the research to prove the empirical analysis for higher education issues. The approach is based on the dissertation of Ting, Wen-Ling (2000).⁷⁸ It discuss the operating performance of the national universities in Taiwan by testified the financial indicators. Therefore, I launch into this approach in depth.

In previous section, we can comprehend the difference of the defined variables among the 24 selected universities. We can compare their levels of operating performance, revenue, expenditure, and teaching-quality approach based on the data I collected.

Intuitively, a consideration of the data present in the section would indicate

⁷⁸ See [17] Ting, Wen-Ling (2000) "A Study of Performance Evaluation on Campus Fund of National Universities in Taiwan." Graduate School of Education, National Chengchi University, non-published dissertation. (In Chinese)

that to a consideration extent. Despite we do not have massive samples because of the limitation of the disclosed information. Apparently, a variety of measures have been used in the past to measure the operating performances and conducting efficiency.

3.4 Analyzing techniques

Let's continue to talk about introduction of the research methodology in this section. The main statistic tool is the software, LIMDEP, a powerful application. Furthermore, the practicality of the proposed methodology is demonstrated through a statistical regression with ordinary least square model. In recent years, the study of a private university's operating performance has apparently moved from prescriptive and rather anecdotal attitudes to more descriptive and scientific stances. It enhances this study to analyze straight ward in the higher education field.

Financial and non-financial variables are selected in the research process. Ordinary least square is conducted afterwards, and the selection process and results are showed next chapter in details. Unfortunately, Cross-section and time-series methods do not be adopted in this study because of some extent of complex techniques, ordinary least square.

Both qualitative and quantitative data analyses are performed. In order to examine the relationship between the surplus and the independent variables as I defined earlier, the study applied severl kinds of regressions analysis. Statistic instrument must be used appropriately if the desired results are to be obtained.

Standardized regressions were conducted to estimate the effects of
The model shows the effect of independent variables on dependent variable and

reveals the influence of all approaches. To further verify the empirical results, the data were also examined by LIMDEP, common used statistical software.