CHAPTER V

EMPIRICAL RESULT

This chapter is divided into two sections. The first section reports statistical results and the second one presents regression results.

5.1 Summary of Statistics

The statistics of Gini coefficient, average year of schooling, educational inequality, expenditure on education, and pupil-teacher ratio by educational service area are presented in Table 5.1.1 to 5.1.4.

Table 5.1.1 Gini Coefficient by Educational Service Area during 1996-2002

Unit: Point

EDUCATIONAL SERVICE AREA	1996	1998	2000	2002
CENTRAL	0.35	0.35	0.43	0.46
1	0.37	0.37	0.40	0.42
2	0.52	0.53	0.57	0.49
3	0.45	0.44	0.48	0.48
4	0.45	0.47	0.50	0.46
5	0.46	0.46	0.49	0.46
6	0.47	0.46	0.49	0.45
7	0.46	0.47	0.52	0.50
8	0.47	0.47	0.53	0.49
9	0.51	0.50	0.53	0.52
10	0.54	0.50	0.54	0.52
11	0.50	0.51	0.54	0.51
12	0.43	0.42	0.47	0.46
MEAN	0.46	0.46	5.0	0.48
MAX	0.54	0.53	0.57	0.52
MIN	0.35	0.35	0.40	0.42
RANGE	0.19	0.18	0.17	0.10
S.D.	0.05	0.05	0.05	0.03

Source: Author's Calculation

From Table 5.1.1, on average, the income distribution problem was the most intense in 2000, but better in the later year. This problem in central educational service and area 1 which are Bangkok and vicinities has become more serious during 1996 to 2002. Although it has become more intense over time, it is still less intense than other educational service areas, especially when compared to educational service area 9,10 and 11 which is in Northeastern region.

Table 5.1.2 Level of Schooling by Educational Service Area during 1996-2002

Unit: Year

EDUCATIONAL SERVICE AREA	1996	1998	2000	2002
CENTRAL	8.18	9.15	9.28	9.05
1	7.40	7.77	8.19	8.08
2	4.82	5.25	5.53	5.75
3	6.20	6.60	6.85	6.79
4	6.27	6.65	7.01	6.87
5	5.66	5.90	6.21	6.24
6	6.20	6.43	6.58	6.66
7	5.40	5.63	5.77	5.59
8	5.14	5.77	5.93	5.85
9	5.69	6.00	6.30	6.06
10	5.56	5.86	6.09	5.97
11	5.23	5.62	5.96	5.66
12	6.03	6.36	6.79	6.69
MEAN	5.98	6.38	6.65	6.56
MAX	8.18	9.15	9.28	9.05
MIN	4.82	5.25	5.53	5.59
RANGE	3.36	3.90	3.75	3.46
S.D.	0.93	1.05	1.05	1.01

Source: Author's Calculation

From the table above, the average educational attainment of labor in Thailand is primary level. Only workers in central educational service area and area 1 have educational level higher than primary level. The average year of schooling of these two areas are around seven to nine years. Workers in educational service area 2 which are Yala, Pattani, Narathiwat, and Satun, on average, have the lowest level of education.

However, one has to be careful when interpreting these results over time since the raw data used to calculate average year of schooling had some changes in year 2002 in that the population of this calculation was labor force aged fifteen years old and over instead of thirteen years old. Besides, the definition of level of education also changed. Therefore, one perhaps cannot compare the average year of schooling in the year 2002 with that of other years.

Table 5.1.3 Educational Inequality by Educational Service Area during 1996-2002

Unit: Year

EDUCATIONAL SERVICE AREA	1996	1998	2000	2002
CENTRAL	4.54	4.63	4.71	4.84
1	3.87	3.92	4.12	4.48
2	3.74	4.00	4.04	4.36
3	3.48	3.66	3.82	4.28
4	3.64	3.67	3.79	4.21
5	3.38	3.61	3.55	4.05
6	3.55	3.71	3.78	4.26
7	3.17	3.33	3.51	3.82
8	3.65	3.87	3.88	4.38
9	2.90	3.13	3.25	3.66
10	2.67	2.85	3.07	3.55
11	2.78	2.91	3.20	3.54
12	3.36	3.62	3.78	4.11
MEAN	3.44	3.61	3.73	4.12
MAX	4.54	4.63	4.71	4.84
MIN	2.67	2.85	3.07	3.54
RANGE	1.87	1.78	1.64	1.30
S.D.	0.50	0.48	0.44	0.39

Source: Author's Calculation.

Table 5.1.3 indicates that education has become more unequal over time in nearly all of the provinces in Thailand. This problem is more serious in the big cities which are in central educational service area, and area 1, including provinces in boundary of the Southern part which is area 2. Although the overall average year of schooling has increased, inequality of education has been higher too. It implies that only some groups of people can get access to educational services, while most people of the country cannot. This may be a factor offsetting the equalizing effect of increased educational attainment. Nevertheless, low level of inequality may not be a good thing if it means that people do not have different level of education because they receive no education or only low level of education. Here is an example. Northeastern region, which are educational service area 9,10 and 11, has very low level of inequality, but educational attainment of people in these provinces are low too. People in these areas, on average, receive less than six years of education. Therefore, only high educational equality is not desirous as long as educational attainment is still low.

This paper uses two indicators to measure the quality of education. The first one is educational expenditure and the second one is pupil-teacher ratio.

Table 5.1.4 Educational Expenditure by Educational Service Area during 1996-2002

Unit: Baht

EDUCATIONAL SERVICE AREA	1996	1998	2000	2002
CENTRAL	7,638	8,948	8,136	8,248
1	2,216	2,501	2,234	2,543
2	3,213	3,649	3,281	3,277
3	3,526	4,070	3,761	3,777
4	3,383	3,852	3,378	3,384
5	2,839	3,308	3,051	3,195
6	2,978	3,463	3,219	3,360
7	2,649	3,079	2,865	3,052
8	3,250	3,814	3,568	3,639
9	2,820	3,256	3,040	3,146
10	2,697	3,138	2,899	2,992
11	2,413	2,815	2,584	2,671
12	2,714	3,112	2,924	2,905
MEAN	3,257	3,770	3,457	3,553
MAX	7,638	8,948	8,136	8,248
MIN	2,216	2,501	2,234	2,543
RANGE	5,422	6,447	5,902	5,705
S.D.	1,369	1,616	1,462	1,453

Source: Author's Calculation

From Table 5.1.4 shown above, educational budget allocated to Bangkok is about one-fifth of the total educational budget. Educational expenditure per capita of Bangkok is nearly two and a half times higher than the average. Educational expenditure per capita is relatively high in educational service areas where large cities are located, such as area 3 which is composed of Songkhla, Nakhon Si Thammarat, Surat Thani, Pattalung, and Chumphon, and area 8 which is location of Chiang Mai.

Table 5.1.5 Pupil-Teacher Ratio by Educational Service Area during 1996-2002

EDUCATIONAL SERVICE AREA	1996	1998	2000	2002
CENTRAL	19	19	20	20
1	22	22	23	24
2	22	22	22	22
3	20	20	20	20
4	21	21	22	23
5	19	19	19	20
6	18	18	18	18
7	19	19	19	18
8	18	19	19	20
9	21	21	20	22
10	20	20	20	21
11	21	22	22	22
12	21	21	21	22
MEAN	20	20	20	21
MAX	22	22	23	24
MIN	18	18	18	18
RANGE	4	4	5	6
S.D.	1.38	1.36	1.50	1.80

Source: Author's Calculation

Pupil-teacher ratio is another indicators measuring quality of education. The lower ratio, the higher quality of education. From the table above, educational service area 6 which represents Lop Buri, Phra Nakhon Si Ayutthaya, Ang Thong, Saraburi, Singburi, Chainat, and Uthai Thani has the lowest pupil-teacher ratio, but the low ratio in this case in reality might not represent the high quality of education. It might be resulted from the lower number of students caused by diminishing birth trend in Thailand. In contrast, educational service area 1 which are the provinces surrounding Bangkok seems to have the highest ratio, but it does not mean that this area has the lowest quality of education. In this case it might be

because of an increased number of students. In addition, the quality of teachers must also be taken into consideration in interpreting the result of those two cases.

From statistical results shown above, the educational service areas with lower income inequality, such as central area and area 1, have more unequal education and higher level of education. Although income inequality of Bangkok and vicinities is lower than other provinces, it has become more intense over time. Average year of schooling and standard deviation of average year of schooling of Bangkok and vicinities have also continuously increased. Thus, it might be possible that higher educational attainment and more educational dispersion are related to more intense of income inequality. Quality of education, both educational expenditure and pupil-teacher ratio, does not show the vivid relationship with income inequality. However, only looking figures is not enough to explain the accurate relation. Next section will examine the relationship between educational attainment, educational inequality, educational quality and income distribution by considering regression results.

5.2 Regression Results

$$YI_i = a_0 + a_1E_i + a_2EI_i + a_3EX_i + a_4PT_i + a_5\log Y_i + a_6[\log Y_i]^2 + \varepsilon_i \quad (5.2.1)$$

$i = 1, 2, \ldots, 76$

Equation 5.2.1 is estimated by cross section technique. Since each regression represents relationship in each year, there are four regressions for the year 1996, 1998, 2000, and 2002. The provincial data of Gini coefficient, average year of schooling, standard deviation of average year of schooling, educational expenditure, and pupil-teacher ratio are shown in table 1 to 5 in appendices.

This paper uses 10% level of significance to test the null hypothesis that the coefficient of the variable is equal to zero. The results of the year 1996, 1998, 2000, and 2002 are presented in the table 5.2.1, 5.2.2, 5.2.3, and 5.2.4 respectively.

Table 5.2.1 Regression Results by Cross Section Estimation for the year 1996.

Dependent Variable	Gini Coefficient				
Variable	Coefficient	Std. Error	t-stat	Prob.	Result at 10%
C	1.632375	1.014527	1.609001	0.1122	Cannot Reject
E	-0.010954	0.008676	-1.262545	0.2110	Cannot Reject
EI	0.014021	0.015315	0.915545	0.3631	Cannot Reject
EX	0.000003	0.000007	0.504877	0.6153	Cannot Reject
PT	0.004428	0.002965	1.493479	0.1399	Cannot Reject
Log Y	-0.418693	0.430458	-0.972670	0.3341	Cannot Reject
$[\text{Log Y}]^2$	0.031608	0.045726	0.691252	0.4917	Cannot Reject

Table 5.2.2 Regression Results by Cross Section Estimation for the year 1998.

Dependent Variable	Gini Coefficient				
Variable	Coefficient	Std. Error	t-stat	Prob.	Result at 10%
C	1.241735	0.935835	1.326874	0.1889	Cannot Reject
E	-0.025338	0.007388	-3.429752	0.0010	Reject
EI	0.015200	0.016116	0.943127	0.3489	Cannot Reject
EX	0.000002	0.000006	0.390928	0.6971	Cannot Reject
PT	0.001501	0.002689	0.558284	0.5785	Cannot Reject
Log Y	-0.223580	0.404859	-0.552241	0.5826	Cannot Reject
$[\text{Log Y}]^2$	0.014506	0.043242	0.335461	0.7383	Cannot Reject

Table 5.2.3 Regression Results by Cross Section Estimation for the year 2000.

Dependent Variable	Gini Coefficient				
Variable	Coefficient	Std. Error	t-stat	Prob.	Result at 10%
C	1.742936	0.831000	2.097395	0.0396	Reject
E	-0.025500	0.006736	-3.785544	0.0003	Reject
EI	0.013644	0.017261	0.790425	0.4320	Cannot Reject
EX	0.000013	0.000006	1.901705	0.0614	Reject
PT	0.003459	0.002426	1.425478	0.1585	Cannot Reject
Log Y	-0.455276	0.359316	-1.267062	0.2094	Cannot Reject
$[\text{Log Y}]^2$	0.039840	0.038056	1.046896	0.2988	Cannot Reject

Table 5.2.4 Regression Results by Cross Section Estimation for the year 2002.

Dependent Variable	Gini Coefficient				
Variable	Coefficient	Std. Error	t-stat	Prob.	Result at 10%
C	1.242070	1.265801	0.981253	0.3299	Cannot Reject
E	-0.005373	0.010976	-0.489512	0.6260	Cannot Reject
EI	-0.006135	0.027913	-0.219805	0.8267	Cannot Reject
EX	-0.000003	0.000009	-0.365252	0.7160	Cannot Reject
PT	0.002274	0.002514	0.904477	0.3689	Cannot Reject
Log Y	-0.229548	0.551560	-0.416179	0.6786	Cannot Reject
$[\text{Log Y}]^2$	0.014634	0.058014	0.252253	0.8016	Cannot Reject

From the four tables above, the results are inconsistent over period of time. Educational attainment is statistically significant in the year 1998 and 2000 but it is insignificant in 1996 and 2002. Educational expenditure is significant only in 2000. The negative sign of educational attainment implies that the provinces with lower average year of schooling have more inequality of income. This result is similar to the conclusion from the statistical table 1 and 2 in appendices finding that the

provinces with higher income inequality, such as Surin, Si Sa Ket, Kalasin, Sakon Nakhon, and Nakhon Phanom, have lower level of education.

However, the results from cross section technique are less reliable since the model is a static model. It does not consider changes over time. Education in this year might not have an effect on this year income, but it might affect income in next year or in the next two years. Therefore, another better model is regression equation 5.2.2 which is estimated by pooled least square techniques to allow the changes of factors in the model over periods of time.

$$YI_{i,t} = b_{0i} + b_1E_{i,t} + b_2EI_{i,t} + b_3EX_{i,t} + b_4PT_{i,t}\ b_5\log Y_{i,t} + b_6[\log Y_{i,t}]^2 + \varepsilon_{i,t} \qquad (5.2.2)$$

$i = 1, 2,\ldots, 13$

$t = 1996, 1998, 2000, 2002$

This paper estimates equation 5.2.2 from the panel data set of education and income distribution by educational service area shown in the table 5.1.1 to 5.1.5. The regression equation allows for different intercepts for each educational service area because of the hypothesis that provinces in the same educational service area might have the same educational management structure contributing to similar pattern of income distribution, but it might be different from others. Therefore, fixed effect is chosen for performing regression.

The results are shown in Table 5.2.5 below.

Table 5.2.5 Regression Results by Pooled Least Square Technique

Dependent Variable	Gini Coefficient				
Variable	Coefficient	Std. Error	t-stat	Prob.	Result at 10%
E	0.064258	0.017907	3.588330	0.0011	Reject
EI	-0.019557	0.020775	-0.941381	0.3534	Cannot Reject
EX	-0.000037	0.000020	-1.860913	0.0717	Reject
PT	0.004905	0.007601	0.645343	0.5232	Cannot Reject
Log Y	0.897706	1.705225	0.526444	0.6021	Cannot Reject
$[\text{Log Y}]^2$	-0.087506	0.178488	-0.490261	0.6272	Cannot Reject
C0	-2.174150				
C1	-2.360097				
C2	-1.979730				
C3	-2.118650				
C4	-2.145183				
C5	-2.100099				
C6	-2.135889				
C7	-2.034873				
C8	-2.014602				
C9	-2.030198				
C10	-2.000458				
C11	-2.021642				
C12	-2.194349				

From the table above, educational attainment and expenditure on education are rejected. It means that these two variables have relationship with Gini coefficient. The results, thus, represent the role of education on income distribution.

The positive relationship between average year of schooling and Gini coefficient indicates that the higher educational attainment, the more inequality of

income. This result contradicts to the hypothesis that higher educational attainment could reduce income inequality. It might be because primary and secondary enrollment ratios are already high for Thailand during the period of study, so an increase in educational attainment is an increase in higher education. Most people who can get access to higher education come from high and middle income group. After they graduate higher educational level, their income will be much higher than those graduated only at primary or secondary level. Therefore, higher educational attainment makes people from high and middle income group gain higher wages, while people from low income still gain low wages. As a result, income discrepancy between the rich and the poor is larger. This result is consistent with Isra Sarntisart (1996) finding that changes at the university level played the major roles in the increase in labor earning inequality.

According to the concept of Knight and Sabot (1983), it might conclude here that in Thailand at present, the composition effect dominates wage compression effect since only high income people can get access to higher education. However, after some periods of educational expansion, supply of high educated workers increase, so their wages decrease. Thus, income differences are lower. Whenever everybody can access to higher educational level, an increase in educational attainment will lead to more equality of income. Therefore, in this stage wage compression effect dominates composition effect.

From regression, the coefficient, which is equal to 0.064, suggests that one more year of schooling will increase the Gini coefficients by 0.064.

Inequality of education, measured as the standard deviation of average year of schooling of workers, does not have a significant effect on income inequality. This may be due to the fact that the majority of Thai workers only have basic compulsory education, and the enrollment ratio of compulsory education in Thailand is very high. Thus, the impact of this variable on income inequality may not appear.

In terms of quality of education, there are two indicators in regression equation to measure quality of education: expenditure on education and pupil-teacher ratio. More educational expenditure helps to raise quality of education by improving educational instruments and encouraging teachers to do the best of their ability via higher salaries. Besides, the lower pupil-teacher ratio makes education more effective as teachers can pay attention to their students thoroughly. Therefore, high quality of education transforms workers to be more productive than low quality of education.

From the regression result, expenditure on education has a significantly negative effect on income inequality. The more educational expenditure, the more equality of income. More expenditure on education raises quality of education which will improve quality of low educational level, and thus raise marginal productivity of low educated workers. Their wages, finally, increase. While wages of low educated workers are higher, those of high educated workers are unchanged. Therefore, income of population becomes more equal.

It must be noted that educational budget in Thailand consist mainly of teachers' salaries, while capital and other development expenditures are of a small proportion. To raise quality of education via educational expenditures must focus on increasing the non-wage and non-salary portion of the budget.

In terms of pupil-teacher ratio, although it has a positive relationship with income inequality as expected, it does not show significant effect since this research assumes quality of teachers is the same for all regions. However, in reality teacher's quality is different. Teachers in Bangkok and vicinities seem to have higher quality than teachers in remote area such as Pattani, Yala, Naratiwat, and Satun. As a result, the high or low values of pupil-teacher in this case do not represent the real quality of education.

Since educational expenditure is significant, while pupil-teacher ratio is not. It implies that educational expenditure has more influence on quality of

education than pupil-teacher ratio. Thus, in order to improve quality of education, the government should allocate more budgets to education.

Considering the log of per capita GPP and its square added to examine the Kuznets hypothesis, they are not significant. Other specifications for testing the Kuznets curve have been proposed by Anand and Kanbur (1993). The results show that no matter what specifications, the relationship between income and its distribution is still insignificant. Insignificant relationship might imply that continuous growth of economics does not guarantee that income will become automatically equal sometime in the future.

Considering the intercept of each educational service area which specifics characteristics of each region as fixed effect, one can see that the intercept for each area is rather different. Central educational service area, educational service area 1 and 12 which are composed of Bangkok and vicinities, including provinces in Eastern region, such as Chonburi, Chanthaburi, Rayong have large negative fixed effect intercept than other areas. It implies that provinces in these areas have more equality of income. In contrast, provinces in educational service area 2 which are four provinces in boundary of Southern region have the lowest negative intercept. Thus, these four provinces seem to have the worst income inequality.